

THAI VERSION OF HIV HEALTH LITERACY TEST FOR PEOPLE WITH HIV

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Abstract. Health literacy is an individual's ability to understand medical information and services needed to make appropriate health decisions. A Thai version of a HIV Health Literacy Test (HIV-HLT) for people living with HIV was developed using a 17-item scale from a literature review. Principal components analysis was performed to assess scale construct validity and reliability. The Thai version of HIV-HLT was tested on 400 people with HIV, 18-64 years of age (42 ± 12 years), 31% having graduated with a bachelor's degree. Forty-nine percent of participants were diagnosed with HIV for ≥ 5 years, 87% had CD4 counts >200 cells/cm³ and 86% had a viral load <20 copies/ml. All 17 items reached a high Cronbach's alpha index (0.81) and were subjected to a principal components analysis, revealing nine items appropriate for HIV knowledge subscale and eight for adherence to antiretroviral therapy subscale. Inadequate HIV health literacy was observed among the study participants. The study indicates the Thai version of HIV-HLT was valid and reliable for assessment of health literacy among people with HIV, was simple to be applied in a clinical setting to identify patients with limited health literacy and to develop a care plan appropriate for these patients.

Keywords: Cronbach's alpha index, Thai HIV Health Literacy Test, people with HIV, principal components analysis.

INTRODUCTION

Health literacy is an individual's ability to act and understand health or medical information and services needed to make appropriate decisions (IOM, 2004). Given that The Institute of Medicine (IOM) instrument for health literacy consists of only reading skill, IOM recommended developing

new instruments to assess patients' understanding of health information and health outcomes in various settings and urges literacy experts to develop more accurate instruments for measuring health literacy for specific diseases (Weiss *et al*, 2005). Previous studies assessed health literacy in a specific clinical care context using general health literacy tools (Gong *et al*, 2007; Lee *et al*, 2007); however, these studies mainly evaluated reading skill from a health care context and did not assess patients' ability to understand the information and how to act to achieve the desired health outcomes. An ideal instrument for health literacy should

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accurately identify patients with limited health literacy and be clinically relevant for health literacy screening, able to predict health outcomes and appropriate for use in clinical settings (Gong *et al*, 2007; Lee *et al*, 2007; Richman *et al*, 2007).

Previous studies demonstrated that compared to those with higher literacy skills, individuals with limited health literacy skills are more likely to infrequently or inappropriately access health care services (Scott *et al*, 2002; Sudore *et al*, 2006) and to have difficulty understanding medical instructions (Davis *et al*, 2006; Wolf *et al*, 2006), mental and physical health problems, and less self-management with chronic disease (Baker *et al*, 2007).

As regards HIV, individuals with limited health literacy skills are more likely to have poor management of their health and poor rate of adherence to HIV treatment (Kalichman *et al*, 2005; Kalichman *et al*, 1999; Osborn *et al*, 2007). Tique *et al* (2017) have defined HIV health literacy as the ability to understand medical recommendations, access medical care and execute a medical treatment plan. Evidence of HIV health literacy from USA showed HIV health literacy skill is important for health behavior and as mediator of HIV-related knowledge and outcomes (Kalichman *et al*, 2000; Wolf *et al*, 2004; Wolf *et al*, 2005). Previous studies suggested individuals with HIV health literacy have poor knowledge of HIV disease (Kalichman *et al*, 2000; Wolf *et al*, 2004; Wolf *et al*, 2005), poor ability to correctly manage HIV treatment, low levels of CD4 counts, and a lower likelihood of achieving undetectable viral loads (VL) compared to those with adequate HIV health literacy skills (Waldrop-Valverde *et al*, 2010). Most studies demonstrated limited health literacy is associated

with lower adherence to antiretroviral therapy (ART), lower CD4 and VL levels (Kalichman *et al*, 2000; Kalichman *et al*, 2007). However, other studies failed to find such relationships (Liu *et al*, 2006; