

Restorative treatment threshold reported by Iranian dentists

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Objective: To study Iranian dentists' conceptions of the earliest stage to place a restoration on proximal caries lesions. **Basic research design:** A questionnaire survey was carried out among the participants of two annual dental meetings in Tehran, Iran, in December 2004 and July 2005. The questionnaire was filled in anonymously and returned during the meeting days. The questions covered two patient paper cases with schematic drawings of the radiolucency of proximal caries lesions according to bitewing radiographs from 20-year-old patients: one high-caries case and one low-caries case. Dentists' gender, age, working experience and place, and participation in continuing education served as background data. In total, 1,033 dentists completed the questionnaire, 63% were men. Statistical evaluation was by the Chi square test and logistic regression. **Main outcome measures:** Respondents were to select from four alternatives the earliest stage in the progression of a lesion at which they would intervene by restorative treatment. **Results:** For the high-caries case, 77% of the respondents chose to restore a caries lesion confined to enamel; activity in continuing education was the strongest factor (OR=1.4) to explain dentists' restoring a lesion no earlier than in dentine. For the low-caries case, 32% chose to restore a lesion in enamel. Restoring a lesion no earlier than in dentine was more likely (OR=1.5) among female dentists. **Conclusion:** Iranian dentists seem to prefer early restorative intervention, which indicates a need to focus on the preventive aspects of caries treatment both in dental curricula and in continuing education.

Key words: Dentists' characteristics, patient paper case, proximal caries, restorative treatment decisions.

Introduction

The decision about the earliest stage of caries progression requiring restorative treatment is of utmost importance, considering dental caries as an ever-present problem and main cause of dental pain and tooth loss in populations throughout the world (Fejerskov and Kidd, 2003).

An average of three to four years has been reported for caries progression through enamel in patients with low to moderate caries risk (Lith *et al.*, 2002; Mejäre *et al.*, 1999; Pitts, 1983). In addition, some enamel lesions never penetrate into dentine and up to 60% of lesions in the outer half of dentine is shown to be non-cavitated, so they can be arrested (Bille and Thylstrup, 1982; Pitts and Rimmer, 1992). Therefore postponement of restorative intervention should be taken into consideration accordingly (Anusavice, 1997; Elderton, 1993).

Dentists' restorative threshold and changes in their clinical practice have been largely evaluated through questionnaire studies (Domejean-Orliaguet *et al.*, 2004; el-Mowafy and Lewis, 1994; Mejäre *et al.*, 1999; Nuttall and Pitts, 1990; Tan *et al.*, 2002; Tveit *et al.*, 1999). Over the past decade, changes in restorative treatment criteria toward a less invasive approach have been obvious in countries like Norway and Sweden (Edward, 1997; Gimmestad *et al.*, 2003; Tveit *et al.*, 1999). However, in countries with less preventively-orientated oral health delivery system, like in Iran, these aspects have seldom been discussed.

The present survey studied the restorative threshold of Iranian dentists in relation to their age, gender and professional background.

Methods

The present study was carried out among Iranian general dental practitioners (GDP) by means of a self-administered questionnaire, pretested on a group of ten dentists and revised accordingly. The target population comprised participants of two major dental meetings in Tehran, Iran, one in December 2004, and the other in July 2005, in order to attain a convenience sample of about 1,000 GDPs. The dentists filled in and returned the questionnaire during the meeting days. The survey was conducted anonymously. Those who filled in the questionnaire at the first meeting were not asked to do it again. The questionnaire included patient paper cases which enquired about the restorative threshold of the GDPs.

Year of birth, gender, and year of graduation served as background information. Practice-related factors included location (Tehran or else) and sector by this question: "What is your current job?" The alternatives were categorized into:

- Private (self-employed or employed by someone else in private office, or working in charity clinics)
- Public (employed by the government or engaged in mandatory practice stage in public clinic, or working as a teacher in a dental school)
- Both sectors (for those practicing in both private and public clinics)
- No clinical work.

