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Oral Health Literacy and Health Seeking Behavior of Older Adults in Rural Community

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Abstract

Objectives: This community-based cross-sectional study aimed to examine health information seeking behavior regarding oral health and oral health literacy and their relationship in older adults.

Methods: The research was conducted with 432 participants from the rural area of, Noen Maprang District, Phitsanulok province, Northern Thailand. To measure oral health literacy, modified Short Test of Functional Health Literacy in Dentistry for Older Adults was used. The adapted questionnaire was used to collect health information seeking behavior in the past 3 months.

Results: Only 12.3% demonstrated adequate oral health literacy. Some 27.1% presented active health information seeking behavior, 57.3% presented passive health information seeking behavior and 15.6% had never obtained or sought any oral health information. The association between health information seeking behavior and oral health literacy could not be observed. Television, health personnel, family members/relatives and village health volunteers were the most popular information sources.

Conclusions: By adding oral health information and improving skills of oral health information for village health volunteers, it is possible to develop oral health literacy in older adults in rural areas.

Keywords: health information seeking behavior, older adults, oral health literacy

Introduction

Health literacy (HL) relates to health outcomes and self-care behaviors. Persons of all ages who presented low HL were more likely to hospitalize, to use emergency care and have less access to screening and vaccination.⁽¹⁾ However, in older adults, inadequate HL negatively correlated to hospitalization and emergency room visits⁽²⁾ and more likely reported health-related limitations including physical function and activity and demonstrable lower scores of subjective general health.⁽³⁾ HL has been related to cognitive and social skills and ability of individuals to gain access to health information, and their understanding and capacity to use information effectively for promoting and maintaining health.⁽⁴⁾ Thus, HL could direct individuals to achieve knowledge and personal skills and take actions to change their lifestyles and living conditions to achieve good health. As HL has been concerned with the knowledge and ability of people to meet complex health needs, Sørensen and colleagues⁽⁵⁾ reviewed the definitions and the conceptual models of HL and proposed an integrated model of HL. The ability, in the integrated model, was defined as the process of accessing, understanding, appraising, and applying health related information and those abilities have been proposed as the core competencies of HL. To achieve HL, the process starts with access to health information that refers to the ability to seek, to find and to obtain health information.

Health information-seeking was defined as the process of an individual using different methods to seek information based on different motivations, stimuli and situations to improve health.⁽⁶⁾ The correlation between HL and health information seeking behaviors (HISB) had been reported in previous studies. The study of HL in low-income populations found that the low HL pregnant women were less likely to use the internet and had more personal barriers to seek information than those who had high HL. However, significant differences in obtaining information from interpersonal sources, health fairs, or health organizations were not observed.⁽⁷⁾ The study in older Korean adults also reported a positive correlation between HL and information-seeking preferences after adjustment for demographic and illness variables.⁽⁸⁾ Lee and colleagues also found Minnesotan adults who presented high level of HISB on the internet had greater access to mobile phones, computers or tablets.⁽⁹⁾ The HISB had not been determined only to actively seek information but also

passively to obtain health information.

Various wordings have been used to describe the actions of accessing health information⁽⁵⁾ such as to gain access, to seek out, to find, to obtain. Lalazaryan and Zare-Farashbandi categorized the information seekers into three categories as active, passive information seekers, and information “blunters”. Active seekers actively search when they are in stressful or health threatening situations, while information blunters actively seek and keep awareness of new information.⁽⁶⁾ Drummond *et al.*, defined methods of obtaining health information as active HISB that referred to the process of looking for and seeking for information, and passive HISB that referred to the process in which a person encounters information and decides on the attention given to it.⁽¹⁰⁾

Active HISB may be associated with higher HL, health behaviors and consequently health outcomes. The evidence from previous studies in older adults reported the higher HL was negatively related to risk behaviors but showed positive relations to health behaviors such as having regular health examination, self-reporting good health and more likely to sufficiently access multiple health information sources.⁽¹¹⁾

Oral health literacy (OHL) has become a major concern to promote oral health and achieve quality of life. Several tools were developed to measure OHL in older adults. Rapid Estimate of Adults Literacy in Dentistry (REALD-30) has been used to assess word recognition efficiency⁽¹²⁾, but the word comprehension could not be tested. Test of Functional Health Literacy in Dentistry (TOFHLiD) aimed to test functional dental health literacy by measuring reading comprehension and numerical ability.⁽¹³⁾ With concern for the cultural diversity, the Test of Functional Health Literacy in Dentistry for Older Adults (OA-TOFHLiD) had been developed from Thai Older adults and reported with acceptable validity and reliability.⁽¹⁴⁾ However, the OA-TOFHLiD was required much time for assessment and the older adults could not answer independently, the Short OA-TOFHLiD that excluded the session about reading and answering; modified toothpaste and mouthwash labels⁽¹⁵⁾, were used in this study.

