Parents' dental anxiety and oral health literacy: effects on parents' and children's oral health-related experiences

William K. Shin, DDS[1]; Thomas M. Braun, PhD[2]; Marita R. Inglehart, Dr. phil. habil.[1,3]

1 Department of Periodontics & Oral Medicine, School of Dentistry, University of Michigan, Ann Arbor, MI, USA
2 School of Public Health, University of Michigan, Ann Arbor, MI, USA
3 Department of Psychology, College of Literature, Science & Arts, University of Michigan, Ann Arbor, MI, USA

Keywords
oral health literacy; dental fear; oral health; parents; dental visits

Correspondence
Dr. Marita R. Inglehart, Department of Periodontology & Oral Medicine, University of Michigan School of Dentistry, 1011 N. University Ave., Ann Arbor, MI 48109-1078. Tel.: 734-763-8073; Fax: 734-763-5503; e-mail: mri@umich.edu. William K. Shin is with the Department of Periodontics & Oral Medicine, School of Dentistry, University of Michigan. Thomas M. Braun is with the School of Public Health, University of Michigan. Marita R. Inglehart is with the Department of Periodontics, School of Dentistry, and the Department of Psychology, College of Literature, Science & Arts, University of Michigan.

Received: 6/9/2012; accepted: 11/8/2013.

doi: 10.1111/jphd.12046

Journal of Public Health Dentistry **74** (2014) 195–201

Abstract

Objective: To explore a) the relationship between parents'/guardians' dental anxiety and oral health literacy and b) those between these variables and background and oral health-related characteristics.
Methods: Survey data were collected from 187 parents/guardians (81% female; average age 37 years). Dental anxiety was measured with the Dental Anxiety Scale – Revised (DAS-R) and oral health literacy with the Rapid Estimate of Adult Literacy in Dentistry (REALD-30). Children's dental charts were reviewed to collect information about their dental treatment.
Results: DAS-R and REALD-30 scores were correlated ($r = -0.22$; $P = 0.003$). A multivariate regression model with DAS-R score as the dependent variable showed that the DAS-R score has a significant multivariate association with REALD-30, oral health, income, and presence of fillings.
Conclusions: Dental anxiety and oral health literacy are related. However, DAS score has a significant multivariate association with the four variables REALD-30 score, oral health, income, and presence of fillings. These findings show that among socioeconomically disadvantaged patients, the contributors to poor oral health are interrelated and multidetermined and include poor oral health literacy and dental anxiety. The public health message is that in order to improve the overall oral health of socioeconomically disadvantaged patients, public health stakeholders need to consider how to communicate with these patients effectively and how to reduce dental anxiety. Gaining a better understanding of how to communicate with parents a) at an appropriate literacy level and b) in a way that it reduces dental anxiety is therefore crucial.

Introduction

Research in the United States and in other countries has shown that dental anxiety in adults is widespread (1,2) and is a common reason for avoiding dental visits (3,4). Avoiding routine dental care is likely to result in poorer oral health (5,6). In addition, parents with higher dental anxiety scores are less likely to take their child to the dentist than parents with lower dental anxiety scores (7). The fact that parents from lower socioeconomic backgrounds and with lower levels of education are more likely to have dental anxiety than their more affluent and better educated counterparts (1,2,8-10) deserves attention, because it might affect the way they access dental care services for their children, who are more likely to have oral health problems than children from middle- and upper-class socioeconomic backgrounds (11,12).

Research has shown that families from poorer socioeconomic backgrounds are more likely to have lower levels of health literacy (13). Health literacy is defined as the degree to which patients are able to obtain, process, and understand basic health information and services needed to make appropriate health decisions (13). A recent study showed that almost half (43%) of the adults in the United States were unable to comprehend and navigate printed materials related to everyday issues such as health, safety, and finance (14,15). Adults with lower health literacy were 1.5 to 3 times more likely to encounter poorer health, to underutilize health resources, to have higher rates of chronic diseases, and to engage in unhealthy behavior (16,17). Patients with poorer

health, those with less education, and those from underrepresented minority backgrounds were more likely to have lower health literacy (14,18).

