



## Oral health literacy among mothers of pre-school children

Tippanart Vichayanrat<sup>1</sup>, Tashsamon Sittipasoppon<sup>2</sup>, Thanatporn Rujiraphan<sup>2</sup>,  
Napas Meeprasert<sup>2</sup>, Pattareeya Kaveepansakol<sup>2</sup>, Yonlada Atamasirikun<sup>2</sup>

<sup>1</sup> M.S.D., Dr.P.H., Department of Community Dentistry, Faculty of Dentistry, Mahidol University.

<sup>2</sup> Dental student, Faculty of Dentistry Mahidol University.

### Abstract

**Objectives:** The aim of this study was to develop and validate a new oral health literacy test for Thai mothers. This study also examined the relationship among oral health literacy, oral health knowledge, socioeconomic factors and pre-school children's oral health status.

**Materials and methods:** The oral health literacy (OHL) test was developed to measure 3 aspects, which were basic/functional, communicative, and critical OHL. Mothers who brought their 2-6 years old children to the Pediatric Dental Clinic at Faculty of Dentistry, Mahidol University were invited to answer a self-administered questionnaire, which consisted of socio-demographic information and oral health knowledge (OHK), and OHL test. Caries status was collected from children's dental records. Factor analysis was used to analyze a construct validity of the OHL test. Cronbach's alpha was utilized to evaluate the internal consistency reliability of the test. Binary logistic regression was used to analyze the relationships among caries status, OHL scores, OHK, and socio-demographic variables.

**Results:** The factor analysis extracted 4 components instead of 3 originally proposed in questionnaire, which suggested addressing the 'searching and using information' OHL aspect. The 25-item OHL test showed acceptable reliability (Cronbach's alpha = 0.76). Mothers who correctly answered OHK items had significantly higher OHL scores, except the knowledge of cariogenic food. Less than 50 percents of mothers correctly understood the words 'periodontal disease', 'root canal treatment', 'mottled tooth', 'scaling', 'bridges', and 'plaque' (in Thai). Significant factors associated with children's caries status were mother's education (OR=9.1, 95% CI: 1.16-71.65), and OHL score (OR= 0.87, 95% CI: 0.76-0.98).

**Conclusion:** The newly developed OHL test had acceptable validity and reliability to measure various aspects of oral health literacy. Mother's education and oral health literacy were significant predictors to their children's caries status. This study reveals the complexity of OHL and help gaining the understanding of caregivers OHL in relation to knowledge and social variables.

**Keywords:** dental caries, oral health, knowledge, oral health literacy, pre-school child, mother, socioeconomic status

**How to cite:** Vichayanrat T, Sittipasoppon T, Rujiraphan T, Meeprasert N, Kaveepansakol P, Atamasirikun Y. Oral health literacy among mothers of pre-school children. *M Dent J* 2014; 34: 243-52.

### Correspondence author:

Tippanart Vichayanrat  
Department of Community Dentistry,  
Faculty of Dentistry, Mahidol University,  
6 Yothi Rd., Rajathevi, Bangkok 10400.  
Tel: 02-200-7809  
Fax: 02-200-7808  
Email: tippanartv@hotmail.com

**Received:** 24 June 2014

**Accepted:** 22 July 2014

## Introduction

Although these days health-related information is widely available and easily accessible, it is still questionable if these messages are thoroughly understood by everyone. It has been shown that the illiteracy rate among the world population is 17%<sup>1</sup>. In Thailand, the literacy rate of population that is 15 years old or older was 93.5%<sup>2</sup>. Even though people are able to read, they may not fully understand health information that could affect their health and family.

Health literacy have been defined as the levels of individual that can perceive, manage, and understand health care and service information including the ability to make a decision to maintain healthy<sup>3, 4</sup>. Nutbeam<sup>5</sup> proposed that health literacy could be divided into 3 aspects; first, “basic/functional literacy” which is the ability to read and understand health information such as consent forms and medical labels, second, “communicative/interactive literacy” which is the ability to use the health knowledge to communicate and participate in order to take care one’s self, and third, “critical literacy” which is the ability to analyze the validity and reliability of the received information. Previous studies found that people with low health literacy were more likely to have higher risk of having disease, to have less utilization of preventive health services, and to have higher rate of hospital admission, including higher risk of chronic diseases than those with higher health literacy<sup>6, 7</sup>.