In Thai older adults, the prevalence of low and inadequate OHL were reported as 49.3%⁽¹⁶⁾ and 45.2%.⁽¹⁷⁾ This evidence also reported negative associations between low OHL and < 20 remaining teeth,⁽¹⁶⁾ less number of natural

functional teeth to occlude and less number of posterior occluding pairs.⁽¹⁷⁾ The 8th Thai National Oral Health survey reported that 54.7% and 36.2% of older adults aged 60-74 years obtained oral health information from health personnel and television. Only 2.4% of them looked for the information from the internet (Website, Facebook, or LINE).⁽¹⁸⁾ However, the evidence of HISB and OHL and their association has been limited. This study aimed to examine HISB regarding oral health and OHL and to investigate the relationship between the HISB and OHL in older adults.

Materials and Methods

Study design

The community-based cross-sectional study was conducted in Noen Maprang District, Phitsanulok province, Northern Thailand. The district is rural, consisting of 7 subdistricts with 6,120 older adults aged 60-79 years old.⁽¹⁹⁾ Dental personnel and dental care accessibility can reflect the availability of oral health information. The 4 subdistricts were selected as a study area according to the following criteria: 1) whether there were dental personnel in the Tambon Health Promotion Hospital (primary care unit), and 2) low or high percentage of dental care accessibility. From the Thai health data center⁽¹⁹⁾, the two areas presented with the highest and the lowest percentage of access to dental service were included.

Older adults who presented mental health problems, were illiterate, or were unable to communicate were excluded. The 432 participants were included in this study by using proportion sampling according to the number of older adults in subdistricts and systematic random sampling methods. Data collection was administered during November 2019 to February 2020. Ethical approval was received from the Ethics Committees of the Faculty of Dentistry, Chiang Mai University (63/2562).

Oral health literacy (OHL)

Modified form of the Short Test of Functional Health Literacy in Dentistry for Older Adults (The Short OA-TOFHLiD) was used to measure OHL. The test consists of 39 questions with 4 alternatives. The total score ranged from 0 to 39. The inadequate OHL was score 0-34 and adequate OHL was score 35-39, with 60% sensitivity and 60.7% specificity.⁽¹⁵⁾

Health information seeking behaviors (HISB)

The questionnaire was constructed by researchers to collect HISB for dental health in the past 3 months. The questionnaire consisted of 4 parts: 1) the frequency of information seeking and information sources, 2) content and information sources 3) satisfaction with the information (rated 3 to 1 from high to low level of satisfaction) and 4) barriers to information seeking (yes/no). The content validity of the questionnaire was evaluated by using the Index of Item-Objective Congruence from 3 experts with experience of surveys. To achieve reliability, the researcher did a pilot study in 30 older adults in the district, which was not included in this study, with kappa value >0.70. For data collection, 8 research assistants were trained until they felt confident to collect demographic data and to interview the HISB. Active HISB was determined as seeking at least one issue of oral health information in the past 3 months. Passive HISB was defined as to never seek, but only obtain oral health information. No active and no passive HISB was determined to have never sought or obtained any oral health information.

Sociodemographic variables including gender, age, educational level, occupation and monthly income, and oral health satisfaction were collected by questionnaire.

The sample size was determined according to previous studies, the expected percentage of adequate OHL in older adults was 54%,⁽¹⁴⁾ considering a confidence level of 95% and precision of 5%. To compensate for 20% attrition, the sample size was 432.

Data analysis

Percentage, mean standard deviation (sd) was used in descriptive statistics. Chi-square or Fisher's exact test were used to examine the differences in demographic and HISB between adequate and inadequate OHL. Odds ratios which were modeled by logistic regression were calculated to describe the association between HISB, barrier to information seeking and OHL. In this study, SPSS (Ver.24) was used with a significance level of 0.05.

