

Health Literacy Problems and its associated factors among elderly in Thailand

By

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Abstract

This study aimed to identify the level of health literacy and factors related to inadequate and problematic levels health literacy among elderly in Thailand. This cross-sectional analytical study used the data set from the National Health Literacy Survey of Thailand. The study population of this study was Thai citizen aged 60 years and older residing in all 13 zones which consisted of 77 provinces of 4 regions in Thailand. A total of 6,477 elderly who passed the inclusion and exclusion criteria were recruited. Multivariable analysis was performed by including all independent variables into the model by assigning significant p-value. Our study observed that 37.58% of elderly had problematic health literacy level (51-66 %) with 95% CI: 36.40-38.76. Our multivariate analysis revealed that factors associated with problematic and inadequate level of health literacy were elderly having age group of ≥ 80 years (Adj.OR 2.12 ,95% CI:1.64-2.740, p-value <0.001), elderly without formal education (Adj.OR=6.08, 95% CI: 3.80-9.73, p-value <0.001), those who can't read and write fluently with Adj.OR 1.49 (95% CI, 1.15-1.94, p-value 0.003), (Adj.OR 1.53, 95% CI, 1.18-1.98, pvalue 0.001) respectively. Furthermore, respondents who were never had health information acquisition from physician (Adj.OR=1.52, 95% CI, 1.32-1.74, with p-value <0.001), health professionals (Adj.OR=1.35, 95% CI, 1.17-1.56, p-value <0.001), health volunteers workers (Adj.OR=1.75, 95% CI, 1.50-2.03, p-value < 0.001) and not using glasses or contact lens to see (Adi.OR=1.15, 95% CI, 1.01-1.32, p-value 0.035) were significantly associated with inadequate as well as problematic level of health literacy respectively. Nearly a quarter of the elderly has adequate level of health literacy. Moreover, the raising age amongst the elderly was significantly associated with inadequate health literacy level.

Keywords Health literacy, Elderly, Thai Health Literacy, problematic health literacy

Social Science Journal

1. Introduction

A large number of elder adults in developed countries have low health literacy (Hochhauser, Brusovansky, Sirotin, & Bronfman, 2019; Kutner, Greenburg, Jin, & Paulsen, 2006; Lor, Koleck, Bakken, Yoon, & Dunn Navarra, 2019; Visscher, Steunenberg, Zwikker, Heerdink, & Rademakers, 2021). Since the last thirty years, health literacy has increased extensive global interest. In addition, Thailand in 2017, elder persons accounts about 11 million, or 16.7%, of the total population and is projected to rise to 32% by 2040 (National Statistical Office, 2018).

Health literacy (HL) was conceptualized as "the cognitive and social skills which determine the motivation and ability of individuals to gain access to understand, and use information in ways that promote and maintain good health"(Liu et al., 2018; Sørensen et al., 2012). However, commonly health literacy is defined as "the degree to which people are able to access, understand, appraise and communicate information to engage with the demands of different health contexts to promote and maintain health across the life course" (Sørensen et al., 2012; Zumbo et al., 2006).

HL has been indicated as producing vigorous effectiveness on improving health practices and health outcomes (Burton et al., 2021). Small amount of Health Literacy is a significant public health concern around the world and including developed countries. In 2003, approximately 80 million adults of USA (36%) were estimated to have limited health literacy (Kutner et al., 2006). In 2015, nearly one out of ten individuals i.e.12% was observed to have inadequate health literacy in Europe (Van Hoa, Giang, Vu, Van Tuyen, & Khue, 2020). In addition, numbers of studies showed that inadequate health literacy has a strong impact on various health outcomes including low utilization rate of preventive measures and emergency services, increase healthcare costs and higher hospitalization rate, health behavior, and health equity (Tian & Xu, 2020). People with low level of health literacy should be more likely to have lower accessing health information, health care, self-preventing and treatments. As the result, the decision to select health care methods would regardless of academic principles (Pitug, Laohasiriwong, Senahad, & Soeung, 2020). Lacking HL has been observed to be related with destructive health outcomes.

Person's ability to acquire health related information can be affected by people aging conditions and it will also be associated with their physical and mental declines. Elder people require some type of training or schooling for sufficiently use healthcare services. So that, they can be able to read and calculate necessaries for them. The ageing people observe less likely to be use internet compared with other adults. Therefore, elderly is at a significantly vulnerable position in relation with their HL capacity (Van Hoa et al., 2020). Therefore, an increase in health literacy of people could enhance their knowledge on consequences of illicit drugs which could then resulted in not using those substances (Oo & Laohasiriwong, 2020). Older adults with low HL levels expressed their difficulty to understand and act upon health information (Bozkurt & Demirci, 2019; Montgomery, Morgan, & Srithanaviboonchai, 2020) resulting in no adherence to medical instructions (Kutner et al., 2006). Inadequate HL skills of older adults caused higher rate no adherence to their medical regimens. Older adults are concerned to improve their HL. So, improving people's health literacy is one of the most fundamental, economic, and effective measures to improve the health level of the entire population. Therefore, the aim of this study is to observe the level of health literacy within the elderly population and the factors associated with having inadequate and problematic level of health literacy. The results of this present study may contribute to visualize the status of health literacy and its associated factors in Thailand which will help the program managers, health experts and the policy makers at national and international levels in planning and taking Res Militaris, vol.13, n°1, Winter-Spring 2023 180 REVUE EUROPEENNE D ETUDES EUROPEAN JOURNAL OF MILITARY STUDI suitable actions.

2. Materials and Methods

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2.1. Ethical consideration

The researcher submitted a proposal to the Department of Health, the Ministry of Public Health, and Thailand's Ethics Committee. Participants were informed of the study's goals, expected outcomes, and the right to leave at any time. Each participant was assured that their information would be kept confidential and that participating posed no risk. In addition, this study has also been approved by Khon Kaen University Centre for Research Ethics in Humans under ethical exemption (HE652126).

2.2. Study Design

This cross-sectional analytical study was used the data set from the National Health Literacy Survey of Thailand (Department of Health, Ministry of Public Health, 2021). Thai citizen aged 60 years and older residing in all 13 zones which consisted of 77 provinces of 4 regions in Thailand were selected as study population.

2.3. Sample Size and Sampling Population

A total of 6477 sample size has been calculated by assuming the power of test using a sample size calculation formula for logistic regression (Hsieh, Bloch, & Larsen, 1998). This study used the stratified three-stage sampling method of which 12 health zones and Bangkok Metropolitan were included in the initial step. Then, 3 provinces had been selected systematic randomly from each zone made the total of 36 provinces. The second step systematic random sampling has been applied to select units proportional to size of provinces. The third step, a systematic random sampling method used to select 15 households from each unit. Then after, a respondent from each household were participate in the study.

2.4. Data Collection

Face to face interview was conducted by using Semi structured questionnaire to assess the health literacy level of the respondents. The questionnaire consisted of 3 part as the following: Part 1 has 5 domains and 42 questions on health literacy. Similarly, part 2 consists of demographic and socioeconomic information including gender, age, marital status, educational level, occupation, literacy, adequacy of income, household commodity, roles in the community, and source of health information. Finally, part 3 includes questions regarding eyeglasses, hearing issues, weight, height, waist circumference, blood pressure, chronic disease, health insurance (8 questions). The questionnaire was adjusted based on the recommendations of 5 experts who were reviewed its content validity. The reliability of the edition was tested using 240 cases with similar characteristics to the samples. The Alpha Coefficient of Cronbach was 0.87.

2.5. Statistical analysis

Statistics analysis was performed by using STATA 10 Texas USA 2007 statistics analysis (Copyright of Khon Kaen University). For the bivariate analysis simple logistic regression was carried out to determine the correlation between one dependent variable and one independent variable with regardless of the impact of the rest of the variables reporting Crude Odds Ratio (Crude OR or OR) and 95% CI. The multivariable analysis was performed using a multilevel logistic regression by including all independent variables into the model by *Res Militaris*, vol.13, n°1, Winter-Spring 2023 181

assigning p-value for entry (Pe) 0.25, p-value for remove (Pr)> Pe, and eliminating variables that do not relate to the model by backward elimination method (Hosmer & Lemeshow, 2000). Finally, we have tested the Goodness of fit and report each variable's with Adjusted OR (OR adj.) and 95% CI at the 0.05 significance level ($\alpha = 0.05$).

3. Results:

3.1. Description of the Study Population

A total of 6477 participants were involved in this study, of which, 3993 (61.65%) were female followed by male with 2,484 (38.35%). The majority of the respondents were with age group between 60-69 years with mean age 69.65 (\pm 7.48). The majority of the study population were married (66.64%) and most of the respondents were with elementary school level of education (77.23%). Similarly, 37.58% of total participants had a problematic health literacy level (51-66%) with 95% CI: 36.40-38.76 and a mean of 75.07 (\pm 21.03). (Table 1)

Table 1.	Bivariate	analysis	between	independent	factors	and	level	of	health	literacy	among
elderly in	n Thailand	(n = 6, 47)	77)								

Characteristics and socio-economic	Number	Percentage
Gender		0
Male	2,484	38.35
Female	3,993	61.65
Age (years)		
60 - 69	3,634	56.10
70 - 79	2,053	31.70
≥ 80	790	12.20
Mean (Standard Deviation)	69.65(±7.48)	
Median(Minimum:Maximum)	68(60, 97)	
Marital status		
Single	371	5.73
Married	4,316	66.64
Windowed/Separated	1,784	27.54
Other	6	0.09
Education		
No formal education	514	7.94
Elementary school	5,002	77.23
Junior school	338	5.22
High school	385	5.94
Vocational certificate	76	1.17
Bachelor's degree or higher	162	2.50
Current Occupation		
Personal Business and Government Officer, Other	1,545	23.85
Laborers, workers (such as general contractors Housekeepers, cleaning workers,	508	26 17
security guards)	590	50.47
Farmer / Gardener	1,972	9.23
Unemployed / Housewife (no income)	2,362	30.45
Reading skills		
Can't read	720	11.12
Not fluent read	2,580	39.83
Fluent read	3,177	49.05
Writing skills		
Can't write	2,903	44.82
Not fluent write	2,931	45.25
Fluent write	643	9.93
Financial status of family (During the past 1 year)		
Adequacy with saving	331	5.11
Adequacy without saving	2,130	32.88
Inadequate	3,044	47.00
Inadequate with debt	972	15.01
Household facilities (more than 1 answer)		
Electricity	6,369	98.33
	6,318	97.55
AM/FM radio	3,472	53.61
Cable TV	4,842	74.76



Characteristics and socio-economic	Number	Percentage
Computers	1,030	15.90
Mobile phones	4,043	62.42
Participated in the community	5 1 2 0	70.17
Not Participated	5,128	79.17
Community leaders (Auch as village headman or subdistrict Headman)	1,549	20.85
President of the club or fund	106	7 72
Members of various clubs	478	34.81
Health Volunteers	435	31.66
Other Volunteers	134	9.75
Religious Leader	78	5.68
Other	276	20.09
Source of Health Information	(00	10.50
Not received at all	680	10.50
1 v AM/FM radio	5,420 1.168	38.37
Books/Newspapers/Journals	515	8 81
LINE	419	7.16
Facebook	314	5.37
Internet	372	6.36
Physician	2,244	38.37
Nurse	1,558	26.64
Pharmacists	328	5.61
Physical therapists	274	4.68
Dentists Health meluntane	2,204	37.68
Family Mombers	5,504 1,652	59.91 28.26
Friend	1,035	20.20
Line audio/broadcast tower	1,102	28.93
Other	32	0.55
Health information acquisition		
Physician	3,389	52.32
Nurse	2,261	34.91
Other Health Personnel	2,311	35.68
Health volunteers	3,882	59.94
Family Members	1,874	28.93
Friend	992 201	15.32
Uner	291	4.49
Municipality	3 1 1 5	48.09
Outside the Municipality	3 362	51 91
Using glasses or contact lenses	0,002	0101
Yes	3,266	50.42
No	3,211	49.58
Hearing problems		
Yes	955	14.74
	5,522	85.26
Body Mass Index (BMI) Observe $(DMI > 25 \log (m^2))$	2 552	20.40
Obesity (BMI ≥ 25 kg/m ²) Overweight (BMI $= 23 \cdot 24.0 \log(m^2)$	2,552	39.40 16 77
Normal (BMI – $18.5-22.9 \text{ kg/m}^2$)	2 230	3/ /3
Underweight (BMI $< 18.5 \text{ kg/m}^2$)	609	9 40
Mean (Standard Deviation)	25.21	(+6.48)
Median(Minimum:Maximum)	23.82 (12	.42, 47.56)
Chronic disease (more than 1 answer)	[×]	· · ·
Never checked	760	11.73
Do not have any chronic disease	1,734	26.78
Having chronic diseases (more than 1 answer)	3,983	61.49
Health insurance	5 051	01.12
Universal health insurance	5,251	81.13
Social Security insurance	143	2.21
State Enterprise Officer	30	0.46
Personal insurance	59	0.40
Community Welfare Fund	25	0.39
Other	328	5.08
Health Literacy Level		•
Inadequate ($\leq 50\%$)	2,423	37.41
Problematic (51 – 66 %)	2,434	37.58
Adequate level (67 – 84%)	1,452	22.42
Excellent (\geq 85 %)	168	2.59
Mean (Standard Deviation)	75.07 (±21.19)
Median(Minimum:Maximum)	75 ((): 100)



3.2. Bivariate Analysis

Table 2.

Gender 72.22 1 1 Fenale 3.993 76.71 1.26 1.12101.42 60 - 69 3.634 69.70 1 1 4 707 79 2033 72.01 1.55 1.4500.188 $< < < < < < < < < < < < < < < < < < > < < < < < < < < < < < < > < < < < < < < < < < < < > < < < < < < < < < < < > < < < < < < > < < < < < < < < < < < < < < < < < < < <$	Factors	n	%	CrudeOR.	95%CI	p-value
Male 2,484 72,22 1 1 1 1 0.001 Age (vers) 3993 67.11 1.26 1.201.42 $<$ 0.001 00 - 60 3,634 69.70 1 1 1 1 0.001 70 79 2.053 72.30 1.35 1.4501.128 $<$ 0.001 Martial status 790 83.3 3.29 2.053.127 1.01 1 1.020.201 $<$ 0.001 Martied 4.316 7.257 1.03 0.8110.130 $<$ 0.001 Windowed/ Separated/ Other 1.790 81.45 1.71 1.320.20 $<$ 0.001 Vocational certificate or higher 238 29.83 1 1 $<$ 0.001 Vocational certificate or higher 238 29.87 1.11 0.91-1.37 $<$ $<$ 0.001 Personal Business and Government officer. Other 1.545 66.60 < $<$ $<$ 0.001 Primer/ Garchear 1.972 76.39 1 1 1.011.09.1-1.37 $<$ $<$ 0.001 Funner/ Anot fluent read 3.300 <td< th=""><th>Gender</th><th></th><th></th><th></th><th></th><th><0.001</th></td<>	Gender					<0.001
Female 3.93 76.71 1.26 1.126 1.42 .0001 60 - 69 3.634 69.70 1 1 $1.450.183$ 707 2033 72.01 1.635 1.4510.183 800 790 8.33 3.29 2.630.41 <0.001 Married 4.316 72.57 1.03 0.811.03 <0.001 Vocational certificate or higher 238 29.83 1 1 1.220.02 Education 723 57.81 3.22 2.350.41 2.3001 <0.001 Vocational certificate or higher 1.54 68.72 18.49 125 w/7.00 <0.001 Vocational correlation 5002 7.82.1 8.44 6.3401123 <0.001 Current Occupation 514 8.72 18.49 125 w/7.00 <0.001 Current Occupation 2.362 80.61 2.081 <0.001 <0.001 Current Occupation 2.362 80.61 2.352 2.960.378 <0.001 Current Occupation 2.362 80.61 3.35 2.960.378	Male	2,484	72.22	1	1	
Age (years) $< < < < < < < < < < < < < < < < < < < $	Female	3,993	76.71	1.26	1.12to1.42	
	Age (years)	2 (24	<0.70	1	1	< 0.001
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	00 - 09	3,034	69.70 70.20	l 165	1 15to 1 99	
	> 80	2,035	79.20 88.35	1.05	1.43101.88 2.62to/ 1/	
Single 371 71.9 1 1 1000000000000000000000000000000000000	<u></u> Marital status	170	00.55	5.27	2.02104.14	<0.001
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Single	371	71.97	1	1	<0.001
Windowed/Separated/Other 1,790 81.45 1.71 1.3202.20 Vocational certificate or higher 238 29.83 1 1 High school 723 57.81 3.22 2.350.41 Elementary school 5.002 78.21 8.44 6.3401123 0.001 Personal Business and Government officer, Other 1,545 66.60 -0.001 Laborers, workers (such as general contractors Housekeepers, cleaning workers, security guards) 1,972 76.62 1.64 1,41-1.90 Unemployed/Housewife (no income) 2,362 80.61 2.08 7.92.41 -0.001 Partner/ Gardener 1,972 76.62 1.64 1,41-1.90 -0.001 Unemployed/Housewife (no income) 2,363 8.561 3.35 2.900.378 -0.001 Plaentty write 3,574 84.78 1 -0.001 -0.001 Adequacy with saving 2,130 62.924 1 -0.001 Adequacy with saving 3,137 67.24 1 1 -0.001 Adequacy with saving 3,14 62.44 1 1 -0.001 <th>Married</th> <td>4,316</td> <td>72.57</td> <td>1.03</td> <td>0.81to1.30</td> <td></td>	Married	4,316	72.57	1.03	0.81to1.30	
Education <0.001 Vocational certificate or higher 23 29.83 1 1 High school 723 57.81 3.22 2.350.41 Elementary school 5.002 78.21 8.44 6.34001123 0.001 Current Occupation 514 88.72 18.49 1252 \$27.30 0.001 Personal Business and Government officer, Other 1.545 66.60 .0001 1 1.41.90 0.91-1.37 Clambers, workers (such as general controstr Housekceepers, claming workers, security guards) 1.972 76.62 1.64 1.41-1.90 0.001 Unemployed/Housewife (no income) 2.362 80.61 2.08 1.92.241 .0.001 Fluently write 2.903 62.93 1 1 .0.001 Can tread/notfluentread 3.100 69.34 1.77 1.970-174 .0.001 Adequacy with saving 2.130 69.34 1 1 .0.001 Adequacy with saving 2.131 6.800.21 1.8100.241 .0.001	Windowed/ Separated/ Other	1,790	81.45	1.71	1.32to2.20	
Vocational certificate or higher 238 29.83 1 1 High school 723 57.81 3.22 2.3504.41 Elementary school 5,002 78.21 8.44 6.3401.123 No formal education 514 88.72 1.8.49 1.252.07.0001 Personal Business and Government officer, Other 1.545 66.60 <0.001 Laborest, workers (such as general contractors Housekeepers, cleaning workers, security guards) 1.972 76.62 1.64 1.41-1.90 Unemployed/Housewife (no income) 2.362 80.61 3.25 2.960.378 <0.001 Primated / not fluent read 3.177 63.96 1 <0.001 Cantread/notfluentread 2.903 62.93 1 1 Cantread/notfluentread 3.04 77.48 8.28 2.190.60 <0.001 Adequacy without saving 3.11 62.24 1 1 <0.001 Inadequate 3.044 77.42 2.08 1.8180.240 <0.001 Mousphold facilities 77.42 2.08	Education					< 0.001
High school 7.23 57.81 5.22 2.360.41 Rementary school 500 78.21 8.44 63401123 No formal education 514 88.72 18.49 63401123 No formal education 514 88.72 18.49 62300123 Personal Business and Government officer, Other 1.545 66.60 <0.001 Labores, workers (such as general contractors Housekeepts, cleaning workers, security guards) 1.972 76.62 1.64 1.41-1.90 Unemployed/Housewife (no income) 2.362 80.61 2.08 1.79-2.41 <0.001 Fluently write 2.903 85.61 3.55 2.960.378 <0.001 Can tread/notfluentread 3.574 84.78 3.28 2.9103.69 <0.001 Adequacy with saving 3.13 62.24 1 1 Adequacy with saving 3.044 77.89 2.13 1.6800.21 <0.001 Adequacy with saving 3.044 77.89 2.13 1.6800.24 <0.001 Adequacy with saving 5.128 79.10	Vocational certificate or higher	238	29.83	1	1	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	High school	723	5/.81	3.22	2.35to4.41	
	No formal education	5,002	18.21	8.44 18.40	0.34011.23 1252 to 27.20	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Current Occupation	514	00.72	10.49	12.52 1027.50	<0.001
	Personal Business and Government officer. Other	1.545	66.60			<0.001
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Laborers, workers (such as general contractors Housekeepers,				0.01.1.05	
Farmer?Gardener1.97276.621.441.41-1.90Unemployed/Housewife (no income)2,36280.612.081.79-2.41Reading skills3.17763.9611Can'tread/not fluent read3,30085.613.352.96to3.78Writing skills2.90362.9311Can'tread/notfluentread3,57484.783.282.91to3.69Financial status of family (During the past 1 year)3162.2411Adequacy without saving1,31069.341.371.07to1.74Inadequate with debt97282.612.882.18to3.80Household facilities0.0012.8477.422.081.8tto2.40Computers0.0014.44777.422.081.8tto2.40Available1.03062.14110.001Present4.04369.28110.001Absent2.43484.472.412.12to2.740.001Participated1.34959.38110.001Never3.09079.511.591.42to1.780.001From Physician3.02677.131.261.13to1.41Never2.59780.091.591.41to1.79Reidence2.59780.091.591.41to1.79Reidence2.55272.2211Not Participatify3.1572.6811Municipality3.1572.681 <th>cleaning workers, security guards)</th> <td>598</td> <td>69.06</td> <td>1.11</td> <td>0.91-1.37</td> <td></td>	cleaning workers, security guards)	598	69.06	1.11	0.91-1.37	
$\begin{array}{l l} \text{Unemployed/Housewife (no income)} \\ \text{Reading skills} \\ \text{Fuent read} \\ \text{Can't read / not fluent read} \\ Can't read / not fluent read / not / not / $	Farmer/ Gardener	1,972	76.62	1.64	1.41-1.90	
Reading skills $\langle 0.001$ Can'tread/ not fluent read $3,177$ 63.96 1 1 Can'tread/ not fluent read $3,300$ 85.61 3.35 $2.9603.78$ $\langle 0.001$ Fluent read $2,903$ 62.93 1 1 $\langle 0.001$ Can'tread/notfluentread $2,933$ 62.24 1 1 $\langle 0.001$ Adequay without saving $2,130$ 69.34 1.37 $1.0710.74$ $\langle 0.001$ Adequay without saving $2,130$ 69.34 1.37 $1.0710.74$ $\langle 0.001$ Inadequate with debt 972 82.61 2.88 $2.180.380$ $\langle 0.001$ Available 1.030 62.14 1 1 $\langle 0.001$ Available 1.030 62.28 1 1 $\langle 0.001$ Participated 1.442 2.08 $1.8102.40$ $\langle 0.001$ Participated 1.442 $2.1202.74$ $\langle 0.001$ Participated 1.4403 69.28 1 1 Not Participated 1.4403 69.28 1	Unemployed/Housewife (no income)	2,362	80.61	2.08	1.79-2.41	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Reading skills	2 177	(2.0)	1	1	< 0.001
	Fluent read	3,1//	63.96 85.61	2 25	1 2 06to 2 78	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Writing skills	3,300	65.01	5.55	2.90105.78	<0.001