The National Institute of Dental and Craniofacial Research (NIDCR)<sup>8</sup> defined oral health literacy as “the degree to which individuals have the capacity to obtain, process, and understand basic oral health information and services needed to make appropriate health decisions”. There are growing evidences that mothers’ oral health literacy was related to children’s oral health<sup>9-13</sup>. Study found that

caregivers with higher literacy scores were likely to have children with less treatment needs<sup>13</sup>. Previous study demonstrated that caregiver with lower literacy was associated with nighttime bottle use and no daily brushing/cleaning<sup>14</sup>. In addition, low-literacy caregivers related with increased emergency children’s dental care expenditures and total cost of oral care<sup>15</sup>.

Although numerous oral health literacy instrument have been proposed<sup>16-20</sup>, none of these tests had included all aspects of health literacy that previously proposed by Nutbeam<sup>5</sup>. The aims of this study were to develop and validate the oral health literacy test that included various aspects of oral health literacy, and use it to evaluate the relationships among oral health knowledge, oral health literacy, socioeconomic status, and children’s dental caries status.

## Materials and methods

Study population in this study was mothers of children aged 2-6 years who brought their children to Pediatric Dental Clinic at Mahidol University. Mothers were selected by quota sampling and the sample size was 150<sup>21</sup>. Inclusion criteria were that mothers could read and write Thai language, and took care of their children regularly. Mothers were excluded if they were dental personnel, or refused to participate in the study.

The oral health literacy (OHL) test was developed in Thai version according to Nutbeam<sup>22</sup> health literacy levels. The contents of oral health literacy test consisted of 3 main parts; 1) *Basic Oral Health Literacy* included 14 items for word reading and comprehension (anatomy, pathology, prevention, and dental treatment) and 5 items for understanding the labels, consent form, and post-operative instruction messages (19 items). Words and sentences in questionnaire were chosen by

reviewing the information from brochures, post-operative instructions, consent forms, toothpaste and medication labels that used in the Faculty of Dentistry, Mahidol University dental hospital, 2) *Communicative Oral Health Literacy* included the 3 statements (Q1-Q3 in Table 2) regarding skills in searching oral health information, and ability to communicate or transfer the received oral health information (3 items), and 3) *Critical Oral Health Literacy* included 3 statements (Q4-Q6 in Table 2) regarding the ability to evaluate the reliability of the information and to apply the information into practice (3 items). The communicative and critical OHL were evaluated using three-point Likert scale (agree = 3, undecided = 2, disagree = 1). A total of 25 items was summated into OHL scores. The maximum score of OHL was 37, and the minimum score was 9.

Oral health knowledge (OHK) test included 5 questions (minimum score = 0 and maximum score = 5), regarding cariogenic food, tooth brushing for preschool children, bottle weaning, toothpaste and fluoride treatment for preschool children.

### Data collection

The mothers were asked to answer the questionnaire consisted of socio-demographic information, oral health knowledge test, and OHL test. Caries prevalence in primary teeth and decayed, missing, and filled tooth (dmft) score were collected from oral examination record with permission. All mothers were explained the purposes of the study, and written informed consent was obtained prior to data collection. Research proposal was reviewed and approved by ethical committee of the Faculty of Dentistry/Faculty of Pharmacy Mahidol University (No. MU-DT/PY-IRB 2012/048.2811; November 28, 2012).

### Test of validity and reliability

A total of 25 items of OHL test was evaluated for internal consistency reliability using Cronbach's alpha. For communicative and critical OHL, construct validity was analyzed by factor analysis. Factorability of the questionnaire was investigated by the Kaiser-Meyer-Olkin measure for sampling adequacy (KMO), and the Bartlett's test for sphericity<sup>23</sup>. The optimal number of factors was determined by latent root criterion (eigenvalue greater than 1)<sup>23</sup>. The factor loading tables were compared after rotation. The best fit for the data was assumed if the factor loading was > 0.30<sup>24</sup>. An oblique rotation was employed since the constructs of the OHL were related<sup>23</sup>.