Two questions enquired about activity in continuing education:

“When was the last time you attended a continuing education course on caries prevention?” with these alternatives: Within the last year, During the past 2-5 years, More than 5 years ago, Never, Don't know.

“Which of the following scientific dental journals do you usually read?” The six alternatives were combined into four: No reading, reading general (practical) national dental journals only, reading also scientific national dental and medical journals, reading international scientific dental journals.

Patient paper cases

Restorative treatment threshold was enquired using two patient paper cases (PPC). The characteristics of the two 20-year-old PPCs were as follows:

Case A: Irregular dental visiting, poor oral hygiene, nine teeth (15, 16, 22, 24, 27, 35, 36, 43, and 47) been filled, two (26 and 46) been extracted, and four teeth with current caries.

Case B: Regular annual dental visits, good oral hygiene, four teeth (15, 26, 34, and 46) having one-surface occlusal filling, and one tooth with current proximal caries.

Dentists were asked to indicate the point at which they would begin drilling tooth for placement of restoration, separately for both cases. The question was as follows:

“At which stage from the following alternatives would you begin to drill the tooth for placement of filling? (Please mark only one alternative for each case)”. The figures illustrated four radiographic stages of caries progression on the distal surface of an upper second premolar (see Figure 1). In the analysis, stages three (radiolucency with evident extension in outer half of dentine) and four (radiolucency with evident extension in inner half of dentine) were combined into “radiolucency in dentine”.

Respondents

A total of 1,033 dentists returned the questionnaire. Those who provided no information of their gender or age (n=20), those under 24 (n=11) or older than 67 years of age (n=5), and those who were not practicing as a dentist (n=17) were excluded, leaving a total of 980 respondents for the basic data. Their mean age was 37.4 years (SD=7.7). Respondents' background information appears separately for men and women in Table 1. For the present analyses, 117 dentists were excluded due to missing answer for case A or B. Mean age for those non-respondents was 38.4 (SD=8.5), 66% of whom were men.

Statistical evaluation

Statistical evaluation included the Chi-square test for differences in frequencies. To evaluate factors related to the restorative threshold, logistic regression models were fitted to the data and the corresponding odds ratios and their 95% confidence intervals (95% CI) were defined for the likelihood of filling a lesion extended to dentine rather than confined to enamel as a dichotomized dependent variable. Statistical significance was set to p-value<0.05.

Results

For the high-caries PPC, 77% of the dentists reported that they would fill a proximal lesion confined to enamel: 28% in the outer half and 49% in the inner half of enamel (Figure 1). Within the age group of 35- to 44-year-olds, more men than women chose to fill a lesion in the outer half of enamel (34% vs. 22%, p=0.01) (Table 2). For all, reporting restorative intervention in the outer half of enamel was less frequent among those with more than seven years of practice experience (25% vs. 32%, p=0.04).