Health literacy is also relevant in connection with patients' knowledge about oral health-related issues (19,20), oral health behavior (19), and utilization of oral health care services (21). In addition, adults with lower oral health literacy were also less likely to seek dental care for their children (22).

Oral health literacy can be assessed in a reliable and valid fashion with the Rapid Estimate of Adult Literacy in Dentistry (REALD-30) instrument (17). This scale consists of 30 words related to dentistry that range from easy-to-read words such as "sugar," "smoking," and "floss" to very difficult words such as "hypoplasia," "apicoectomy," and "temporomandibular." One advantage of this instrument is that it takes only approximately 2 to 3 minutes to administer. Research has shown that REALD-30 scores are correlated with the respondents' educational background; their oral health-related knowledge, oral health behavior, and perceived oral health status; the interval between dental visits; and behavior with regard to seeking dental care for their children (17,19,22,23).

No research so far has explored the relationship between dental anxiety and oral health literacy, despite the fact that both of these factors are clearly related to adults' oral health (3,4,6,10,19) and oral health care utilization (3,4,21) as well as to parents' behavior with regard to accessing oral health care services for their children (22,24). The first objective, therefore, is to explore the relationship between parents'/guardians' dental anxiety and oral health literacy. Considering that a lack of understanding might result in higher dental anxiety, it is hypothesized that the lower patients' oral health literacy, the higher their dental anxiety will be.

The second objective is to revisit the question of how patients' background and oral health-related characteristics will be related to their level of oral health literacy and dental anxiety. It is especially important to understand which of these factors are significant predictors of dental anxiety in a regression model. Previous research has shown that poorer oral health literacy scores are clearly related to lower levels of education and income (13), poorer self-reported oral health, a lower likelihood that patients had visited a dentist during the past year, and higher numbers of oral health care experiences for their children (17,19,22,23). Research also showed that the more dental anxiety patients had, the lower their family income (1,2,8-10), their self-reported oral health (5,6), and the likelihood of having seen a dentist during the previous year (3,4), and the more dental treatments their children had received. Based on these previous findings, it is hypothesized that Dental Anxiety Scale – Revised Version (DAS-R) scores will be significantly predicted by several factors, with REALD-30 scores being of particular importance.

Materials and methods

This study was approved by the Institutional Review Board (IRB) for the Behavioral and Health Sciences at the University of Michigan, Ann Arbor, MI, USA.

Respondents

An a priori power analysis with the program package G*Power 3.1.2 (http://www.psycho.uni-duesseldorf.de/abteilungen/aap/gpower3/download-and-register) was conducted to compute the needed sample size given $\alpha = 0.05$, power = 0.95, and a medium effect size of 0.5 when testing for significant differences in average responses between respondents with lower and higher oral health literacy using one-sided *t*-tests for independent samples. The result showed that a sample size of 176 patients was needed. The inclusion criteria were that the respondents a) were accompanying children 11 years of age or younger to a regularly scheduled dental appointment; b) were fluent in English; (c) gave written consent; and (d) signed a Health Insurance Portability and Accountability Act (HIPAA) form that stated that they allowed the researchers to collect information about the child's prior dental treatment from the child's clinical chart.

Data were collected from 187 parents/guardians who brought their child for a regularly scheduled dental appointment at a pediatric dental clinic at a Midwestern dental school. A response rate cannot be computed because no records were kept about how many parents agreed or did not agree to participate in the study. However, the data were collected over a 6-week period by one staff person, who was only available a few hours per day. Parents received free parking vouchers as an incentive for their participation. Most respondents were mothers ($n = 143$), with fewer respondents being fathers ($n = 33$) or guardians, grandmothers, grandfathers, aunts, and others ($n = 11$). The parents/guardians ranged in age from 19 to 70 years (mean = 37 years; SD = 8) and had on average 14.1 years of education (SD = 3.0). The children's dental records were reviewed to collect information about the dental treatment received.

Procedure

When the parents/guardians arrived with their child for a regularly scheduled appointment at the pediatric dental clinic, they were asked by a research staff person if they were native English speakers. If they were native English speakers, they were informed about the study. Parents who were interested in participating received consent and HIPAA forms. Only respondents who signed both forms were eligible to participate in the study. No assent was sought from the pediatric patients because they were less than 12 years old, and no data were collected from them in person. Once the respondents

had signed both forms, the parents/guardians received the survey. After they completed the survey, the interviewer administered the REALD-30 test to assess the respondents' level of oral health literacy. This test was administered in a private space outside of the waiting room area in a secluded part of the clinic. The pediatric patients' charts were reviewed at a later date.

Materials

Both the consent and HIPAA forms were prepared according to the IRB guidelines. They both stated explicitly which data would be collected in the survey and in the chart review. The survey consisted of three parts. Part 1 asked about the respondents' background characteristics. Part 2 gathered information about the respondents' oral health characteristics, such as their self-reported oral health, their last dental visit, and their dental anxiety. Dental anxiety was determined with the DAS-R (25). This scale consists of four items that ask respondents to indicate their level of dental anxiety concerning four dental visit-related situations on a five-point scale. An answer of "1" indicates that the parents are relaxed, and an answer of "5" expresses the highest level of dental anxiety. The answers to the four items were summed to create a total DAS-R score. The DAS-R is a reliable and valid instrument that can be used to get a quick assessment of dental anxiety (26). Part 3 consisted of the REALD-30 instrument (17). This test was administered by the trained interviewer, who had trained by practicing administering the REALD-30 as well as rating the audiotaped responses of 10 persons. Analysis of the interviewer's responses showed that the interviewer was well prepared to administer this test.

Statistical analyses

The data were analyzed with SPSS (Version 18). Descriptive statistics such as frequency distributions, means, and standard deviations were computed to describe the respondents' background characteristics (see Table 1). Independent-sample *t*-tests and univariate analyses of variance were used to explore whether subgroups of respondents differed in their DAS-R and REALD-30 scores (see Table 2). Pearson correlation coefficients were computed to determine the relationships between the DAS-R and REALD-30 scores and continuous variables such as age and years of education (see Table 2). Two multivariate regression models were computed, one for the DAS-R scores and the second for the REALD-30 scores, using stepwise methods to reduce each model to only significant covariates (see Table 3). All background and oral health characteristics included in Table 2 were considered in these multivariate regression models as independent variables. A significance level of $P \leq 0.05$ was accepted as significant.

Table 1 Overview of the Respondents' Background and Oral Health Characteristics

Background characteristics	
Relationship to the child, *n* (%)	
Mother	143 (77)
Father	33 (18)
Female guardian	8 (3)
Male guardian	3 (2)
Age (years), mean ± SD (range)	36.8 ± 8.7 (19-70)
Years of education (from grade 1), mean ± SD (range)	14.1 ± 3.0 (0-29)
Family income during last month (US$), *n* (%)	
No income	4 (2)
<500	7 (4)
500-1,000	42 (23)
>1,000-2,000	39 (22)
2,000-3,000	37 (20)
>3,000-4,000	11 (6)
4,000-5,000	24 (13)
>5,000	19 (10)
Parents' oral health-related characteristics	
Self-reported oral health, mean ± SD (range)*	2.8 ± 1.1 (1-5)
Dental visit during last year, *n* (%)	118 (63)
DAS-R score, mean ± SD (range)†	7.9 ± 3.6 (4-19)
REALD-30 score, mean ± SD (range)‡	23.4 ± 4.7 (7-30)

Due to rounding, percentages may not add up to 100%.

* Possible scores range from 1 (poor) to 5 (excellent).

† Possible scores range from 4 (lowest dental anxiety) to 20 (highest).

‡ Possible scores range from 0 (lowest oral health literacy) to 30 (highest).

Results

Table 1 provides an overview of the respondents' background and oral health-related characteristics. The respondents' answers concerning their self-reported oral health ranged from "1" (poor) to "5" (excellent). Only 63% of the respondents had visited a dentist during the previous year. Fifty-nine of the patients who had not seen a dentist provided an answer concerning why they had not utilized dental care services, with 11 respondents providing two answers. The reasons for not going to the dentist were that the respondents had no insurance ($n = 48$), couldn't afford it ($n = 9$), were too busy ($n = 7$), or had no existing dental problems ($n = 6$). None of these respondents mentioned dental anxiety as a reason for not visiting a dentist during the past year.

The respondents' dental anxiety was assessed with the DAS-R (25). The Cronbach's alpha reliability coefficient for this scale was 0.87. The answers to the four items were summed to create a total DAS-R score. The responses to each of the four items ranged from "1" (relaxed) to "4.75"; the average total DAS-R score was 7.9 (SD = 3.6). The REALD-30 (17) oral health literacy scores ranged from a lowest score of 7 to the highest possible score of 30 (mean = 23.4; SD = 4.7).

Table 2 Univariate Associations of Background Characteristics, Oral Health-Related Responses, and DAS-R and REALD-30 Scores

	Category	DAS-R score	REALD-30 score
Parents'/guardians' background characteristics			
Gender	Male	7.7	21.4
	Female	7.9	23.8
	P	0.81	0.01
Age	*r*	–0.07	0.09
	P	0.32	0.22
Years of education (from Grade 1)	*r*	–0.06	0.25
	P	0.41	<0.001
Family income during last month	Low*	8.4	22.6
	Moderate†	7.3	23.2
	High‡	7.5	25.2
	P	0.16	0.01
Parents' oral health characteristics			
Self-reported oral health	P or F	8.9	22.5
	G, VG, or E	7.2	24.0
	P	0.003	0.03
Dental visit during last year	No	8.3	22.4
	Yes	7.6	24.1
	P	0.20	0.02
DAS-R score	*r*	1	–0.22
	P	0	0.003
REALD-30 score	*r*	–0.22	1
	P	0.003	0
Children's oral health characteristics			
Fillings in primary or permanent teeth	No	6.9	23.3
	Yes	8.3	23.4
	P	0.02	0.86
Extractions of primary or permanent teeth	No	7.6	23.3
	Yes	8.4	23.5
	P	0.16	0.80
Pulp treatment in primary or permanent teeth	No	7.6	23.8
	Yes	8.8	22.1
	P	0.08	0.04

Values are mean scores unless otherwise indicated.

* $0-999/month.

† $1,000-1,999/month.

‡ $2,000 or more/month.

P, poor; F, fair; G, good; VG, very good; E, excellent.

Table 3 Multivariate Associations of Background Characteristics, Oral Health-Related Responses, and DAS-R and REALD-30 Scores

Multivariate model for DAS-R			Multivariate model for REALD-30		
Variable	*r* (SE)	*P*	Variable	*r* (SE)	*P*
Intercept	9.88 (1.44)	<0.001	Intercept	21.57 (1.88)	<0.001
REALD-30 score	–0.13 (0.06)	0.022	DAS-R score	–0.23 (0.09)	0.010
Income, moderate vs. low	–1.29 (0.62)	0.943	Income, moderate vs. low	0.95 (0.79)	0.228
Income, high vs. low	–0.05 (0.68)	0.034	Income, high vs. low	1.83 (0.87)	0.038
Oral health, F/P vs. G/VG/E	1.50 (0.55)	0.008	Gender, male vs. female	–2.61 (0.81)	0.002
Fillings, yes vs. no	1.23 (0.57)	0.038	Years of education	0.25 (0.12)	0.030

P, poor; F, fair; G, good; VG, very good; E, excellent.

Table 2 shows that the respondents' DAS-R and REALD-30 scores correlated, as predicted ($r = -0.22$; $P = 0.003$): The lower the oral health literacy scores were, the more dental anxiety the respondents had.

In addition, Table 2 also provides an overview of the univariate associations of the parents' background characteristics, their and their children's oral health-related characteristics, and the DAS-R and REALD-30 scores. While no significant associations were found between the DAS-R scores and background characteristics, the data showed that parents who rated their oral health as poor or fair had more dental fear than parents who rated it as good, very good, or excellent. In addition, parents whose children had no fillings in their primary or permanent teeth had lower DAS-R scores than parents of children with fillings.

Concerning the relationships between the REALD-30 scores and the respondents' background characteristics, Table 2 shows that males had lower REALD-30 scores than females. The higher the oral health literacy scores were, the more years of education the respondents had. Parents with low family incomes had the lowest REALD-30 scores, and parents in the highest income groups had the best REALD-30 scores. Parents who described their oral health as poor or fair had lower REALD-30 scores than parents who described it as good, very good, or excellent. Parents whose children had had pulp treatment in primary or permanent teeth had poorer REALD-30 scores than parents of children who had not had such treatment.