Results

A total of 431 older adults (99.7%) participated in this study with a mean age of 65.58 years old (sd 4.1). The majority graduated primary school, were growers, and had low income (<3000 baht/month). 55.7% had dental treatment in the previous whole year, and 76.8%

reported satisfaction in their oral health status. 12.3% of older adults demonstrated adequate OHL and different percentages of adequate OHL were observed according to educational level, occupation, and income, with statistical significance (Table 1). The majority (84.4%) had accessed oral health information and the 57.3% and 27.1% of them reported passive HISB and active HISB. Only 15.6% of participants had never obtained or sought any oral health information. The statistically significant difference between HISB and adequate OHL was observed (Table 1).

Factors related to OHL were presented in Table 1. In crude analysis, higher income positively associated with adequate OHL. Older adults who graduated primary school were more likely to have adequate OHL than those who uneducated. In occupation variable, pensioners were positively association with adequate OHL, but the finding was conclusive as the statistically significant was reported with a wide range of 95% confidence interval. In multi-variable analysis, the reverse association was observed in primary school when compared to uneducated.

The distribution of passive and active HISB by information sources was described in Table 2. Most participants access oral health information from television, doctors/nurses/public health officials. While television, radio/community radio and public address vehicles/village public address tower were passively accessed by older adults, a higher proportion of active HISB older adults seeking oral health information from village health volunteers (VHVs), internet, doctors/nurses/public health officials, parents/relatives/offspring and books/magazines/newspapers were observed.

Oral care products and teeth brushing were among the most common oral health information accessed by the elderly. Among active HISB, causes of tooth loss, periodontal disease, toothache, dental prostheses, and oral cancer were the top five content items actively sought, while xerostomia was not sought (Table 2). Barriers to health information-seeking associated with inadequate OHL were shown in Table 3. Not knowing how to get information and no transportation were significant barriers to adequate OHL.

Discussion

This study reported the active HISB older adults were more likely to demonstrate adequate OHL than those who were passive or without HISB. However, the asso-

ciation between HISB and OHL could not be observed. Only 12.3% of participants demonstrated adequate OHL. The 27.1% presented active HISB, 57.3% presented passive HISB and 15.6% had never obtained or sought any oral health information.

The percentage of adequate OHL, in this study, is lower than previous studies that reported 50.7%⁽¹⁶⁾ of high OHL and 54.5%⁽¹⁷⁾ in older adults in Southern and Northern Thailand. High and moderate OHL were reported as 38.3% and 30.1% of non-institutionalized Brazilian older adults,⁽²⁰⁾ while the 19.3% and 29.6% of high and moderate OHL of the institutionalized Indian elderly were reported.⁽¹²⁾ The percentage of OHL level varied among studies, which might be due to differences in socio-demographic characteristics. In our study, 91.4% of elderly had graduated primary school or lower, while a previous study of the Thai elderly reported 77.6%⁽¹⁶⁾ graduated primary education or lower, and 53% graduated high school or lower.⁽¹⁷⁾ Previous evidence, including this study, have observed the inverse association between lower educational level, income, and higher level of OHL.^(12,16,17)

In addition, the percentage of older adults with adequate OHL, among studies, could not be compared because different tools had been used for OHL assessment. Rapid Estimate of Adult Literacy in Dentistry (REALD-30)⁽¹²⁾ aimed to test word recognition and reading comprehension. The Health Literacy in Dentistry scale (HeLD-Th),⁽²⁰⁾ and that validated in Thai⁽¹⁶⁾ aimed to assess comprehensive ability including understand, access, evaluate information and decision making. This study used the modified Short OA-TOFHLID⁽¹⁴⁾ adapted to the Thai context, and aimed to assess functional oral health literacy including word recognition, numeracy and reading comprehension of the older adults.

In this study, we categorized HISB into active and passive manners. Our findings were consistent with the 8th Thai National Oral Health survey that reported public health officials, VHVs and television were the most popular oral health information sources for older adults.⁽¹⁸⁾ Television and radio could deliver the mass media and be easy to access, while the older adults could access the information from health personnel when they made a dental visit at hospital or at the primary care unit. According to the health information culture in Thai context, television and radio are the main sources of information for the elderly. Dharma content and herbal infor-

mation related to health had been delivered through the television or radio, while “village public address tower” has been used mainly for informing on local specific issues and a few items of content related to health.⁽²¹⁾ VHVs, who were the respected members of their villages where they lived and work, were briefly trained in health promotion and disease prevention.⁽²²⁾ The elderly felt free to ask or to consult VHVs for oral health information.

The positive association between adequate social support and better literacy OHL, and less hospital admissions had been reported in older Chinese adults.⁽²³⁾ The higher proportion of the elderly who actively accessed oral health information, more often accessed oral health information from VHVs, health personnel, books/magazines/newspapers, and internet, compared to other information sources demonstrated in this study.

Table 1: Demographic data and association between factors and adequate oral health literacy

Characteristics	N (%)	Adequate OHL N (%)	Inadequate OHL N (%)	p-value ⁽¹⁾	Crude OR ⁽²⁾ (95%CI)	Adjusted OR ⁽³⁾ (95%CI)
Number of older adults	431	53 (12.3)	378 (87.7)			
Gender				0.143		
Male	202 (46.9)	30 (14.9)	172 (85.1)		Reference	
Female	229 (53.1)	23 (10.0)	206 (90.0)		0.64 (0.36, 1.14)	0.89 (0.47,1.71)
Age (years)				0.074		
60-69	337 (78.2)	36 (10.7)	301 (89.3)		Reference	
≥ 70 (70-74)	94 (21.8)	17 (18.1)	77 (81.9)		0.52 (0.29, 1.02)	
(Mean=65.58 ; sd= 4.1)						
Education				<0.001*		
Uneducated	8 (1.8)	3 (37.5)	5 (62.5)		Reference	Reference
Primary School	386 (89.5)	37 (9.6)	349 (90.4)		0.18 (0.04, 0.77)*	0.14 (0.03, 0.66)*
Secondary School	31 (7.2)	10 (32.3)	21 (67.7)		0.79 (0.16, 4.00)	0.51 (0.09, 2.99)
Bachelor's degree	6 (1.4)	3 (50.0)	3 (50.0)		1.67 (0.19, 14.27)	0.50 (0.04, 6.05)
Occupation				0.016*		
Unemployed	64 (14.8)	6 (9.4)	58 (90.6)		Reference	
Agriculturist	203 (47.1)	25 (12.3)	178 (87.7)		1.36 (0.53, 3.47)	
Pensioner	6 (1.4)	3 (50.0)	3 (50.0)		9.67 (1.58, 58.93)*	
Housewife	61 (14.2)	5 (8.2)	56 (91.8)		0.86 (0.25, 2.99)	
Employee	57 (13.2)	5 (8.8)	52 (91.2)		0.93 (0.27, 3.23)	
Trader/Self-employed	40 (9.3)	9 (22.5)	31 (77.5)		2.81 (0.92, 8.61)	
Monthly income (Baht)				0.001*		
1 - 3,000	322 (74.7)	29 (9.0)	293 (91.0)		Reference	Reference
3,001 - 10,000	86 (20.0)	16 (18.6)	70 (81.4)		2.31 (1.19, 4.48)*	1.82 (0.88, 3.79)
10,001 - 15,000	12 (2.8)	4 (33.3)	8 (66.7)		5.05 (1.43, 17.80)*	3.25 (0.84, 12.56)
≥15,000	11 (2.5)	4 (36.4)	7 (63.6)		5.77 (1.60, 20.90)*	2.69 (0.53, 13.66)
Past dental experiences in the last 1 year				0.107		
No	191 (44.3)	29 (15.2)	162 (84.8)		Reference	Reference
Yes	240 (55.7)	24 (10.0)	216 (90.0)		0.62 (0.35, 1.11)	0.62 (0.32, 1.18)
Oral health satisfaction				0.862		
No	100 (23.2)	13 (13.0)	87 (87.0)		Reference	Reference
Yes	331 (76.8)	40 (12.1)	291 (87.9)		0.92 (0.47, 1.79)	1.12 (0.58, 2.55)
Health information-seeking behavior				0.017*		
None	67 (15.6)	7 (10.4)	60 (89.6)		Reference	Reference
Passive	247 (57.3)	23 (9.3)	224 (90.7)		0.88 (0.36, 2.15)	0.84 (0.32, 2.15)
Active	117 (27.1)	23 (19.7)	94 (80.3)		2.10 (0.85, 5.19)	1.58 (0.58, 4.27)