### Data analysis

The total of OHL scores of mothers were compared between those who correctly and incorrectly answered each knowledge item using t-test. The mean scores of each OHL aspect were also compared between mothers who had children with caries and no caries using t-test. Binary logistic regression analysis was performed to evaluate the associations between mother's age, mother's education, family income, oral health knowledge, and oral health literacy on children's caries status (yes/no). The statistical significant was set at 0.05.

### Results

Total of 149 mothers with mean age 36 years included in analysis. Most of the mothers obtained bachelor degree or higher and had family income more than 40,001 baht/month. Mean children's age was 5 years. Caries prevalence was 92.62% and mean dmft was 7.34. The sources of oral health information were TV/radio (50.3%), internet (45.6%), friends or relatives (40.9%). Most of the mothers reported receiving dental treatment at least once a year (58.9%) (Table 1).

### Reliability and Validity of Oral Health Literacy Test

The 25-item OHL test showed acceptable reliability (Cronbach's alpha = 0.76)<sup>25</sup>. The

factor analysis extracted the 3 factors from 6 items regarding communicative and critical OHL (Table 2). Kaiser-Meyer-Olkin measure for sampling adequacy (KMO) (0.574), and Bartlett's

**Table 1** Socio-demographic characteristics (n=149)

Characteristics	n	%
<b>Mother's age (years)</b>		
21-30	18	12.1
31-40	104	69.8
41-50	27	18.1
Mean	36	
Range	21-50	
<b>Mother's education</b>		
High school / Diploma	38	25.5
Bachelor degree or higher	111	74.5
<b>Family's income (baht/month)</b>		
20,000 or less	26	17.45
20,001 - 40,000	58	38.93
40,001 or more	65	43.62
<b>Oral health information received from (can choose more than one)</b>		
TV/Radio	75	50.34
Friends/Relatives	61	40.94
Newspaper/Magazine	51	34.23
Dental health/ health personnel	46	30.87
Internet	68	45.64
Brochure/Poster	33	22.15
Others	2	1.34
<b>Dental visit</b>		
Never/when having symptoms	62	41.61
Routinely (once or more/year)	87	58.39
<b>Children's age</b>		
Mean	5	
Range	2-6	
<b>Children's Caries status</b>		
Yes	138	92.62
No	11	7.38
<b>dmf(t)</b>		
Mean ± SD	7.34 ± 5.28	
Range	0-20	
<b>dmf(s)</b>		
Mean ± SD	16.17 ± 15.56	
Range	0-72	

test of sphericity ( $\chi^2 = 68.73$ ,  $df = 15$  and  $p$ -value  $< 0.001$ ) indicated the data were able to be grouped. The results revealed communality values, the amount of variance in the variable shared with all other variables, ranged from 0.489-0.769 (Table 2). The optimal number of factors suggested by the eigenvalue (greater than 1) was a three-factor-model, instead of two-factor-model (communicative and critical OHL). The results from factor analysis indicated that the questions on 'information searching' and 'applying information' should be separated from communicative and critical OHL. The final three factors explained 66.45% of the variance; Factor 1 with 2 statements addressing the critical OHL; Factor 2 with 2 statements addressing searching and using information OHL; Factor 3 with 2 statements addressing the communicative OHL (Table 2).

Thus, the final OHL test was revised into 4 aspects (basic/functional, searching and using information, communicative, and critical OHL, instead of the original 3 aspects proposed by Nutbeam<sup>22</sup>.

### Basic/functional oral health literacy

Less than half of mothers understood the meaning of 'periodontal disease', 'root canal treatment', 'mottled tooth', 'scaling', 'bridges', 'plaque' (in Thai). Regarding the information from the brochure, toothpaste label, and consent form, most mothers (96.6%) correctly understand about what consent form was for, but 49% of them correctly knew about the rights of patient when signed the consent form. The topic that mothers less likely to understand was related to the correct usage of toothpaste for children (57%) (Table 3).

**Table 2** Factor loadings and communalities of factor analysis for communicative and critical OHL

Statements	Factors			Communalities
	1	2	3	
Q1. If I know that my child have cavity, I'll look for more information.		<b>0.810</b>		0.704
Q2. If I receive information about dental health such as cause of tooth decay, cavity prevention and dental care, I can understand that information.			<b>0.470</b>	0.489
Q3. If I receive information about dental health, I can explain them to other people.			<b>0.885</b>	0.769
Q4. If I receive information about how to take care of child's teeth, I can apply that information in order to maintain my child's dental health.		<b>0.711</b>		0.696
Q5. If I receive information about dental health, I can judge which information is reliable.	<b>0.865</b>			0.725
Q6. If I know that my child has cavity, I can search for information that can help my decision.	<b>0.729</b>			0.604

Factor 1: Q5, Q6 addressing 'critical OHL'

Factor 2: Q1, Q4 addressing 'searching and using information OHL'

Factor 3: Q2, Q3 addressing 'communicative OHL'

Extraction and rotation method: Principal Component Analysis, Oblimin with Kaiser Normalization.

**Table 3** The percentage of mothers with correct response to basic/ functional oral health literacy test (19 items)

Wording comprehension		% correct response
Anatomy	Pulp	70.5
	Enamel	53.0
	Dentin	57.0
	Root canal	68.5
Pathology	Tooth shift	77.9
	Gingival recession	70.5
	Mottled tooth	33.6
	Plaque	41.6
	Periodontal disease	8.1
Treatment	Bridges	35.6
	Local anesthesia	97.3
	Sealants	61.7
	Root canal treatment	28.9
	Scaling	34.2
Understanding brochure, toothpaste label, and consent form		
	- Tooth brushing instruction	75.8
	- Toothpaste for children	57.0
	- Post-operative instruction after tooth extraction	71.8
	- The objectives of consent form	96.6
	- Patient's right	49.0

### Relationships between Oral Health Knowledge and Oral Health Literacy

Mother's OHL scores were significantly different between those who correctly answered the knowledge about tooth cleaning/ brushing ( $p= 0.015$ ), bottle weaning ( $p= 0.012$ ), toothpaste for preschool children ( $p= 0.003$ ), and knowledge of fluoride treatment ( $p=0.009$ ). However, the OHL scores were not significantly different between mothers who correctly answered about cariogenic food, and those who incorrectly answered about this knowledge ( $p= 0.085$ ) (Table 4).

### Relationship between Oral Health Literacy and Children's Oral Health Status

The total mean scores of OHL were found significantly different between mothers who had children with caries and no caries ( $p < 0.001$ ). When each aspect of OHL was analyzed,

the scores of basic, communicative, and critical OHL were found significantly different between mothers of children with caries and no caries. Mother with caries free children had significantly higher OHL scores in basic, communicative, and critical OHL scores, compared to those having children with caries ( $p < 0.05$ ). There was no significant difference between OHL scores in searching information aspect between mothers who had caries free children and having caries ( $p=0.093$ ) (Table 5).

### Impact of socioeconomic status, knowledge, oral health literacy on children's caries status

Binary logistic regression analysis indicated that factors significantly associated with children's caries status were mother's education (OR=9.1, 95% CI: 1.16-71.65), and OHL score (OR= 0.87, 95% CI: 0.76-0.98), when Y was dependent variable (yes/no caries), EDU\_gr(1)