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Fluently write	2,903	62.93	1	1	<0.001
Financial status of family (During the past 1 year) 331 62.24 1 1 Adequacy with saving 301 62.24 1 1 Inadequate with dut saving 301 62.24 1 1 Inadequate with dut saving 301 62.24 1 1 Inadequate with dut saving 300 62.14 1 1 Available 1.030 62.14 1 1 1 Unavailable 1.030 62.14 1 1 1 0.001 Mobilephones - - - $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$ $<$	Can'tread/notfluentread	3,574	84.78	3.28	2.91to3.69	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Financial status of family (During the past 1 year)	-)				< 0.001
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Adequacy with saving	331	62.24	1	1	
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	Adequacy without saving	2,130	69.34	1.37	1.07to1.74	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Inadequate	3,044	77.89	2.13	1.68to2.71	
Note that function for the function of the functi	Inadequate with debt	972	82.61	2.88	2.18to3.80	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Computers					<0.001
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Available	1 030	62.14	1	1	<0.001
Mobilephones 4.043 69.28 1 1 Present 4.043 69.28 1 1 Absent $2,434$ 84.47 2.41 $2.1202.74$ Participated in the community $1,349$ 59.38 1 1 Not Participated $1,349$ 59.38 1 1 Not Participated $5,128$ 79.10 2.58 $2.27to2.94$ Health information acquisition $5,128$ 79.10 2.58 $2.27to2.94$ Health information acquisition $5,128$ 79.10 2.58 $2.27to2.94$ Never $3,090$ 79.51 1.59 $1.42to1.78$ <0.001 Never $4,168$ 78.41 1.64 $1.46to1.84$ <0.001 Never $2,597$ 80.09 1.59 $1.41to1.79$ <0.001 Never $3,362$ 77.13 1.26 $1.13to1.41$ $=0.001$ Using glasses or contact lenses <0.001 <0.001 <0.001 <0.001 No $5,522$ 81.47 1.55 <	Unavailable	5.447	77.42	2.08	1.81to2.40	
Present4,04369.2811Absent2,43484.472.112.12to2.74Participated in the community < 0.001 Participated1,34959.3811Not Participated5,12879.102.582.27to2.94Health information acquisition < 0.001 From Physician < 0.001 < 0.001 Never $< 3,090$ 79.511.591.42to1.78From Other Health Personnel < 0.001 < 0.001 < 0.001 Never $< 2,597$ 80.09 1.591.41to1.79Residence $< 2,597$ 80.09 1.591.41to1.79Municipality $3,115$ 72.6811Outside the Municipality $3,362$ 77.131.261.13to1.41Health status < 0.001 < 0.001 No $5,522$ 81.47 1.551.30to1.85No $5,522$ 81.47 1.551.30to1.85 < 0.001 No $5,522$ 72.22 11 < 0.001 No $5,522$ 81.47 1.551.30to1.85 < 0.001 No $5,522$ 81.47 1.551.30to1.85 < 0.001 No $5,522$ 72.52 $1.42to1.78$ < 0.001 No <th>Mobilephones</th> <td>,</td> <td></td> <td></td> <td></td> <td>< 0.001</td>	Mobilephones	,				< 0.001
Absent $2,434$ 84.47 2.41 $2.12 \text{to} 2.74$ Participated $1,349$ 59.38 1 1 Not Participated $5,128$ 79.10 2.58 $2.27 \text{to} 2.94$ Health information acquisition $5,128$ 79.10 2.58 $2.27 \text{to} 2.94$ From Physician $<$ $<$ $<$ $<$ Never $3,090$ 79.51 1.59 $1.42 \text{to} 1.78$ From Other Health Personnel $3,090$ 79.51 1.59 $1.42 \text{to} 1.78$ Never $4,168$ 78.41 1.64 $1.46 \text{to} 1.84$ From health volunteers $2,597$ 80.09 1.59 $1.41 \text{to} 1.79$ Never $2,597$ 80.09 1.59 $1.41 \text{to} 1.79$ Municipality $3,115$ 72.68 1 1 Municipality Health status $3,362$ 77.13 1.26 $1.13 \text{to} 1.41$ Using glasses or contact lenses $<$ $<$ $<$ No $5,522$ 81.47 1.55 $1.30 \text{to} 1.85$ Ody Mass Index (BMI) $5,522$ 81.47 1.55 $1.30 \text{to} 1.85$ Obses $2,552$ 72.22 1 1 Overweight 1.086 74.03 1.09 $0.93 \text{to} 1.28$ Normal $2,230$ 76.55 1.25 $1.10 \text{to} 1.43$ Underweight 609 82.59 1.82 $1.45 \text{to} 2.28$ Obses 760 85.13 2.28 $1.82 \text{to} 2.85$ Ornal underweight 60.98 3.983 <t< th=""><th>Present</th><td>4,043</td><td>69.28</td><td>1</td><td>1</td><td></td></t<>	Present	4,043	69.28	1	1	
Participated in the community < 0.001 Participated1,34959.381Not Participated5,12879.102.582.27to2.94Health information acquisition < 0.001 < 0.001 < 0.001 From Physician < 0.001 < 0.001 < 0.001 Never $< 3,090$ 79.51 1.59 $1.42to1.78$ From Other Health Personnel < 0.001 < 0.001 < 0.001 Never $< 2,597$ 80.09 1.59 $1.41to1.79$ Residence < 0.001 < 0.001 < 0.001 Municipality $3,115$ 72.68 1 1 Outside the Municipality $3,162$ 77.13 1.26 $1.13to1.41$ Health status < 0.001 $< 3,266$ 79.64 1.65 $1.47to1.85$ Hearing problems < 0.001 < 0.001 < 0.001 < 0.001 No $5,522$ 81.47 1.55 $1.30to1.85$ < 0.001 Obese $2,552$ 72.22 1 1 < 0.001 Obese $2,552$ 72.22 1 1 < 0.001 Obese $2,552$ 72.22 1 1 < 0.001 Obese $0.93to1.28$ < 0.001 < 0.001 < 0.001 Obese 0.755 1.25 $1.0to1.43$ < 0.001 Obese 0.755 1.25 $1.0to1.43$ < 0.001 Obese 0.755 1.25 $1.0to1.43$ < 0.001 On on thave any chronic disease 734 7	Absent	2,434	84.47	2.41	2.12to2.74	0.001
Participated1,34939.38111Not Participated5,128 79.10 2.58 $2.27 to 2.94$ Health information acquisitionFrom Physician < 0.001 Never $3,090$ 79.51 1.59 $1.42 to 1.78$ From Other Health Personnel $2,597$ 80.09 1.59 $1.41 to 1.79$ Never $2,597$ 80.09 1.59 $1.41 to 1.79$ Residence $2,597$ 80.09 1.59 $1.41 to 1.79$ Outside the Municipality $3,115$ 72.68 1 1 Outside the Municipality $3,266$ 79.64 1.65 $1.47 to 1.85$ Hearing problems $2,552$ 72.22 1 < 0.001 No $5,522$ 81.47 1.55 $1.30 to 1.85$ Body Mass Index (BMI) $2,552$ 72.22 1 < 0.001 Obese $2,552$ 72.22 1 1 Overweight $1,086$ 74.03 1.09 $0.93 to 1.28$ Normal $2,30$ 76.55 1.25 $1.00 to 1.43$ Underweight 609 82.59 1.82 $1.45 to 2.28$ Chronic disease $3,983$ 74.57 1.6 $102 to 1.32$ Never checked 760 85.13 2.28 $1.82 to 2.85$ Health insurance $5,221$ 7.747 1.92 $1.66 to 2.22$	Participated in the community	1 240	50.20	1	1	<0.001
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Not Participated	1,349	79.50 79.10	258	$2.27 t_0 2.94$	
From Physician <0.001 Never 3,090 79.51 1.59 1.42to1.78 From Other Health Personnel <0.001 <0.001 Never 4,168 78.41 1.64 1.46to1.84 From health volunteers <0.001 <0.001 <0.001 Never 2,597 80.09 1.59 1.41to1.79 Residence <0.001 <0.001 <0.001 Municipality 3,115 72.68 1 1 Outside the Municipality 3,266 79.64 1.65 1.13to1.41 Health status <0.001 <0.001 No 5,522 81.47 1.55 1.30to1.85 Vogt Mass Index (BMI) <0.001 Obese 2,552 72.22 1 1 Overweight 1,086 74.03 1.09 0.93to1.28 Normal 2,230 76.55 1.25 1.10to1.43 Underweight 609 82.59 1.82 1.45to2.28 Onoth have any chronic disease 3,983 74.57	Health information acquisition	5,120	77.10	2.50	2.27102.74	
Never $3,090$ 79.51 1.59 $1.42to1.78$ From Other Health Personnel $4,168$ 78.41 1.64 $1.46to1.84$ Never $2,597$ 80.09 1.59 $1.41to1.79$ Residence $2,597$ 80.09 1.59 $1.41to1.79$ Never $2,597$ 80.09 1.59 $1.41to1.79$ Cutside the Municipality $3,115$ 72.68 1 1 Using glasses or contact lenses <0.001 <0.001 No $3,266$ 79.64 1.65 $1.47to1.85$ No $5,522$ 81.47 1.55 $1.30to1.41$ Health status <0.001 <0.001 <0.001 No $5,522$ 81.47 1.55 $1.30to1.85$ Body Mass Index (BMI) $<2,552$ 72.22 1 0.001 Obese $2,552$ 72.22 1 0.001 Obese $2,552$ 72.52 $1.10to1.43$ <0.001 Outerweight 1.086 74.03 1.09 $0.93to1.28$ Normal $2,230$ 76.55 1.25 $1.10to1.43$ Underweight 609 82.59 1.82 $1.45to2.28$ Chronic disease 760 85.13 2.28 $1.82to2.85$ Normal 2.26 64.36 1 1 Having chronic disease $3,983$ 74.57 1.16 $1.02to1.32$ Never checked 760 85.13 2.28 $8.2to2.85$ Health insurance 6.251 7.47 1.92 $1.66to2$	From Physician					< 0.001
From Other Health Personnel<	Never	3,090	79.51	1.59	1.42to1.78	
Never $4,168$ 78.41 1.64 $1.46to1.84$ From health volunteers $2,597$ 80.09 1.59 $1.41to1.79$ Never $2,597$ 80.09 1.59 $1.41to1.79$ Municipality $3,115$ 72.68 1 1 Outside the Municipality $3,362$ 77.13 1.26 $1.13to1.41$ Health status $3,362$ 77.13 1.26 $1.13to1.41$ Health status $3,266$ 79.64 1.65 $1.47to1.85$ No $3,266$ 79.64 1.65 $1.47to1.85$ Body Mass Index (BMI) <0.001 <0.001 Obese $2,552$ 72.22 1 Overweight $1,086$ 74.03 1.09 Normal $2,230$ 76.55 1.25 Normal $2,230$ 76.55 1.25 Do not have any chronic disease $3,983$ 74.57 1.16 Do not have any chronic disease $3,983$ 74.57 1.16 Having chronic disease $3,983$ 74.57 1.16 $1.02to1.32$ Never checked 760 85.13 2.28 $1.82to2.85$ Health insurance $5,251$ 77.47 1.92 $1.66to2.22$	From Other Health Personnel					< 0.001
From health volunteers < 0.001 Never $2,597$ 80.09 1.59 $1.41to1.79$ Residence < 0.001 < 0.001 Municipality $3,115$ 72.68 1 1 Outside the Municipality $3,362$ 77.13 1.26 $1.13to1.41$ Health status < 0.001 $< 3,266$ 79.64 1.65 $1.47to1.85$ Using glasses or contact lenses < 0.001 < 0.001 < 0.001 No $3,266$ 79.64 1.65 $1.47to1.85$ Hearing problems $< 5,522$ 81.47 1.55 $1.30to1.85$ No $5,522$ 81.47 1.55 $1.30to1.85$ Overweight $1,086$ 74.03 1.09 $0.93to1.28$ Normal $2,230$ 76.55 1.25 $1.10to1.43$ Underweight 609 82.59 1.82 $1.45to2.28$ Chronic disease $3,983$ 74.57 1.16 $1.02to1.32$ Never checked 760 85.13 2.28 $1.82to2.85$ Health insurance $5,251$ 77.47 1.92 $1.66to2.22$	Never	4,168	78.41	1.64	1.46to1.84	0.001
Nevel $2,397$ 80.09 1.39 $1.4101.79$ Residence <0.001 Municipality $3,115$ 72.68 1 1 Outside the Municipality $3,362$ 77.13 1.26 $1.13to1.41$ Health status $3,362$ 77.13 1.26 $1.13to1.41$ Using glasses or contact lenses <0.001 No $3,266$ 79.64 1.65 $1.47to1.85$ Body Mass Index (BMI) $<5,522$ 81.47 1.55 $1.30to1.85$ Obese $2,552$ 72.22 1 1 Overweight $1,086$ 74.03 1.09 $0.93to1.28$ Normal $2,230$ 76.55 1.25 $1.10to1.43$ Underweight 609 82.59 1.82 $1.4502.28$ Chronic disease $3,983$ 74.57 1.16 $1.02to1.32$ Never checked 760 85.13 2.28 $1.82to2.85$ Health insurance $1,226$ 64.36 1 1 Universal health insurance $5,251$ 77.47 1.92 $1.66to2.22$	From health volunteers	2 507	80.00	1.50	1 41to 1 70	<0.001
Numicipality $3,115$ 72.68 1 1 Outside the Municipality $3,362$ 77.13 1.26 $1.13to1.41$ Health status $3,362$ 77.13 1.26 $1.13to1.41$ Using glasses or contact lenses <0.001 No $3,266$ 79.64 1.65 $1.47to1.85$ Hearing problems <0.001 No $5,522$ 81.47 1.55 $1.30to1.85$ Body Mass Index (BMI) <0.001 <0.001 Obese $2,552$ 72.22 1 0 Overweight $1,086$ 74.03 1.09 $0.93to1.28$ Normal $2,230$ 76.55 1.25 $1.10to1.43$ Underweight 609 82.59 1.82 $1.45to2.28$ Obese 77.34 71.51 1 1 Do not have any chronic disease $3,983$ 74.57 1.16 $1.02to1.32$ Never checked 760 85.13 2.28 $1.82to2.85$ Health insurance $1,226$ 64.36 1 1 Other Health Insurances $1,226$ 64.36 1 1 Universal health insurance $5,251$ 77.47 1.92 $1.66to2.22$	Residence	2,397	80.09	1.39	1.41101.79	<0.001
Numerical lenses $3,362$ 77.13 1.26 $1.13to1.41$ Health status $3,362$ 77.13 1.26 $1.13to1.41$ Using glasses or contact lenses $3,266$ 79.64 1.65 $1.47to1.85$ No $3,266$ 79.64 1.65 $1.47to1.85$ Hearing problems $5,522$ 81.47 1.55 $1.30to1.85$ No $5,522$ 81.47 1.55 $1.30to1.85$ Body Mass Index (BMI) $2,552$ 72.22 1 0.001 Obese $2,552$ 72.22 1 1 Overweight $1,086$ 74.03 1.09 $0.93to1.28$ Normal $2,230$ 76.55 1.25 $1.10to1.43$ Underweight 609 82.59 1.82 $1.45to2.28$ Chronic disease $1,734$ 71.51 1 1 Do not have any chronic disease $3,983$ 74.57 1.16 $1.02to1.32$ Never checked 760 85.13 2.28 $1.82to2.85$ Health insurance $1,226$ 64.36 1 1 Other Health Insurances $1,226$ 64.36 1 1 Universal health insurance $5,251$ 77.47 1.92 $1.66to2.22$	Municipality	3.115	72.68	1	1	<0.001
Health status Using glasses or contact lenses<0.001	Outside the Municipality	3,362	77.13	1.26	1.13to1.41	
Using glasses or contact lenses<0.001	Health status	,				
No $3,266$ 79.64 1.65 $1.47 \text{tol}.85$ Hearing problems $5,522$ 81.47 1.55 $1.30 \text{tol}.85$ No $5,522$ 81.47 1.55 $1.30 \text{tol}.85$ Body Mass Index (BMI) $2,552$ 72.22 1 1 Obese $2,552$ 72.22 1 1 Overweight $1,086$ 74.03 1.09 $0.93 \text{tol}.28$ Normal $2,230$ 76.55 1.25 $1.10 \text{tol}.43$ Underweight 609 82.59 1.82 $1.45 \text{tol}.228$ Chronic disease $1,734$ 71.51 1 1 Do not have any chronic disease $3,983$ 74.57 1.16 $1.02 \text{tol}.32$ Never checked 760 85.13 2.28 $1.82 \text{tol}.285$ Health insurance $1,226$ 64.36 1 1 Universal health insurance $5,251$ 77.47 1.92 $1.66 \text{tol}.222$	Using glasses or contact lenses					< 0.001
Hearing problems < 0.001 No $5,522$ 81.47 1.55 $1.30to1.85$ Body Mass Index (BMI) $2,552$ 72.22 1 1 Obese $2,552$ 72.22 1 1 Overweight $1,086$ 74.03 1.09 $0.93to1.28$ Normal $2,230$ 76.55 1.25 $1.10to1.43$ Underweight 609 82.59 1.82 $1.45to2.28$ Chronic disease $1,734$ 71.51 1 1 Do not have any chronic disease $3,983$ 74.57 1.16 $1.02to1.32$ Never checked 760 85.13 2.28 $1.82to2.85$ Health insurance $1,226$ 64.36 1 1 Universal health insurance $5,251$ 77.47 1.92 $1.66to2.22$	No	3,266	79.64	1.65	1.47to1.85	0.001
No 5,322 81.47 1.33 1.3001.83 Body Mass Index (BMI) 2,552 72.22 1 1 Obese 2,552 72.22 1 1 Overweight 1,086 74.03 1.09 0.93to1.28 Normal 2,230 76.55 1.25 1.10to1.43 Underweight 609 82.59 1.82 1.45to2.28 Chronic disease 1,734 71.51 1 1 Having chronic disease 3,983 74.57 1.16 1.02to1.32 Never checked 760 85.13 2.28 1.82to2.85 Health insurance 760 85.13 2.28 1.82to2.85 Other Health Insurances 1,226 64.36 1 1 Universal health insurance 5,251 77.47 1.92 1.66to2.22	Hearing problems	5 500	01 47	1 55	1 2040 1 95	<0.001
Doty Mass findex (DM1) 2,552 72.22 1 1 Obese 2,552 72.22 1 1 Overweight 1,086 74.03 1.09 0.93to1.28 Normal 2,230 76.55 1.25 1.10to1.43 Underweight 609 82.59 1.82 1.45to2.28 Chronic disease 3,983 74.57 1.16 1.02to1.32 Never checked 760 85.13 2.28 1.82to2.85 Health insurance <0.001 Other Health Insurances 1,226 64.36 1 1 Universal health insurance 5,251 77.47 1.92 1.66to2.22	NO Body Mass Index (BMI)	5,522	81.47	1.55	1.50(01.85	<0.001
Overweight 1,086 74.03 1.09 0.93t01.28 Normal 2,230 76.55 1.25 1.10t01.43 Underweight 609 82.59 1.82 1.45to2.28 Chronic disease 1,734 71.51 1 1 Having chronic disease 3,983 74.57 1.16 1.02to1.32 Never checked 760 85.13 2.28 1.82to2.85 Health insurance <0.001 Other Health Insurances 1,226 64.36 1 1 Universal health insurance 5,251 77.47 1.92 1.66to2.22	Obese	2 5 5 2	72 22	1	1	<0.001
Normal 2,230 76.55 1.25 1.10to1.43 Underweight 609 82.59 1.82 1.45to2.28 Chronic disease 1,734 71.51 1 1 Having chronic disease 3,983 74.57 1.16 1.02to1.32 Never checked 760 85.13 2.28 1.82to2.85 Health insurance -0.001 -0.001 -0.001 Other Health Insurances 1,226 64.36 1 1 Universal health insurance 5,251 77.47 1.92 1.66to2.22	Overweight	1.086	74.03	1.09	0.93to1.28	
Underweight 609 82.59 1.82 1.45to2.28 Chronic disease <0.001 Do not have any chronic disease 1,734 71.51 1 1 Having chronic disease 3,983 74.57 1.16 1.02to1.32 Never checked 760 85.13 2.28 1.82to2.85 Health insurance <0.001 Other Health Insurances 1,226 64.36 1 1 Universal health insurance 5,251 77.47 1.92 1.66to2.22	Normal	2,230	76.55	1.25	1.10to1.43	
Chronic disease <0.001 Do not have any chronic disease 1,734 71.51 1 1 Having chronic disease 3,983 74.57 1.16 1.02to1.32 Never checked 760 85.13 2.28 1.82to2.85 Health insurance <0.001 Other Health Insurances 1,226 64.36 1 1 Universal health insurance 5,251 77.47 1.92 1.66to2.22	Underweight	609	82.59	1.82	1.45to2.28	
Do not have any chronic disease 1,734 71.51 1 1 Having chronic disease 3,983 74.57 1.16 1.02to1.32 Never checked 760 85.13 2.28 1.82to2.85 Health insurance Other Health Insurances 1,226 64.36 1 1 Universal health insurance 5,251 77.47 1.92 1.66to2.22	Chronic disease					< 0.001
Having chronic disease 3,983 74.57 1.16 1.02to1.32 Never checked 760 85.13 2.28 1.82to2.85 Health insurance Other Health Insurances 1,226 64.36 1 1 Universal health insurance 5,251 77.47 1.92 1.66to2.22	Do not have any chronic disease	1,734	71.51	1	1 02 1 22	
Never checked 760 85.13 2.28 1.82to2.85 Health insurance <0.001	Having chronic disease	3,983	74.57	1.16	1.02to1.32	
Other Health Insurances1,22664.3611Universal health insurance5,25177.471.921.66to2.22	Never checked Health insurance	/00	85.13	2.28	1.82102.85	<0.001
Universal health insurance 5,251 77.47 1.92 1.66to2.22	Other Health Insurances	1 226	64 36	1	1	<0.001
	Universal health insurance	5,251	77.47	1.92	1.66to2.22	



In our bivariate analysis, female was found to be associated with health literacy with OR 1.26, 95% CI 1.12-1.42, p-value <0.001. Similarly, Widowed /Separated/ Other had significant association it with OR1.71, 95% CI, 1.32 -2.20, p-value <0.001. Respondents age group ≥80 years were also significantly associated with inadequate and problematic health literacy level (OR=3.29, 95% CI, 2.62-4.14, p-value <0.001). Likewise, no formal education was another factor to be significantly associated with level of health literacy (OR=18.49, 95% CI, 12.52-27.30, p-value <0.001), similarly, unemployment was also observed to be associated with inadequate and problematic health literacy with OR 2.08 (95% CI, 1.79-2.41, p-value <0.001). Participants residing outside the municipality were found to be significantly associated health literacy with OR 1.26, (95% CI, 1.13-1.41), whereas, those, not using the glasses or contact lenses were also observed with significant association with health literacy with OR 1.65 (95% CI, 1.47-1.85, p-value <0.001), not having hearing problem had also significant association (OR=1.55, 95% CI, 1.30-1.85, p-value<0.001), underweight body mass index (BMI<18.5kg/m2) was observed with significant association (OR=1.82,95%CI: 1.45 to2.28, p-value <0.001). Likewise, those, who never checked for chronic disease and register with universal health insurance were significantly associated with inadequate to problematic health literacy with OR 2.28 (95% CI, 1.82-2.85, p-value <0.001) and OR 1.92 (95% CI, 1.66-2.22, p-value <0.001) respectively. (Table 2)