*Statistical significance : P-value <0.05, OHL: oral health literacy, OR: Odds ratio

⁽¹⁾Chi-square test, ⁽²⁾Simple logistic regression, ⁽³⁾Multiple logistic regression: adjusted for gender, education, monthly income, past dental experiences in the last 1 year and satisfaction with oral health condition

Table 2: Information sources and oral health information that had been accessed in the last 3 months among older adults with passive and active health information seeking behaviors

	Number (%)	Passive HISB N (%)	Active HISB N (%)
Information sources			
1. Television	385 (89.3)	358 (100)	-
2. Doctors/Nurses/Public health officials	307 (71.2)	112 (36.5)	195 (63.5)
3. Parents/Relatives/Offspring	262 (60.8)	112 (42.7)	150 (57.3)
4. Village Health Volunteers	214 (49.6)	58 (23.5)	156 (76.5)
5. Friends	181 (42.0)	84 (46.4)	97 (53.6)
6. Radios/Community radio	154 (35.7)	154 (100)	-
7. Poster/Brochure	120 (27.8)	77 (64.2)	43 (35.8)
8. Book/Magazine/newspaper	98 (22.7)	35 (35.7)	63 (64.3)
9. Public Address/Audio tower village	85 (19.7)	85 (100)	-
10. Internet	42 (9.7)	12 (28.7)	30 (71.3)
Oral health information			
1. Oral care products (e.g. toothbrush, toothpaste, mouthwash)	269 (62.4)	254 (94.4)	15 (5.6)
2. Teeth brushing	223 (51.7)	182 (81.6)	41 (18.4)
3. Toothache	185 (42.9)	136 (73.5)	49 (26.5)
4. Dental caries	172 (39.9)	146 (84.9)	26 (15.1)
5. Dental prostheses	165 (38.2)	126 (76.4)	39 (23.6)
6. Prevention of tooth loss	112 (26.0)	95 (84.8)	17 (15.2)
7. Causes of tooth loss	85 (19.7)	52 (61.2)	33 (38.8)
8. Gingivitis/ periodontitis	84 (19.4)	58 (69.1)	26 (30.9)
9. Oral cancer	53 (12.3)	43 (81.1)	10 (18.9)
10. Tooth fracture	37 (8.6)	31 (83.8)	6 (16.2)
11. Xerostomia	6 (1.4)	6 (100)	-

Table 3: Bivariable analysis of barriers to health information seeking regarding oral health and inadequate oral health literacy

Barriers to health information seeking	Number (N)	Adequate OHL N (%)	Inadequate OHL N (%)	Odds ratios (95%CI)	p-value ⁽¹⁾
1. Don't know how to get info	265	22 (8.3)	243 (91.7)	2.54 (1.41, 4.55)	0.002*
2. Time consuming to get info	220	29 (13.2)	191 (86.8)	0.85 (0.47, 1.51)	0.57
3. Don't know how to use the Internet	345	40 (11.6)	305 (88.4)	1.36 (0.69, 2.67)	0.38
4. No family/friends for questions	66	9 (13.6)	57 (86.4)	0.87 (0.40, 1.88)	0.72
5. No transportation	262	22 (8.4)	240 (91.6)	2.45 (1.37, 4.40)	0.003*
6. No oral health fairs/activities near home	306	37 (12.1)	269 (87.9)	1.07 (0.57, 2.00)	0.84
7. Books/magazines are expensive	244	31 (12.7)	213 (87.3)	0.92 (0.51, 1.64)	0.77
8. Books/magazines are difficult to buy	249	36 (14.5)	213 (85.5)	0.61 (0.33, 1.12)	0.11
9. Oral health care providers are not helpful	70	6 (8.6)	64 (91.4)	1.60 (0.65, 3.89)	0.30
10. Lack information from mass media	138	15 (10.9)	123 (89.1)	1.22 (0.65, 2.31)	0.54

*Statistical significance : p-value <0.05, ⁽¹⁾Simple logistic regression

The study of Kim and Utz in older Korean adults reported health literacy showed positive correlation with information-seeking preferences after adjustment for demographic and illness variables.⁽⁸⁾ In this study, the association between HISB and OHL could not be observed because the sample size was inadequate to detect the association. Only 12.3% of older adults had adequate OHL found in this study, that was lower than the percentage used for sample size estimation. Trainattawan, Wirojratana, and Watanakurilert also found that HISB through online media/social media is positively associated with HL among older Thai older adults.⁽²⁴⁾ The number of internet users in Thailand has increased across all generations.⁽²⁴⁾ The study of Kheokao *J et al.*,⁽²⁵⁾ reported that among the Thai elderly who used the internet, 75.3% went online via personal smart/mobile phone. They used the internet to connect with LINE application (85.7%), Facebook (63.1%). In terms of usage, they watched media clips or listened to music (68.9%), and searched for information and downloads (63.4%).