**Table 4** Mean and standard deviation score of mother's oral health literacy (OHL) by oral health knowledge score

Oral health knowledge	n	% Response	OHL scores (mean $\pm$ S.D.)	p-value
Cariogenic food				
Correct	147	98.7	28.05 $\pm$ 2.83	0.085
Not correct/don't know	2	1.3	23.00 $\pm$ 4.10	
When to start brushing for children				
Correct	130	87.2	28.30 $\pm$ 4.17	0.015*
Not correct/don't know	19	12.8	25.84 $\pm$ 3.15	
When to stop bottle feeding				
Correct	90	60.4	28.67 $\pm$ 4.03	0.012*
Not correct/don't know	59	39.6	26.95 $\pm$ 3.68	
Toothpaste for preschool children				
Correct	95	63.8	28.75 $\pm$ 4.19	0.003*
Not correct/don't know	54	36.2	26.65 $\pm$ 3.68	
Benefit of fluoride treatment				
Correct	117	78.5	28.44 $\pm$ 4.07	0.009*
Not correct/don't know	32	21.5	26.31 $\pm$ 3.95	

\* t-test, significant difference at  $p < 0.05$   
S.D. = standard deviation

**Table 5** Mean score and standard deviation of mother's oral health literacy in each aspect by children's caries status

Oral health literacy	OHL scores (mean $\pm$ S.D.)		p-value
	Children with no caries	Children with caries	
Basic/Functional OHL (0-19)	12.38 $\pm$ 2.56	10.48 $\pm$ 3.79	0.002*
Communicative OHL (3-6)	5.83 $\pm$ 0.47	5.59 $\pm$ 0.64	0.028*
Critical OHL (3-6)	5.93 $\pm$ 0.37	5.59 $\pm$ 0.72	0.001*
Searching and using information OHL (3-6)	5.93 $\pm$ 0.37	5.78 $\pm$ 0.58	0.093
Total OHL scores (9-37)	30.06 $\pm$ 2.67	27.40 $\pm$ 4.33	<0.001*

\* t-test, significant difference at  $p < 0.05$   
S.D. = standard deviation

is mother's educational level less than bachelor degree (dummy variable), and sum OHL is the total scores of mother's oral health literacy.

Odd ratio indicated that children were 9 times more likely to have dental caries if their mother's education were lower than bachelor degree, when compared to those mothers with bachelor degree or higher. In addition, when

mother's OHL scores were increased 1 unit, children were 0.87 times likely to have dental caries which indicated that oral health literacy was a protective factor (Table 6).

## Discussion

The samples in this study represented the middle income mothers, and relatively older than average mothers in Thailand. The results

**Table 6** Logistic regression analysis using forward conditional method

Variables	B	Wald test	Sig.	OR	95% Confidence Interval for Odd ratio	
					Lower	Upper
Edu_gr(1)	2.211	4.425	0.035	9.129	1.163	71.656
Sum_OHL	-0.140	4.621	0.032	0.870	0.766	0.988
Constant	5.070	6.797	0.009	159.224		

Note: Only significant variables are included in the final model, controlled for mother's age, family income, and knowledge scores.

revealed that this group of mothers were actively received oral health information by television, and followed by internet information. It is important to note that the oral health information received from oral health care providers were about 30 percents which is less than received from friends or relatives (40%). This finding suggests that oral health information is currently accessible widely and dental personnel should be aware and utilize these available sources to disseminate oral health information. This information is corresponding with previous study that people usually searched health information from internet before seeking information from doctors<sup>26</sup>. The high prevalence and severity of dental caries in primary teeth among children in this study may due to the fact that the data was collected from university hospital and most children were likely to be referred from other clinics because of their complicated cases.

The factor analysis suggested the modification of original constructs by adding the 'searching information' OHL into original 3 OHL aspects. This result implied that we should distinguish between ability to communicate and apply for health information. Thus, the questionnaire was modified and separated two questions that related to searching and applying information into the new aspects called 'searching and using information OHL' during the analysis in this study. In addition, this questionnaire may be improved by increasing

the numbers of questions in each OHL area, and should be pre-tested in other population to enhance the reliability.

Mother's oral health knowledge was significantly associated with oral health literacy in all questions, except the knowledge about cariogenic food. This finding indicates that the basic knowledge about foods that caused dental caries has widely known by most people even those who have low literacy. However, others knowledge questions may be used to indicate mothers with low oral health literacy.