Table 3 provides information about the multivariate associations among the parents' background characteristics, their own and their children's oral health characteristics, and the DAS-R and REALD-30 scores. This table shows the results of putting all variables described in Table 2 into multivariate regression models for the DAS-R and REALD-30 scores, using stepwise methods to reduce each model to only significant covariates. The DAS-R scores had significant multivariate associations with four variables, namely with the REALD-30 scores, the parents' self-reported oral health scores, family income (high vs. low), and whether the children had fillings. The associations of the REALD-30 scores and the oral health responses with the DAS-R scores are stronger than those of income and fillings with the DAS-R scores. The REALD-30 scores had significant multivariate associations with four variables, namely with the DAS-R scores, the parents' income (high vs. low), the parents' gender, and years of education.

Discussion

Gaining a better understanding of how to assure that children from socioeconomically disadvantaged backgrounds will receive the oral health care services they need is not merely a structural problem but is definitely also related to behavioral and psychological factors. For example, Wang and colleagues showed that only approximately half of the socioeconomically disadvantaged parents who had brought their young children for an emergency or first appointment to a pediatric community dental clinic returned for a scheduled operative follow-up visit – even though they did not have to personally pay for this visit (27). However, when these authors used visual information to educate these parents about the scheduled treatment, the return rate increased to over 90%, and several other factors improved at the follow-up visit as well. Using visual information might have been one way to overcome oral health literacy issues in this situation. Research on low oral health literacy has shown its effects on patients' oral health behavior (19), their knowledge about oral health issues (19,20), and especially their own utilization of oral health care services (21) and their children's likelihood of receiving dental care (22). This study considered one additional factor that might be related to oral health literacy, namely dental anxiety.

The central objective was to explore, for the first time, whether there was a negative relationship between DAS-R and REALD-30 scores. Both the univariate and multivariate analyses showed that there were associations between these two variables. At this point, one can only speculate about the underlying dynamic behind these findings. One could argue that if parents do not understand information about their child's diagnosis and treatment plan provided during a dental visit, they might experience a raised level of uncertainty, which in turn might create dental anxiety. Future research should focus on exploring these relationships and their underlying dynamic.

However, informing clinicians about this finding could reinforce the fact that it is important to communicate effectively with patients with lower oral health literacy and also to respond to their treatment needs in a way that reduces their level of dental anxiety.

In addition to considering the implications of these findings for dental providers' interactions with their patients, it also seems worthwhile to consider how public health dentistry could develop interventions to counteract the negative consequences of poor oral health literacy and dental anxiety. Understanding how information can be made available to the public in such a way that patients with low oral health literacy can benefit from that information is crucial.

Going beyond considerations concerning the relationships among dental anxiety and oral health literacy and the other findings presented in Tables 2 and 3 draws attention to the complexity of the issues involved. Concerning the univariate findings related to the associations of background and oral health-related characteristics with dental fear, it is important to realize that some relationships that were predicted based on the findings of previous research could not be replicated, such as the relationships between dental anxiety and the

respondents' gender, socioeconomic background, and level of education (1,2,9,10). However, the fact that only a minority of the parents had high dental fear scores and the fact that these patients were likely to come from a lower-class socioeconomic background might have played a role in this context.

Consistent with earlier findings, significant associations were found between several variables and the respondents' DAS-R scores. The higher the respondents' dental anxiety was, the poorer their self-reported oral health was. This finding replicated findings from previous studies (3-6,10). However, this study did not replicate previous findings that showed that average dental anxiety was correlated with the likelihood of utilizing dental health care services (3,4,6,10,28). This finding might be due to the fact that many of these socioeconomically disadvantaged parents might not have had an opportunity to access oral health care services due to structural factors. However, their dental anxiety scores were related to whether their child had fillings or not. This finding was consistent with previous research that showed that the more dental anxiety parents had, the higher was the child's need for dental treatment (7).

The results related to the respondents' REALD-30 scores are consistent with several previously found relationships between oral health literacy and parents' background characteristics, such as their years of education (19,23,29) and level of family income (29). In addition, oral health literacy scores were also associated with self-reported oral health. Surprisingly, research has not yet explored this relationship in depth. While research in the medical field has clearly demonstrated that health literacy is correlated with systemic health (16,17), the relationship between oral health literacy and adults' oral health deserves further investigation. Finally, it is interesting that the parents' REALD-30 scores were correlated with whether their child had had a pulp treatment. This finding could be a consequence of the fact that parents with lower oral health literacy scores are less likely to seek dental care for their children than parents with higher oral health literacy scores (22,23).

This study had several limitations. First, the respondents' own oral health was only assessed with a self-report measure. An actual oral health assessment would have provided further insights into the relationships among dental anxiety, oral health literacy, and oral health outcomes among these respondents. Given that research on the relationship between adults' oral health literacy and oral health is scarce, having objective oral health data would have allowed a better understanding of these issues. Second, the pediatric patients' oral health-related characteristics were not assessed in actual screening exams. Instead, a chart review was conducted to collect information about the children's oral health. Any treatment that the pediatric patients had received before they became patients in the dental school clinic might not have been recorded in their current clinical charts. Not having data from on-site oral exams of both the parents and the children did not allow a more in-depth analysis of the relationship among the respondents' dental anxiety, their oral health literacy, and their own and their children's oral health status.

A third limitation is concerned with the way the respondents' dental anxiety was assessed. Given that this concept was of central importance, it might have been beneficial not only to assess it with the DAS-R scale, but in addition to use other scales as well. Finally, these data were collected in a dental school clinic. This fact could imply that patients with dental phobias might not be present among the respondents because they might have avoided bringing their child for a dental visit. In addition, parents who bring their child to a dental school clinic might differ in their characteristics from patients in community-based dental clinics or private dental offices. Future research should take these concerns into consideration.

Conclusions

This first study on the relationship between parents' dental anxiety scores and their level of oral health literacy shows that these two constructs are related.

However, these findings also draw attention to the complexity of the issues involved in this context. It seems justified to consider that factors affecting poor children's oral health are interrelated and multidetermined but include parents' lower oral health literacy skills and higher dental anxiety scores.

The public health message is that better communication between parents of pediatric patients and dental care providers is important, especially when these parents have lower oral health literacy and higher dental anxiety scores. In order to reduce oral health disparities, public health stakeholders need to find ways to overcome barriers due to low oral health literacy and high dental anxiety.

Acknowledgments

We want to thank Dr. Maria Regina Estrella for her support for this study, and Paula De Oliveria, Shawn Stressman, and Michael Hyman for assisting with the collection of the data and preparing the data for analyses. This study was made possible by a grant from the Student Research Program at the University of Michigan School of Dentistry for the first author.

References

1. Oosterink FM, de Jongh A, Hoogstraten J. Prevalence of dental fear and phobia relative to other fear and phobia subtypes. *Eur J Oral Sci*. 2009;**117**:135-43.