Biv Biariate analysis between independent factors and level of health literacy among elderly in Thailand (n = 6,477) Bivariate analysis between independent factors and level of health literacy among elderly in Thailand (n = 6,477)

3.2. Multilevel Analysis

The analysis between independent factors and level of health literacy among elderly in Thailand on the basis of multilevel logistic regression has been described in table 3. According to our findings, the elderly having age group of ≥ 80 years were significantly associated with health literacy with Adj.OR 2.12 ,95% CI:1.64-2.740, pvalue <0.001. Elderly without formal education were also found to be associated with problematic and inadequate level of health literacy (Adj.OR=6.08, 95% CI: 3.80-9.73, pvalue <0.001). Similarly, those who can't read / not fluent read with Adj.OR 1.49 (95% CI, 1.15-1.94, p-value 0.003), can't write / not fluent write with Adj.OR 1.53 (95% CI, 1.18-1.98, p-value 0.001), without cable TV facilities with Adj.OR 1.30 (95% CI, 1.11-1.51, p-value 0.001), without computers with Adj.OR 1.28 (95% CI, 1.08-1.53, p-value 0.004), without mobile phones (Adj.OR 1.45, 95% CI, 1.24-1.69, p-value <0.001), those who did not participate in the community were also found to be significantly associated with low level of health literacy with Adj.OR, 1.87 (95% CI, 1.60-2.18, p-value<0.001). Furthermore, respondents who were never had health information acquisition from physician (Adj.OR=1.52, 95% CI, 1.32-1.74, with p-value <0.001), never from health workers (Adj.OR=1.35, 95% CI,1.17p-value<0.001) never got health information acquisition from health 1.56, volunteers (Adj.OR=1.75, 95% CI, 1.50-2.03, p-value 0.001), likewise, not using glasses or contact lens to see were significantly associated with inadequate as well as problematic level of health literacy with Adj.OR 1.15 (95% CI, 1.01-1.32, p-value 0.035) respectively.

Table	3.	Multilevel	logistic	regression	analysis	between	independent	factors	and	level	of
health	lite	eracy among	g elderly	in Thailand	d (n = 6, 4)	77)					

Factors	Number	%	CrudeOR. Adj.OR.		95%CI	p-value	
Age (years)						< 0.001	
60 - 69	3,634	69.70	1	1			
70 - 79	2,053	79.20	1.65	1.34	1.16-1.56		
≥ 80	790	88.35	3.29	2.12	1.64-2.74		
Education						< 0.001	
Vocational certificate	220	20.82	1	1			
or higher	238	29.03	1	1			
High school	723	57.81	3.22	3.29	2.27-4.77		
Elementary school	5,002	78.21	8.44	5.52	3.89-7.83		
No formal education	514	88.72	18.49	6.08	3.80-9.73		
Reading skills						0.003	
Fluent read	3,177	63.96	1	1			
Can'tread/notfluentread	3,300	85.61	3.35	1.49	1.15-1.94		
Writing skills						0.001	
Fluently write	2,903	62.93	1	1			
Can't read / not	3 574	84 78	3 28	1 53	1 18-1 98		
fluent read	3,374	04.70	5.20	1.55	1.10 1.90		
Household facilities							
Unavailability of Cable	4 842	75 57	1 12	1 30	1 11-1 51	0.001	
TV	1,012	10.01	1.12	1.50	1.11 1.51	0.001	
Unavailability of	5.447	77.42	2.08	1.28	1.08-1.53	0.004	
Computer	0,117		2.00	1.20	100 100	0.001	
Unavailability of	2,434	84 47	2.41	1.45	1.24-1.69	< 0.001	
Mobiles	_,						
Participated in the co	ommunity					< 0.001	
Not Participated	5,128	79.10	2.58	1.87	1.60-2.18		
Health informatio	on acquisitio	on from				< 0.001	
Phys	sician	/					
Never	3,090	79.51	1.59	1.52	1.32-1.74		
Health information a	cquisition f	rom Othe	er			< 0.001	
Health I	Personnel	5 0.44	1 1	1.05			
Never	4,168	78.41	1.64	1.35	1.17-1.56		
nearm mormation acquisition from nearth							
volu	nteers	00.00	1 50	1 75	1 50 0 00		
Never	2,397	80.09	1.59	1.75	1.50-2.03	0.025	
Using glasses o	or contact le	enses	1	1		0.035	
r es	3,211 2,266	70.26 70.64	l 1 <i>65</i>	1	1 01 1 22		
1NO	3,200	/9.64	1.65	1.15	1.01-1.32		

4. Discussion

This present study has been described the circumstantial threads which led by the *Res Militaris*, vol.13, n°1, Winter-Spring 2023 186



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inadequate and problematic level of the health literacy among the elderly people. In this study, female was exceeded than male with the ratio of 1.62:1. However, this study was conducted among the elderly population, majority of respondents from age group 60-69 years and married. More than three quarter of the respondents has inadequate and problematic health literacy and it became the problem for the country to address them an adequate manner. The study from Turkey also revealed the 85.1% elderly population has problematic or inadequate health literacy (Bozkurt & Demirci, 2019). This finding is nearly similar with our study. This might be due to the Thailand will develop a Super Ageing Society by 2050 which means approximately 30% of the population will be elder with age of 65 years and above in 2031 (Nilnate, Hengpraprom, & Hanvoravongchai, 2016). As, an elder has 2.69 times higher association with diseases it is really important for them to enhance health literacy and orient them for the better life.

In our setting, aging among the elderly are likely to be associated with the inadequate and problematic health literacy. So, raising age is one of the challenges to adopt new knowledge. A study conducted in Poland suggested that ageing is one of the main causes of having adequate health literacy. Therefore, elderly was unable to prevent them from any health consequences (Duplaga, 2020). Similarly, respondents those who have no formal education are likely to be associated with the inadequate health literacy. Study from Nigeria suggested that those how were understand English language and have education on the use of medications are less likely to be associated with inadequate level of health literacy (Kuyinu, Femi-Adebayo, Adebayo, Abdurraheem-Salami, & Odusanya, 2020). In addition, the respondents who were unable to read and write had inadequate and problematic health literacy level. So, the consequences of the low level of knowledge on health-related activities is always associated with how the schooling has been taken. The National Assessment of Adult Literacy (NAAL), determined that the educational accomplishment was strongly connected with health literacy (Martin et al., 2009). Study observed that the groups that are more likely to have low level of health literacy include individuals with decreased lower educational attainment, and lower reading/writing ability (Duplaga, 2020).

Moreover, our study also revealed that people having household facilities of Cable TV, computers and mobile phones were less likely to have inadequate and problematic health literacy level. This might to be due to the updated information has been acquired from cable TV, computers through internet and mobiles phones. A study from Pakistan observed that the utilization of rapidly expanding mobile technology and media for dissemination of health information is a viable solution to update the information to the public (Sabzwari, 2017).

Furthermore, our study identifies that the participation in the community activities is also led to enhance the health literacy. Communication alone is not a simple solution to the complex problem of health literacy. Without effective communication, people have limited success in developing health literacy. Therefore, effective Communication with community participation can lead the advance of health literacy (Ratzan, 2001). The current study from Taiwan found that a higher frequency of watching health-related TV programs and more community involvement were both positively associated with higher HL (Lin, 2015).