In this study, the searching information OHL aspects had no association with children's caries status. Since most mothers in this study were highly educated, they may search health information regularly. However, other OHL aspects including the basic OHL such as word recognition, communicative OHL such as understanding and ability to explain to others, and critical OHL such as ability to justify the credibility or reliability of the information were found significantly related with children's caries status, as they needs higher skills than searching information.

When considering the assessment of each aspect and sum of OHL, it is interesting to note that the sum of OHL was found highest significant with children's caries status, followed by critical OHL and basic/functional OHL, respectively (table 5). These findings support the use of full range of OHL when assessing the patients and the critical skill may be the most

important area that can sensitively identify the low literacy patients.

The questionnaire in this study was developed in Thai language, and wording and comprehension tests were obtained from the brochures, consent forms, and labels on the toothpaste in the Faculty of Dentistry. Thus, this questionnaire was acceptable and suitable for assessing Thai mothers as the study used lay terms that are generally found in the print media available in Thai context.

Multivariate analysis indicated that mother's educational level and OHL levels were the best predictors of preschool children's caries status in this study. This result was similar to the previous studies<sup>14, 27, 28</sup>. Although some oral health knowledge items were found related with children's caries status, they were unable to predict the caries while controlling other variables.

In this study, the test covered all areas of OHL as proposed by Nutbeam<sup>5</sup> that extends the understanding of various dimensions of OHL than previous tests such as REALD-30<sup>29</sup>, REALD-99<sup>30</sup>, TOFHLID<sup>17</sup>, which mostly focus on word comprehension. This new 25-item OHL test has shown acceptable reliability, as compared to previous tests that have more items. Future researches on oral health literacy are needed to involve many dimensions that are crucial to perform healthy behaviors. The development of health literacy test should also be related to the changing context that people are likely to have increased access to health information.

## Acknowledgements

The authors would like to express sincere gratitude to all mothers who participated in this study. We also appreciate the support and coordination from the staff at the Department of Pediatric Dentistry.

**Funding:** Faculty of Dentistry, Mahidol University

**Competing interests:** None declared

**Ethical approval:** MU-DT/PY-IRB 2012/048.2811

## References

1. UNESCO Institute for Statistics. UIS fact sheet : Adult and Youth literacy 2011 15/1/2014. Available from: <http://www.uis.unesco.org/literacy/Documents/fs26-2013-literacy-en.pdf>.
2. Thailand Basic Indicator : Adult literacy rate [Internet]. 2007-2011 [cited 22 Jan 2014]. Available from: [http://www.unicef.org/infobycountry/Thailand\\_statistics.html](http://www.unicef.org/infobycountry/Thailand_statistics.html).
3. Nutbeam D, Kickbusch I. Health promotion glossary. *Health Promot Int* 1998; 13: 349-64.
4. Davis TC, Wolf MS, Arnold CL, Byrd RS, Long SW, Springer T, et al. Development and validation of the Rapid Estimate of Adolescent Literacy in Medicine (REALM-Teen): a tool to screen adolescents for below-grade reading in health care settings. *Pediatr* 2006; 118: e1707-14.
5. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promot Int* 2000; 15: 259-67.
6. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Viera A, Crotty K, et al. Health literacy interventions and outcomes: an updated systematic review. *Evid Rep Technol Assess* 2011; 199: 1-941.
7. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. *Annals Intern Med* 2011; 155: 97-107.
8. National Institute of Health. The invisible barrier: literacy and its relationship with oral health. A report of a workgroup sponsored by the National Institute of Dental and Craniofacial Research, National Institute of Health, U.S. Public Health Service, Department of Health and Human Services. *J Public Health Dent* 2005 ; 65: 174-82.
9. Bridges SM, Parthasarathy DS, Wong HM, Yiu CK, Au TK, McGrath CP. The relationship between caregiver functional oral health literacy and child oral health status. *Patient Educ Couns* 2014; 94: 411-16.
10. Garrett GM, Citi AM, Gansky SA. Parental functional health literacy relates to skip pattern questionnaire error and to child oral health. *J*