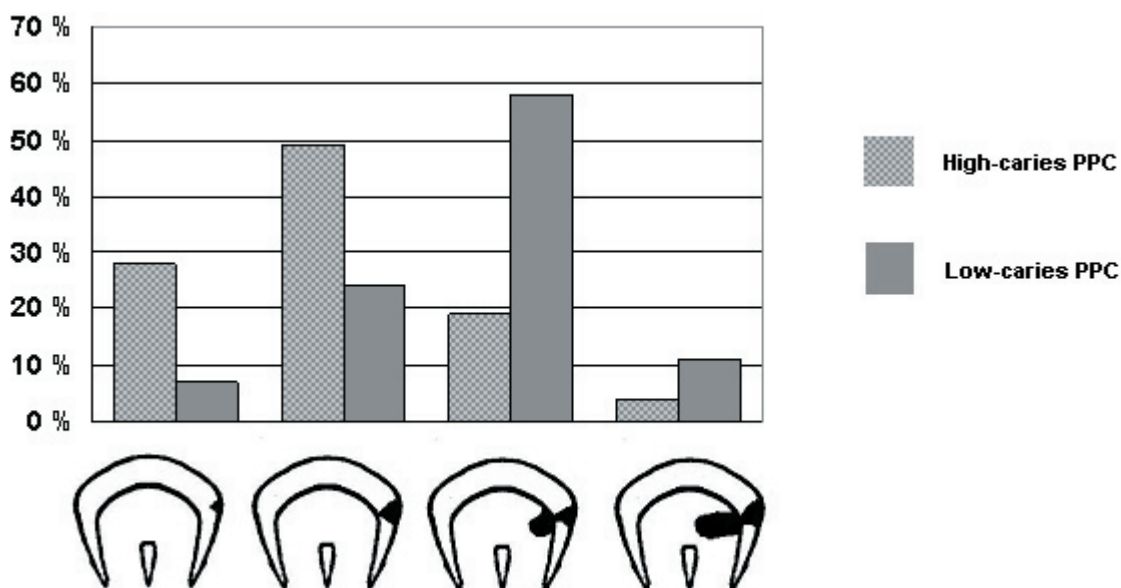


Figure 1. Proportion (%) of respondents' decision on the earliest stage of proximal carious development, judged on radiograph, at which the dentists would intervene with operative treatment, based on caries risk of two patient paper cases (PPC), as judged by Iranian dentists (n=980).

Table 1. Distribution (%) of Iranian dentists (n=980) by their background, separately for men (n=629) and women (n=351).

<i>Characteristics</i>	<i>Men (%)</i>	<i>Women (%)</i>	<i>p-value¹</i>
Age in years			<0.001
<35	26	56	
35-44	57	34	
≥45	17	10	
Practice years			0.37
≤7	48	51	
>7	52	49	
Practice location			<0.001
Tehran	40	58	
Non-Tehran	60	42	
Practice type			<0.001
Private	71	70	
Public	3	13	
Both sectors	25	17	

¹ Statistical evaluation of differences by gender: Chi-square test.

Table 2. Distribution (%) of Iranian dentists (n=884) by their restorative threshold regarding proximal caries on the distal surface of an upper second premolar of a 20-year-old, high-carries patient paper case, separately by gender, age and practice-related factors.

	<i>n</i>	<i>Radiolucency limited to outer half of enamel (%)</i>		<i>Radiolucency extending to the inner half of enamel (%)</i>		<i>Radiolucency in dentine (%)</i>		<i>p-value¹</i>
		Men	Women	Men	Women	Men	Women	
	Men (Women) 566 (318)	30	25	46	54	24	21	0.06
Age								
<35 years	152 (175)	26	27	53	51	21	22	0.97
35-44 years	325 (110)	34	22	41	56	25	22	0.01
≥45 years	89 (33)	21	24	53	58	26	18	0.67
Practice experience								
≤7 years	269 (163)	35	29	43	49	22	22	0.45
>7 years	297 (155)	27	20	48	59	25	21	0.09
Practice location ²								
Tehran	231 (185)	27	24	47	52	26	24	0.57
Non-Tehran	334 (133)	32	27	45	56	23	17	0.09
Practice type								
Private	401 (222)	29	24	48	52	23	24	0.45
Public	17 (43)	35	21	30	60	35	19	0.09
Both sectors	148 (53)	33	30	42	57	25	13	0.11

¹ Chi-square test for difference by gender.

² One man gave no answer.

Table 3. Distribution (%) of Iranian dentists (n=870) by their restorative threshold regarding proximal caries on the distal surface of an upper second premolar of a 20-year-old, low-carries patient paper case, separately by gender, age and practice-related factors.

