The Use of Restorative Materials in Primary Molars among Pediatric Dentists in Israel

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Objectives: *To assess the current choice of various restoration materials among Israeli pediatric dentists according to seniority and specialty.* ***Study design***: *Participating dentists completed a 23-item questionnaire on their qualifications, type of practice and preference of restorative material.* ***Results***: *Seventy-five dentists (average age 46.27±12.6 years, 58 females) participated. Forty-one were specialist pediatric dentists and 34 were general practitioners. Amalgam was preferred by 49.3%, followed by composite (41.3%), glass ionomer cement (5.3%) and compomer (4%). Only 13.3% of the dentists thought amalgam bears environmental and health hazards, compared to 49.3% for composite. Satisfaction was high for amalgam and composite, less for glass ionomer cements and least for compomer. General practitioners preferred amalgam (70.6%) while pediatric dentists preferred composite (51.2%), P < 0.003.* ***Conclusions:*** *Amalgam and composite were the materials of choice among the participating Israeli dentists. Most of them (86.7%) responded that amalgam does not possess any health issues. Their satisfaction with the restoration materials was highest for amalgam and composite, a choice significantly affected by whether they were in general practice (amalgam) or specialized in pediatric dentistry (composite).*

Key words: restorations, children, preferences

Introduction

Dental amalgam, composite materials, glass ionomer cements (GICs), resin modified glass ionomer cements and compomers are used for restoring carious primary and permanent teeth.[1,2] Due to its mercury content, there have been concerns about amalgam toxicity. Those concerns together with improvements in esthetic materials has raised questions about the use of amalgam in children, since there are changes in volume after amalgam is placed on a cavity, the end result of which may be fractures of the restoration margins over time.[3] In 2009, the Environmental Council of the United Nations recognized the need to develop a convention regarding the use of materials containing mercury in order to avoid reported potentially adverse effects, such as accumulation in the kidney and other organs as well as metilation of mercury by metilation of oral streptococci.[4] The resultant Minamata Convention for the Use of Mercury[5,6] and the International Dental Federation (FDI) recommended a phase-down of the use of amalgam.[6] This has led to changes in the professional medical and dental communities' use of dental amalgam worldwide, and to the introduction of and switching to tooth-colored materials as alternative materials for caries restoration.[7-9]

Alexander *et al* recently looked into dentists' decision-making of restoratives in the absence of an amalgam option.[10,11] The aims of the current study were to assess the current use of various restoration materials among pediatric and general practitioner dentists in Israel, and to compare their preferences according to seniority and professional specialty.

MATERIALS AND METHOD

The Israeli Society of Dentistry for children includes both specialist pediatric dentists as well as general practitioners who treat children. All attendees of a meeting of the March 2015 Israeli Society of Dentistry for children (ISDC) were asked to complete a 23-item non-validated questionnaire designed for this study to elicit information on the following:

a. Demographics and education (age, gender, place of dental studies and numbers of years since, the main source of professional information according to which a specific restorative material is selected)

b. Practicing pediatric dentistry or in general practice, university affiliation, private practice and/or public clinic.

c. Percent of children on patient list.

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d. The restorative material of choice for primary molars.

e. Surgery-related questions: performance of Class II restorations from tooth-colored materials on posterior teeth, knowledge of risk associated with the use of amalgam or composite materials, and use of GICs.

f. Ranking satisfaction with amalgam, resin composites, GICs and compomers on a 1-5 scale, where 1 = greatest level of satisfaction.

g. Selection of the material with the highest number of failures.

The study was approved by the ethics committee of Tel Aviv University. All respondents gave their informed consent to participate in the study.

Statistical analyses

Data analyses were performed using an SPSS (statistical package for the social sciences) 15.0 software (SPSS Inc., Chicago. IL., USA)

RESULTS

A total of 110 dentists were invited to participate in this study and 75 agreed to fill in the questionnaires. Table 1 summarizes the main data on demographics and types of dental practice. Forty-five (60%) of the dentists had over 10 years of experience (senior group), 16 (21.3%) had 5-10 years of experience and 14 (18.7%) had fewer than 5 years of experience (young group). Forty-one dentists were specialists in pediatric dentistry (54.7%) and 34 (45.3%) were general practitioners. Thirty-nine responders (52%) were associated with academia.