- Calif Dent Assoc 2012; 40: 423-30.
11. Divaris K, Lee JY, Baker AD, Vann WF, Jr. Caregivers' oral health literacy and their young children's oral health-related quality-of-life. *Acta Odontologica Scand* 2012; 70: 390-7.
  12. Lee JY, Divaris K, Baker AD, Rozier RG, Lee SY, Vann WF, Jr. Oral health literacy levels among a low-income WIC population. *J Public Health Dent* 2011; 71: 152-60.
  13. Miller E, Lee J, DeWalt D, Vann W. Impact of caregiver literacy on children's oral health outcomes. *Pediatr* 2010; 126: 107-14.
  14. Vann WF, Jr., 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.
  15. Vann WF, Jr., Divaris K, Gizlice Z, Baker AD, Lee JY. Caregivers' health literacy and their young children's oral-health-related expenditures. *J Dent Res* 2013; 92: 555-62S.
  16. Lee JY, Rozier RG, Lee SY, Bender D, Ruiz RE. Development of a word recognition instrument to test health literacy in dentistry: the REALD-30--a brief communication. *J Public Health Dent* 2007; 67: 94-8.
  17. Gong DA, Lee JY, Rozier RG, Pahel BT, Richman JA, Vann WF, Jr. Development and testing of the Test of Functional Health Literacy in Dentistry (TOFHLiD). *J Public Health Dent* 2007; 67: 105-12.
  18. Wong HM, Bridges SM, Yiu CK, McGrath CP, Au TK, Parthasarathy DS. Validation of the Hong Kong Oral Health Literacy Assessment Task for paediatric dentistry (HKOHLAT-P). *Int J Paediatric Dent* 2013; 23: 366-75.
  19. Sabbahi DA, Lawrence HP, Limeback H, Rootman I. Development and evaluation of an oral health literacy instrument for adults. *Community Dent Oral Epidemiol* 2009; 37: 451-62.
  20. Richman JA, Lee JY, Rozier RG, Gong DA, Pahel BT, Vann WF, Jr. Evaluation of a word recognition instrument to test health literacy in dentistry: the REALD-99. *J Public Health Dent* 2007; 67: 99-104.
  21. Tabachnick B, Fidell L. *Using Multivariate Statistics*. 4th ed ed. Needham Height, MA: A Pearson Education Company; 2001.
  22. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promot Int* 2000; 15: 259-67.
  23. Hair J, Anderson R, Tatham R, Black W. *Multivariate Data Analysis*. 5th ed. New Jersey: Prentice Hall; 2006.
  24. Costello A, Osborne J. Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation* 2005; 10: 1-9.
  25. Tavakol M, Dennick R. Making sense of Cronbach's alpha. *Int J Med Educ* 2011; 2: 53-5.
  26. Hesse B, Nelson D, Kreps G, Croyle R, Arora N, Rimer B, et al. Trust and sources of health information: the impact of the Internet and its implications for health care providers: findings from the first Health Information National Trends Survey. *Arch Intern Med* 2005; 165(22): 2618-24.
  27. Bridges SM, Parthasarathy DS, Wong HM, Yiu CK, Au TK, McGrath CP. The relationship between caregiver functional oral health literacy and child oral health status. *Patient Educ Couns* 2014; 94: 411-6.
  28. Miller E, Lee JY, DeWalt DA, Vann WF, Jr. Impact of caregiver literacy on children's oral health outcomes. *Pediatr* 2010; 126: 107-14.
  29. Lee J, Rozier R, Lee S, Bender D, Ruiz R. Development of a word recognition instrument to test health literacy in dentistry, the REALD-30--a brief communication. *J Public Health Dent* 2007; 67: 94-8.
  30. Richman J, Lee J, Rozie rR, DA G, Pahel B, Vann W. Evaluation of a word recognition instrument to test health literacy in dentistry: the REALD-99. *J Public Health Dent* 2007; 67: 99-104.