	<i>n</i>	<i>Radiolucency limited to outer half of enamel (%)</i>		<i>Radiolucency extending to the inner half of enamel (%)</i>		<i>Radiolucency in dentine (%)</i>		<i>p-value</i> ¹
		Men	Women	Men	Women	Men	Women	
	Men (Women) 555 (315)	8	5	28	20	64	75	0.003
Age								
<35 years	147 (171)	4	3	29	19	67	78	0.07
35-44 years	321 (111)	8	7	27	22	65	71	0.50
≥45 years	87 (33)	12	3	29	18	59	79	0.09
Practice experience								
≤7 years	263 (162)	6	4	27	20	67	76	0.09
>7 years	292 (153)	9	6	29	20	62	74	0.03
Practice location²								
Tehran	226 (180)	8	5	28	20	64	75	0.06
Non-Tehran	328 (135)	8	5	27	19	65	76	0.06
Practice type								
Private	395 (219)	9	6	28	19	63	75	0.01
Public	17 (43)	12	2	29	24	59	74	0.25
Both sectors	143 (53)	5	4	27	19	68	77	0.42

¹ Chi-square test for difference by gender.

² One man gave no answer.

Table 4. Dentist-factors explaining the likelihood of filling a lesion extended to dentine rather than confined to enamel in Iranian dentists regarding proximal caries on the distal surface of an upper second premolar of 20-year-old patient paper cases (PPC), separately for high-carries (n=884) and low-carries (n=870).

	<i>High-carries PPC</i>					<i>Low-carries PPC</i>				
	<i>Estimate</i>	<i>S.E</i>	<i>OR</i>	<i>95% C.I</i>	<i>p-value</i>	<i>Estimate</i>	<i>S.E</i>	<i>OR</i>	<i>95% C.I</i>	<i>p-value</i>
Gender (0=male, 1=female)	-0.24	0.19	0.8	0.5-1.1	0.20	0.43	0.18	1.5	1.0-2.2	0.01
Age (years)	-0.00	0.01	1.0	0.9-1.0	0.80	-0.01	0.01	1.0	0.9-1.0	0.18
Practice location (0=non-Tehran, 1=Tehran)	0.31	0.18	1.3	0.9-1.9	0.08	0.13	0.16	1.1	0.8-1.5	0.43
Activity in continuing education (1=≤5years, 3=≤1years)	0.33	0.11	1.4	1.1-1.7	0.005	-0.01	0.10	1.0	0.8-1.2	0.85
Experience years	0.00	0.01	1.0	0.9-1.0	0.76	-0.00	0.01	0.9	0.9-1.0	0.88
Practice sector (1=private, 2=public, 3=both sectors)	-0.02	0.10	0.9	0.7-1.2	0.82	0.16	0.09	1.0	0.8-1.2	0.49
Professional reading ¹	-0.13	0.08	0.8	0.7-1.0	0.11	0.09	0.08	1.0	0.9-1.3	0.23
Constant and goodness of fit (p)	-1.64	0.60			0.24	1.07	0.55			0.48

¹ Professional reading: 0=None, 1=General (practical) national dental journals only, 2=Also scientific national dental and medical journals, 3=International scientific dental journals moreover.

For the low-carries PPC, filling a lesion in the outer half of dentine was the most frequently reported choice (58%) among all choices. Thirty-two percent of the dentists chose to restore the lesion restricted to enamel; 7% in the outer half and 25% in the inner half of enamel (Figure 1), significantly more men than women ($p=0.003$) (Table 3). Among those dentists with practice experience more than seven years and those working in private practice, more of the men than women reported filling proximal caries in enamel. Practice-related factors showed no impact on these choices.

More than half of the respondents reported participation in a continuing education course on caries prevention during last year, and 96% reported reading at least one national professional journal; 9% reported reading international journals as well. For the high-carries case, respondents who participated in a continuing education course on caries prevention during last year were less likely to restore a proximal caries lesion in enamel ($p=0.02$), for the low-carries case such a difference was not found.

For the high-carries case, the activity in continuing education ($OR=1.4$, $p=0.005$) remained the only significant factor explaining dentists' decision to fill the lesion not in enamel but in dentine when analyzed together with dentists age, gender, practice-related factors, and reading dentistry-related journals by means of a logistic regression model (Table 4). In a similar model for the low-carries case, female gender appeared as the only significant factor ($OR=1.5$, $p=0.01$) explaining dentists' choice to restore a lesion no earlier than in dentine.