Table 1. Summary of main demographic and clinical data

Gender	Female	58 (77.3%)
	Male	17 (22.7%)
Age (years±SD)	Total	12.6±46.27
	Female	11.42±44
	Male	13.9±53.94
Experience	<5 years	18.7%
	5-10 years	21.3%
	>10 years	60%
Pediatric specialist	Yes	41 (54.7%)
	No	34 (45.3%)
Treating only children	Yes	80%
	No	20%
Working in public clinic	Yes	68%
	No	32%
Working in private clinic	Yes	66.6%
	No	33.3%

Figure 1 illustrates the dentists' preferences of restorative material of choice for primary molars. Noteworthy, composite was reportedly used in class II restorations in primary teeth by 88% of the dentists. It was used in more than 20% of the class II restorations by 44 (58.7%) dentists and in fewer than 20% of the class II restorations by the remaining 31 dentists.

Figure 1: Restorative material of choice for primary molars

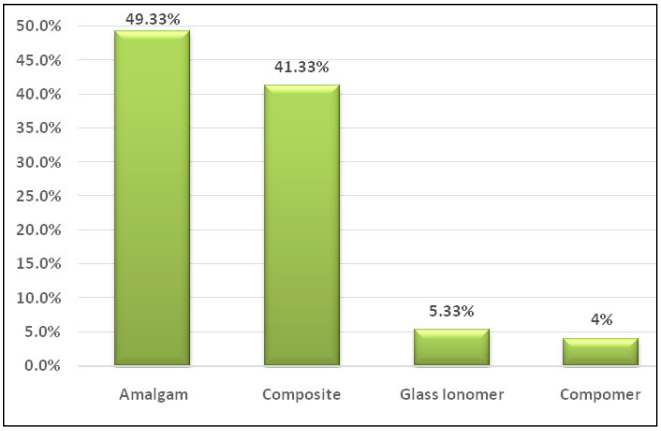
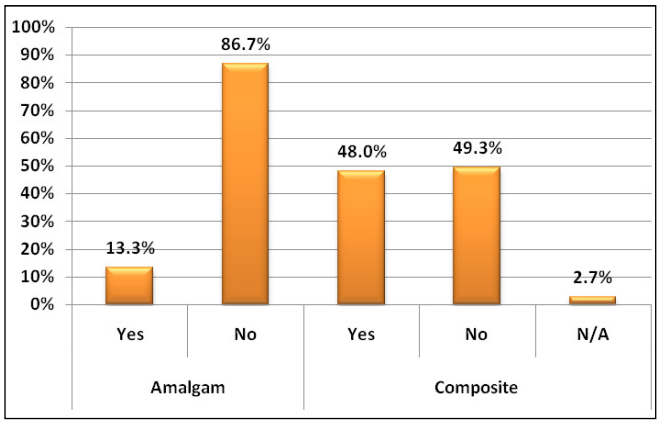