Healthy lifestyles, treatment and medication were the popular content that the elderly searched regularly.⁽²⁶⁾ Major oral problems from national surveys among older Thai adults were tooth loss, untreated tooth decay, attrition, needs for dental prostheses, calculus and bleeding, periodontal disease, and xerostomia.⁽¹⁸⁾ In this study, causes of tooth loss, gingivitis/periodontal disease, toothache, dental prostheses, and oral cancer, sorted that order, were popular content that had been sought. Xerostomia was passively accessed by only 6 older adults and none of the participants had ever searched for this information. The findings from a previous study among smartphone users for seeking health information suggested that younger age, higher educational levels, having regular exercise, higher medical expenditure, and HL correlated to HISB.⁽²⁷⁾ This study could not observe the association of HISB and OHL. This might be due to the large number of older adults who were determined as having inadequate OHL, and consequently the association could not be detected. However, the increasing trend of using the internet, particularly on personal smart/mobile phones in elderly, can increase the potential to actively access oral health information.

Not knowing how to get information and having no transportation were significant barriers to access information in our study population. Some did not know

how to access the internet, and some had no idea how to search. In addition, no oral health fairs were located nearby and they could not go to the information sources such as community hospitals or primary care units. The barriers to HISB have been proposed as individual factors which were: degraded physical function, lack of HL and lack of information search skill. Lack of social support was determined as inadequate family support, limited access to professional health service, lack of health information services/sources and inadequate control of health information quality by the government.⁽²⁸⁾

Increasing access to oral health information could be considered with various types of HISB. Television and radio are effective channels to passively deliver oral health information. However, the quantity and variety of content and essential information for the elderly will be new challenges. Improving the skills of VHV to give consultations, and to help the elderly to prevent problems or promote oral health, could encourage older adults to actively access oral health information and further create more flexible interactions. As internet users, reliable sources of information on internet or social media, and essential content about xerostomia or dysphagia, and quality of oral health information should be adequately controlled. In further study, the availability, accessibility of oral health information and effectiveness of communication should be evaluated with both quantitative and qualitative research.

There are some limitations to this study. We assessed only access to oral health-related information that is one out of four competencies of HL. To achieve oral health by developing OHL, the ability to understand, to appraise and to apply oral health information should be further considered. The study participants were older adults in rural areas, so comparing our findings to other studies should consider different contexts and cultural diversity. Lastly, the questionnaire survey had limitations for giving explanations from some perspectives such as quality of information/sources and difficulties to access information.

Conclusions

Older adults with active HISB tended to demonstrate adequate OHL than those who were passive or without HISB. Television, health personnel, family members/relatives and VHV were the most popular oral health information sources. Not knowing how to get information

and no transportation were significant barriers to access information. Increasing access to information by inserting oral health information in television, radio, internet, and social media, improving information search skills for the elderly, and improving oral health information skills for VHV's could be able to develop OHL in older adults.

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Conflicts of interest

The authors declare no conflict of interest.

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Statement of Ethics

The study protocol was approved by the Human Experimentation Committee of the Faculty of Dentistry, Chiang Mai University. (No. 63/2019) Study participants have given their written informed consent.