2. Armfield JM. The extent and nature of dental fear and phobia in Australia. *Aust Dent J*. 2010;**55**:368-77.
3. Rao A, Sequeire PS, Peter S. Characteristics of dental fear amongst dental and medical students. *Indian J Dent Res*. 1997;**8**:111-4.
4. Doerr PA, Lang WP, Nyquist LV, Ronis DL. Factors associated with dental anxiety. *J Am Dent Assoc*. 1998;**129**:1111-9.
5. Armfield JM, Spencer AJ, Stewart JF. Dental fear in Australia: who's afraid of the dentist? *Aust Dent J*. 2006;**51**:78-85.
6. Abrahamsson KH, Berggren U, Hakeberg M, Carlsson SG. Phobic avoidance and regular dental care in fearful dental patients: a comparative study. *Acta Odontol Scand*. 2001;**59**: 273-9.
7. Meng X, Heft MW, Bradley MM, Lang PJ. Effect of fear on dental utilization behaviors and oral health outcome. *Community Dent Oral*. 2007;**35**:292-301.
8. Jamieson LM, Mejia GC, Slade GD, Roberts-Thomson KF. Predictors of untreated dental decay among 15-34-year-old Australians. *Community Dent Oral*. 2009;**37**:27-34.
9. Schuller AA, Willumsen T, Holst D. Are there differences in oral health and oral health behavior between individuals with high and low dental fear? *Community Dent Oral*. 2003;**31**: 116-21.
10. Klingberg G, Berggren U. Dental problem behaviors in children of parents with severe dental fear. *Swed Dent J*. 1992;**16**:27-32.
11. Dye BA, Tan S, Smith V, Lewis BG, Barker LK, Thornton-Evans G. Trends in oral health status: United States, 1988-1994 and 1999-2004. National Center for Health Statistics. *Vital Health Stat*. 2007;**11**(248):3-6.
12. Villalobos-Rodelo JJ, Medina-Solis CE, Maupome G, Lamadrid-Figueroa H, Casanova-Rosado AJ, Casanova-Rosado JF *et al*. Dental needs and socioeconomic status associated with utilization of dental services in the presence of dental pain: a case-control study in children. *J Orofac Pain*. 2010;**24**:279-86.
13. Institute of Medicine. *Health literacy: a prescription to end confusion*. Washington, DC: National Academies Press; 2004.
14. Kutner ME, Greenberg E, Jin Y, Paulsen C. The health literacy of America's adults: results from the 2003 National Assessment of Adult Literacy. Washington: National Center for Education Statistics; 2006. National Center for Education Statistics Publication 2006-2483.
15. Rudd RE. Health literacy skills of U.S. adults. *Am J Health Behav*. 2007;**31** Suppl 1:S8-S18.
16. DeWalt DA, Berkman ND, Sheridan S, Rohr KN, Pignone MP. Literacy and health outcomes: a systematic review of the literature. *J Gen Intern Med*. 2004;**19**:1228-39.
17. Lee JY, Rozier RG, Lee SY, Bender D, Ruiz RE. Development of a word recognition instrument to test health literacy in dentistry: the READ-30 – a brief communication. *J Public Health Dent*. 2007;**67**:94-8.
18. Kiresh IS, Jungeblut A, Jenkins L, Kolstad A. Adult literacy in America: a first look at the results of the National Adult Literacy Survey (NALS). Washington: National Center for Education Statistics; 1993. National Center for Education Statistics Publication 1993-1275.
19. Vann WF, Lee JY, Baker D, Divaris K. Oral health literacy among female caregivers: impact on oral health outcomes in early childhood. *J Dent Res*. 2010;**89**:1395-400.
20. Macek MD, Manski MC, Schneiderman MT, Meakin SJ, Haynes D, Wells W *et al*. Knowledge of oral health issues among low-income Baltimore adults: a pilot study. *J Dent Hyg*. 2011;**85**:49-56.
21. Parker EJ, Jamieson LM. Associations between indigenous Australian oral health literacy and self-reported oral health outcomes. *BMC Oral Health*. 2010;**10**:3.
22. Miller E, Lee JY, DeWalt DA, Vann WF. Impact of caregiver literacy on children's oral health outcomes. *Pediatrics*. 2010;**126**:107-14.
23. Jones M, Lee JY, Rozier G. Oral health literacy among adult patients seeking dental care. *J Am Dent Assoc*. 2007;**138**: 1199-208.
24. Themessl-Huber M, Freeman R, Humphris G, MacGillivray S, Terzi N. Empirical evidence of the relationship between parental and child dental fear: a structured review and meta-analysis. *Int J Paediatr Dent*. 2010;**20**:83-101.
25. Ronis DL, Hansen CH, Antonokos CL. Equivalence of the original and revised dental anxiety scales. *J Dent Hyg*. 1995;**69**:270-2.
26. Schuurs AHB, Hoogstraten J. Appraisal of dental anxiety and fear questionnaires: a review. *Community Dent Oral*. 1993;**21**: 329-39.
27. Wang SJ, Briskie D, Hu J, Majewski R, Inglehart MR. Illustrated information for parent education – parent and patient responses. *Pediatr Dent*. 2010;**32**:295-303.
28. Pohjola V, Lahti S, Vehkalahti MM, Tolvanen M, Hausen H. Association between dental fear and dental attendance among adults in Finland. *Acta Odontol Scand*. 2007;**65**: 224-30.
29. Lee JY, Divaris K, Baker AD, Rozier RG, Lee SY, Vann WF. Oral health literacy levels among a low-income WIC population. *J Public Health Dent*. 2011;**71**:152-60.