Figure 2: Dentist's opinion on the danger of using amalgam and composite



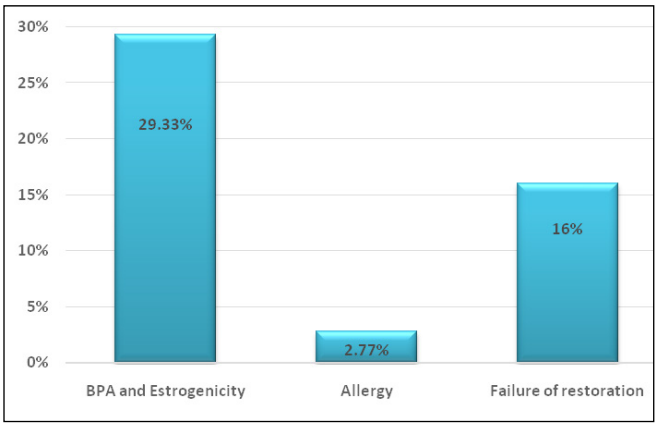
N/A = no answer

The dentists' view on the danger associated with the use of amalgam and composite is depicted in Figure 2. Most of the dentists (86.7%) considered that amalgam was safe for restoration. Their opinions about whether or not there are hazards related to the use of composite was split almost in half (Figure 3). Twenty-two dentists (29.33%) claimed that there are health issues with using composite because of the exposure to bisphenol A (BPA) and its estrogenic effect, two dentists noted the allergenic potential of composite and 12 dentists mentioned the potential of failures and secondary caries development.

Figure 4 describes the level of satisfaction with each restorative material. In reply to the question of which restorative material was associated with the most failures, 46.67% chose composite, 26.67% chose GIC, 13.33% chose compomer and only 6.67% chose amalgam (6.67% did not respond).

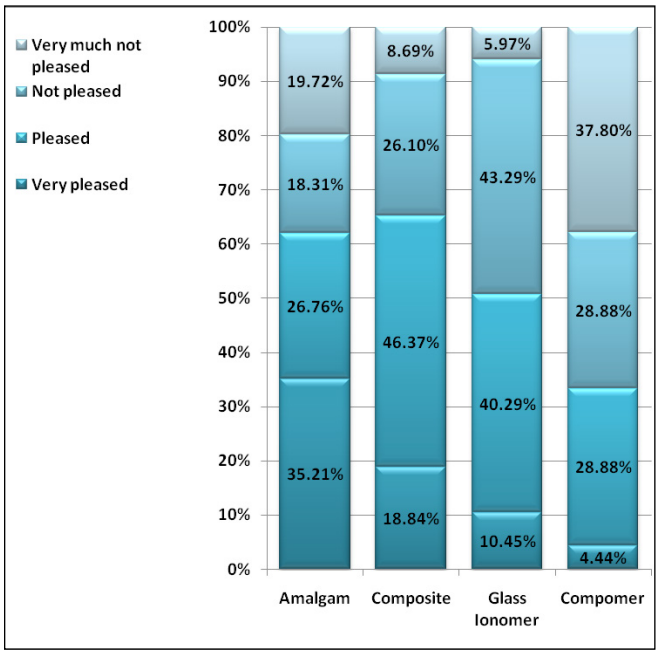
In order to study the influence of professional experience on the way the dentists chose a restorative material, the responders were divided into two groups according to age (<40 years and >40 years). They were also divided into groups of specialist pediatric dentists and general practitioners. Table 2 summarizes the preferences of dentists according to age and specialty. Most of the senior dentists (83.3%) worked in private clinics compared to the young dentists (48.5%, Fisher's Exact test, $P = 0.002$). In contrast, the majority of the young dentists (84.8%) worked in public clinics compared

Figure 3: Reasons for the hazards of using composite



BPA = bisphenol A

Figure 4: Dentists' level of satisfaction for each restorative material

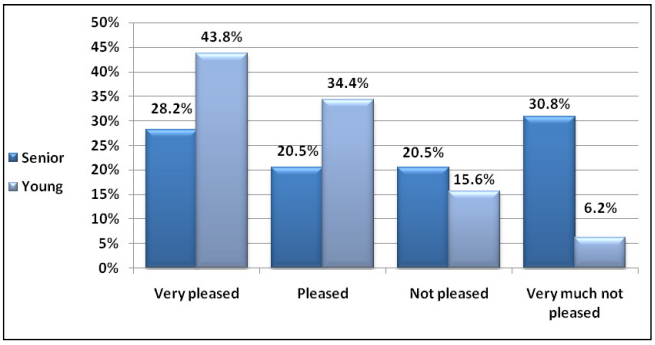


to 52.3% of the senior dentists (Fisher's Exact test, $P = 0.003$). Most of the pediatric dentists (87.8%) worked in private clinics compared to 44.1% of the general practitioners (Fisher's Exact test, $P = 0.00006$), and most of the general practitioners (85.3%) worked in public clinics compared to 51.23% of the pediatric specialists (Fisher's Exact test, $P = 0.003$).