References

- Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: an updated systematic review. *Ann Intern Med.* 2011;155(2):97-107.
- Cho YI, Lee SD, Arozullah AM, Crittenden KS. Effects of health literacy on health status and health service utilization amongst the elderly. *Soc Sci Med.* 2008;66(8):1809-16.
- Kim SH. Health literacy and functional health status in Korean older adults. *J Clin Nurs.* 2009;18(16):2337-43.
- 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(3):259-67.
- Sørensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, *et al.* Health literacy and public health: a systematic review and integration of definitions and models. *BMC Public Health.* 2012;12(1):80.
- Lalazaryan A, Zare-Farashbandi F. A review of models and theories of health information seeking behavior. *Int J Health Syst Disaster Mgmt.* 2014;2(4):193-203.
- Shieh C, Mays R, McDaniel A, Yu J. Health literacy and its association with the use of information sources and with barriers to information seeking in clinic-based pregnant women. *Health Care Women Int.* 2009;30(11):971-88.
- Kim SH, Utz S. Association of health literacy with health information-seeking preference in older people: a correlational, descriptive study. *Nurs Health Sci.* 2018;20(3):355-60.
- Lee HY, Jin SW, Henning-Smith C, Lee J, Lee J. Role of health literacy in health-related information-seeking behavior online: cross-sectional study. *J Med Internet Res.* 2021;23(1):e14088.
- Drummond FJ, Reidy M, von Wagner C, Livingstone V, Drennan J, Murphy M, *et al.* Health literacy influences men's active and passive cancer information seeking. *Health Lit Res Pract.* 2019;3(3):e147-e60.
- Liu YB, Liu L, Li YF, Chen YL. Relationship between health literacy, health-related behaviors and health status: a survey of elderly Chinese. *Int J Environ Res Public Health.* 2015;12(8):9714-25.
- Chowdary MS, Sudhir K, Reddy V, Kumar K, Srinivasulu G. Oral health literacy and its impact on oral health status among institutionalised elderly population. *IOSR-JDMS.* 2015;14(8):96-104.
- 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(2):105-12.
- Wanichsaihong P, Goodwin M, Pretty IA. Development and pilot study of an oral health literacy tool for older adults. *J Investig Clin Dent.* 2019;10(4):e12465.
- Wanichsaihong P. Further validation of a dental functional health literacy for older adults (Short OA-TOFHLiD) [thesis]. Manchester, United Kingdom: The University of Manchester; 2019.)
- Sermutsi-Anuwat N, Piyakhunakorn P. Association between oral health literacy and number of remaining teeth among the Thai elderly: a cross-sectional study. *Clin Cosmet Investig Dent.* 2021;13:113-9.
- Wanichsaihong P, Goodwin M, Pretty I. Oral health status of Thai older adults with different oral health literacy levels. *CM Dent J.* 2021;42(2):104-13.
- Keeddee C, Mongkolnchai-arunya S, Pochanukul N, Jintakanon P, Sukhumalind P. The 8th national oral health survey 2017 of Thailand. Bangkok: Bureau of Dental health, Department of Health, Ministry of Public Health; 2018
- Poluation Standards Report Group [Internet]. 2019 [cited 2019 Jun 4]. Available from: <https://hdcservice.moph.go.th/hdc/main/index.php>

20. Tenani CF, De Checchi MHR, Bado FMR, Ju X, Jamieson L, Mialhe FL. Influence of oral health literacy on dissatisfaction with oral health among older people. *Gerodontology*. 2020;37(1):46-52.
21. Polpichit P, Vongprasert C. Health information culture in Thai rural community. *JLISSWU*. 2017;10(2):63-77.
22. Kauffman KS, Myers DH. The changing role of village health volunteers in northeast Thailand: an ethnographic field study. *Int J Nurs Stud*. 1997;34(4):249-55.
23. Liu YB, Hou P, Xue HP, Mao XE, Li YN. Social support, health literacy, and health care utilization among older adults. *Asia Pac J Public Health*. 2019;31(4):359-66.
24. Trainattawan W, Wirojratana V, Watanakukrileert D. Factors influencing health literacy among older adults. *JHSR*. 2019;13(2):41-51.
25. Phisanwut N, Nompitakcharoen T, Nimanong T, Bunnak N, Thiangtham A. *Thailand Internet User Behavior 2020*. Bangkok: Electronic Transactions Development Agency; 2020
26. Kheokao J, Ubolwan K, Tipkanjanaraykha K, Plodpluang U. Online health information seeking behaviors among the Thai elderly netizens. *TLA Research Journal*. 2019;12(1):60-76.
27. Oh YS, Choi EY, Kim YS. Predictors of smartphone uses for health information seeking in the Korean elderly. *Soc Work Public Health*. 2018;33(1):43-54.
28. Zhao D. Exploring older adults' health information seeking behavior: evidence from urban China. *Proc Assoc Inf Sci Technol*. 2019;56(1):847-8.