Never the less, our study also revealed the acquisition of the health information from physician was also associated with improving health literacy level among elderly. In addition, the respondents who were unable to acquire the health information from health workers as well



as any health volunteers were significantly associated with inadequate and problematic health literacy level. Moreover, using glasses or contact lenses by the elderly has significantly decreased health literacy level. Study observed that older patients are particularly affected because their reading and comprehension abilities are influenced by their cognition and their vision and hearing status. Inadequate health literacy can result in difficulty accessing health care, following instructions from a physician, and taking medication properly. Patients with inadequate health literacy are more likely to be hospitalized than patients with adequate skills. Therefore, patients understand medical information better while information provided slowly, simple words are used, and a restricted amount of information is presented (SAFEER & JANN KEENAN). A Turkish study suggested that the health literacy of the patients amplified when the behaviours towards the correct use of contact lenses improved (DAGTEKIN et al., 2022).

As this study design has been focused on the secondary analysis, it is one of the limitations of this study. Disparate primary analysis, the researcher in secondary analysis must accept the method of data collection and the data "as it is". The researcher can't design the study based on the questions to be answered. Similarly, the researcher designs questions based on the data availability. Regardless of this limitation, secondary analysis of the National Health Literacy Survey of Thailand permitted the researcher to use data from a large sample in a laborious national study.

5. Conclusions

This current study revealed that as high as 75% of the elderly has inadequate to problematic level of health literacy. Moreover, the raising age amongst the elderly was significantly associated with inadequate health literacy level. In addition, respondents who do not have formal education, can't read fluently, unable to write fluently, don't have access of cable TV and computers as well as mobile phones were significantly associated with inadequate level of health literacy. Furthermore, eladerly who were not participated in the community activities, never had health information acquisition from physicians, health workers and health volunteers as well as those who were not using glasses or contact lens to see were likely to be associated with problematic to inadequate health literacy level. So, there is need for educational programs to raise the health literacy awareness among elderly was significantly essential. In addition, future longitudinal studies are recommended to better understand the relationship and causal effects of level of HL of the general public as well.

6. Acknowledgements

The authors would like to thank Faculty of Public Health, Khon Kaen University for providing the opportunity to conduct this study. In addition, they would like to thank Department of Health, The Ministry of Public Health, Thailand for their dearest support and cooperation throughout the study period.

REFERENCES

Bozkurt, H., & Demirci, H. (2019). Health literacy among older persons in Turkey. *Aging Res Militaris*, vol.13, n°1, Winter-Spring 2023 188

Male, 22(4), 272-277. doi:10.1177/1090198119831754

10.1080/13685538.2018.1437901

- Burton, E., Toye, C., Slatyer, S., Ferrari Jacinto, A., du Preez, J., Bronson, M., & Hill, K. D. (2021). Testing the reliability of the Health Literacy Questionnaire with carers of older adults receiving hospital care. *Australasian Journal on Ageing*. doi:10.1111/ajag.12897
- DAGTEKIN, G., UNŠĂL, A., PALA, S. C., OCAL, E. E., ARSLANTAS, D., & SIMSEK, T. J. M. M. J. (2022). Contact lens usage and health literacy among Turkish adults. *35*(1), 67-72.
- Duplaga, M. (2020). Determinants and consequences of limited health literacy in polish society. *International journal of environmental research and public health*, 17(2), 642.
- Hochhauser, M., Brusovansky, M., Sirotin, M., & Bronfman, K. (2019). Health literacy in an Israeli elderly population. Isr J Health Policy Res, 8(1), 61. doi:10.1186/s13584-019-0328-2
- Hosmer, D. W., & Lemeshow, S. J. N. Y. (2000). Applied Logistic Regression. John Wiley & Sons. doi:10.1002/9781118548387
- Hsieh, F. Y., Bloch, D. A., & Larsen, M. D. J. S. i. m. (1998). A simple method of sample size calculation for linear and logistic regression. *17*(14), 1623-1634. doi:10.1002/(sici)1097-0258(19980730)17:14<1623::aid-sim871>3.0.co;2-s.
- Kutner, M., Greenburg, E., Jin, Y., & Paulsen, C. (2006). The Health Literacy of America's Adults: Results from the 2003 National Assessment of Adult Literacy. NCES 2006-483. *National Center for Education Statistics*.
- Kuyinu, Y. A., Femi-Adebayo, T. T., Adebayo, B. I., Abdurraheem-Salami, I., & Odusanya, O. O. (2020). Health literacy: Prevalence and determinants in Lagos State, Nigeria. *PLoS One, 15*(8), e0237813. doi:10.1371/journal.pone.0237813
- Lin, I.-F. J. A.-P. J. o. P. H. (2015). Health Literacy in Taiwan: A Population-Based Study. 1, 10.
- Liu, H., Zeng, H., Shen, Y., Zhang, F., Sharma, M., Lai, W., . . . Zhao, Y. (2018). Assessment tools for health literacy among the general population: a systematic review. *International journal of environmental research and public health*, 15(8), 1711.
- Lor, M., Koleck, T. A., Bakken, S., Yoon, S., & Dunn Navarra, A. M. (2019). Association Between Health Literacy and Medication Adherence Among Hispanics with Hypertension. J Racial Ethn Health Disparities, 6(3), 517-524. doi:10.1007/s40615-018-00550-z
- Martin, L. T., Ruder, T., Escarce, J. J., Ghosh-Dastidar, B., Sherman, D., Elliott, M., . . . Culbert, A. J. J. o. g. i. m. (2009). Developing predictive models of health literacy. 24(11), 1211-1216.
- Montgomery, H., Morgan, S., & Srithanaviboonchai, K. (2020). Correlates of Health Literacy among Farmers in Northern Thailand. *17*(19). doi:10.3390/ijerph17197071
- National Statistical Office, N. (2018). Report on the 2017 Survey of the Older Persons in Thailand. In.
- Nilnate, W., Hengpraprom, S., & Hanvoravongchai, P. J. J. o. H. R. (2016). Level of health literacy in Thai elders, Bangkok, Thailand. *30*(5), 315-321.
- Oo, Y. H., & Laohasiriwong, W. (2020). Factors Associated with Limited Level of Health Literacy on Application of Health Information Related to Opioid Use in Kachin State, Myanmar. *Indian Journal of Public Health Research & Development*, 11(3).
- Pitug, W., Laohasiriwong, W., Senahad, N., & Soeung, K. P. (2020). Health Literacy and Dietary Supplement Consumption among Northeasterners of Thailand. *EXECUTIVE EDITOR*, 11(7), 1555.
- Ratzan, S. C. J. H. p. i. (2001). Health literacy: communication for the public good. 16(2), 207-214.
- Sabzwari, S. R. J. J. o. P. M. A. (2017). Health literacy in Pakistan: Exploring new ways of addressing an old challenge. 67(12), 1901.
- SAFEER, R. S., & JANN KEENAN, E. S. Health Literacy: The Gap Between Physicians and Patients.
- Sørensen, K., Van den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., & Brand, H. (2012). Health literacy and public health: a systematic review and integration of definitions and models. *BMC public health*, 12(1), 1-13.
- Tian, C. Y., & Xu, R. H. (2020). Generic Health Literacy Measurements for Adults: A Scoping Review. 17(21). doi:10.1007/s00038-018-01200-1



10.3390/ijerph17217768

- Van Hoa, H., Giang, H. T., Vu, P. T., Van Tuyen, D., & Khue, P. M. (2020). Factors associated with health literacy among the elderly people in Vietnam. *BioMed research international*, 2020.
- Visscher, B. B., Steunenberg, B., Zwikker, H., Heerdink, E. R., & Rademakers, J. (2021). The impact of health literacy on beliefs about medication in a Dutch medication-using population. *European Journal of Clinical Pharmacology*. doi:10.1007/s00228-021-03105-0
- Zumbo, B., Kelly, K., Begoray, D., Kazanjian, A., Mullet, J., & Hayes, M. (2006). The development and validation of measures of "Health Literacy" in different populations. *UBC Institute of Health Promotion Research and UVic Community Health Promotion Research: University of British Columbia.*