Amalgam was the restorative material of choice among young dentists (60.6%) followed by composite (36.4%), with only 3% choosing GIC and compomers. The senior dentists similarly preferred composite and amalgam (45.2% and 40.5%, respectively), and the remaining 14.3% choose GIC and compomers. None of the group differences reached a level of significance. Amalgam was also the restorative material of choice among the general practitioners (70.6%), followed by composite (29.4%), while the pediatric specialists preferred composite (51.2%), over amalgam (31.7%) and others (17.1%). This latter group difference was significant (Pearson Chi-Square, $P = 0.001$). Most of the pediatric specialists (80.5%) used composite in more than 20% of the class II restoration, while 55.9% of the general practitioners reported using composite in 10-20% of those cases (Pearson Chi-Square, $P = 0.00001$).

The only significant difference in the levels of satisfaction from each of the materials was found with regard to amalgam (Figure 5). Most of the young dentists (78.2%) were "very pleased" or "pleased" with amalgam, while more than half of the senior dentists expressed dissatisfaction from it (Pearson Chi-Square, $P = 0.045$).

Figure 5: Satisfaction levels for amalgam according to professional seniority



* Pearson Chi-Square, P = 0.045

Table 2. Dentists' preference and data according to age and specialty

		Age (years)		Specialist Pediatric Dentistry	
		Senior (>40)	**Young (<40)**	**Yes**	**No**
Number		42 (56%)	33 (44%)	41 (54.6%)	34 (45.4%)
Private clinic		83.3%*	**48.5%***	87.8%*	44.1%*
Public clinic		52.3*	**84.8%***	51.2%*	85.3%*
Restoration material of choice	Amalgam	45.2%	60.6%	31.7%	70.6%*
	Composite	40.5%	36.4%	51.2%*	29.4%
	Other	14.3%	3%	17.1%	0%
Main source of information	University	**33.3%***	**75.8%***	39%	67.6%*
	Conferences	54.8%	39.4%	48.8%	47.1%
	Literature	31%	33.3%	48.8%*	11.8%*
	Sales Rep	4.8%	0%	2.4%	2.9%

*$P < 0.05$

The main source of information for choosing the restorative material was their dental school for 52% of the responders, from conventions for 48%, and from journals and textbooks for 32%, with only two dentists relying on company representatives. Dental school was the main source for young dentists (75.8%) compared to one-third of the senior dentists (Fisher's Exact test, $P = 0.0004$). The pattern for general practitioners and specialist pediatric dentists was similar: dental school was the source for two-thirds of the former compared to 39% of the latter (Fisher's Exact test, $P = 0.02$). Almost one-half of the pediatric specialists (48.8%) obtained their information on restorative materials from journals and textbooks vs. 11.8% of the general practitioners (Fisher's Exact test, $P = 0.001$).

DISCUSSION

Following the conclusions reached by The Minamata Convention for the Use of Mercury and the recommendations by the International Dental Federation for a phase-down of amalgam usage,[6] we conducted this survey to determine the use of amalgam and other restorative materials among specialist pediatric dentists and general dentist practitioners who treat children in Israel. Dentists attending the annual Israeli Pediatric Dentistry Society convention in 2015 were asked to fill in a questionnaire and their responses provided the data for this investigation.

The shift from amalgam to composite by pediatric dentist specialists, but not general practitioners in Israel, is evident from data that were collected by a survey conducted one decade ago in which the majority of those dentists claimed that they use amalgam in class II restorations in primary molars.[12] The current results demonstrated that the two main restorative materials of choice in the primary molars were amalgam (49.3%) and composite (41.3%), followed by GIC (5.3%) and compomers (4%). Gender, place of study (Israel or abroad) and university affiliation had no influence on restorative material preference.