Discussion

For the high-carries PPC, the vast majority of Iranian dentists and for the low-carries PPC, about one-third of them reported drilling proximal caries lesion confined to enamel. Previous reports on proportions of dentists filling an enamel-lesion in a low-risk patient show a range from 88% (Domejean-Orliaguet *et al.*, 2004) to 55% (Tan *et al.*, 2002), 28% (el-Mowafy and Lewis, 1994), 20% (Nuttall and Pitts, 1990), 18% (Tveit *et al.*, 1999), and 5% (Mejàre *et al.*, 1999). Such a wide range indicates difficulties in standardizing the circumstances for studying dentists' treatment decisions rather than the actual differences in their clinical dental practices. The lowest figure (Mejàre *et al.*, 1999), however, reflects a renewed practice in Sweden, where preventive non-operative treatment in general is encouraged.

The present results revealed that women reported less invasive solutions for treating proximal lesions in a low-carries case. This supports findings by Tan *et al.* (2002), which to our knowledge is the only previous report dealing with dentist's gender in this context.

Our target subjects were participants of two large annual dental meetings in Iran. Such meetings are important events for dentists from all parts of the country, also to collect credits for renewing their practice license. The current data on respondents' background reflect well the FDI information of Iranian dentists (FDI, 2000), thus allowing the present sample be considered as fairly well-representative of Iranian dentists. However, some over-representation may have occurred regarding those

dentists attending a scientific meeting, being more interested in the topics of the questionnaire and thus more confident and knowledgeable. Considering the results, the overall picture of dentists' decisions may, however, be underestimated because restoring an enamel lesion might be more common among those who, due to less interest, rarely take part in dental meetings.

Dentists' answers to questionnaires do not always reflect their real practices (Kay *et al.*, 1992; Mejàre *et al.*, 1999). But studying dentists' restorative treatment decisions in actual practice, which is influenced by many dentist-, patient-, and practice-related factors, is unfeasible (Bader and Shugars, 1992). Additional reimbursement for prevention can be understood to encourage a more preventive approach by dentists. However, this concept has been shown not to affect dentists' everyday practice (Fiset *et al.*, 2000). The present study used simplified hypothetical cases with detailed description of patients' age, dental status, and regularity of dental visiting, together with schematic drawings of radiographs to make the cases more universally understandable.

In Iran, more than half of the 12-year-olds have their caries experience, dominated by the D-component (Pakshir, 2004). Up-to-date data on the adult population are not available. The present study employed high- and low-carries cases to highlight the difference in treatment decisions among dentists. There is now convincing evidence for the possibility of arresting caries even for high-carries cases (Anusavice, 1997; Papas *et al.*, 1999). Nevertheless, the present results indicate that Iranian dentists offer little opportunity for the arresting of caries lesions confined to enamel, probably as a result of over-emphasis on restorative dentistry in dental curricula. No comparisons with dentists' practices from other countries are, however, possible because previous studies have dealt only with low-carries cases.

Dentists' restorative threshold has a major impact on the oral health of a population and also on the costs of treatment (Ismail, 2004; Mjör *et al.*, 2000). Making the first restoration leads to an irreversible cycle of subsequent restorations (Deligeorgi *et al.*, 2001), which may finally result in tooth removal (Mjör *et al.*, 2000). As in many other countries, today's dentists in Iran were trained under a curriculum that strongly emphasized restorative treatments. Moreover, the remuneration system provides no support for a preventive approach. Both of these aspects may also have affected the current picture of dentists' decisions on the stage at which a caries lesion requires restoration.

The present findings call for greater emphasis on preventive aspects in dental curricula and in continuing education programs. Furthermore, preventively-orientated treatments should be eligible for reimbursement.

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