Pair *et al* [13] conducted a survey similar to ours in 2004 among members of the California Society of Pediatric Dentistry. They reported that amalgam was the material of choice for restoration of Class II lesions in primary molars in 57% of the respondents, and that 29% selected composite, 5% GIC, and 6% compomer. Barker *et al*'s [14] survey among general dentists that treat children in Kentucky in 2012 revealed that 54% of the dentists use amalgam in Class II lesions in primary molars, and that 44% rarely or never do so. Moreover, most of those dentists (87%) perform Class II composite restorations on primary teeth, and 13% rarely or never do so.

A comparison of the three surveys indicates that there apparently had been a shift from amalgam to composite over time. The shift from amalgam usage to tooth-colored restorative materials seems to be geographically related. Buerkle *et al* 's[15] 2005 survey of 200 departments of pediatric dentistry in European dental schools on the subject of restorative material of choice in primary molars reported that amalgam was no longer used in north Europe, and in only 3.4% of the departments in Germany. In contrast, amalgam was used in 23.1%, 33.3% and 35% of those departments in south, west and east Europe, respectively. Tran and Messer's[16] 2003 survey reported that amalgam was used exclusively by only 2% members of the Australasian Academy of Pediatric Dentistry and by 3% of the members of the New Zealand Society of Pediatric Dentistry, compared to 89% that used mainly tooth-colored materials mainly and 97% who used tooth-colored materials exclusively. A survey that was conducted Roshan *et al* [17] among general dental practitioners in Yorkshire (UK) from 1986 to 1996 reported that the use of amalgam declined from 80% to 35% while the use of GIC rose. In their survey, 86% of the dentists claimed that there is no danger in using amalgam, while about one-third of the dentists pointed out the risk of BPA exposure in using composite. These finding are similar to those of a survey that was conducted among Nigerian dentists in which more specialists (95.7%) than general dentists (74.5%) agreed about the safety of amalgam.[18] In a survey among Nordic dentists, the percentage of those who responded that there was no health risk associated with the use of amalgam ranged from 33% in Denmark to about 2% in Norway.[19] An earlier survey on the safety of dental restorative materials among dentists in Finland reported that composite was believed to pose the highest risk of side effects, and that only a few dentists regarded amalgam as being hazardous.[20]

Our surveyed dentists' satisfaction level for the different types of the restoration was highest for amalgam and composite, lower for GIC and the lowest for compomer. Interestingly, although amalgam and composite were ranked high in satisfaction level, composite was rated the highest in failures and amalgam was the lowest. The apparent contradiction may be explained by the fact that dentists appreciated the ease of use of composite, its aesthetic appearance and the patient's satisfaction from tooth-colored restoration. The apparently high rate of failures may have been accepted as a necessary compromise.

The responders of the current survey were divided into two groups according to seniority. Although the young dentists tended to use amalgam more frequently than composite (60.6% vs. 36.4%), and the senior dentists similarly used composite and amalgam (45.2% and 40.5%), the difference was not significant. These figures may be linked to the finding that most of the young dentists (84.8%) and more than one-half of the senior dentists (52.3%) worked in public clinics, since the opposite was seen in the private sector in which 83.3% of the senior dentists and 48.5% of the young dentists worked. Specifically, the choice of the restoration material in public clinics may be influenced by a more stringent budget set by a public clinic's administration. The only significant difference between the senior and young dentists' level of satisfaction with restoration material involved amalgam. The young dentists were "pleased" or "very pleased" with amalgam in 78.2% of the questionnaires compared to less than one-half of the senior dentists (48.7%). This difference may also be related to the type of practice they had (public or private, general dentistry or pediatric dentistry) and the greater demand for tooth-colored restorations among private clinic patients.

CONCLUSIONS

As in several other countries worldwide, there has been a shift from the choice of amalgam to composite restoration material among specialist pediatric dentists in Israel over the last decades. Most of all the queried dentists (86.7%) claimed that using amalgam does not possess any health issues. The dentists' satisfaction from the restoration materials was high for amalgam and composite, less for GIC and least for compomer. Both specialty and seniority had a significant impact on the choice of a restorative materia, with more general practitioners and senior dentists in public practice using amalgam and more young specialist pediatric dentists in private practice using composite.

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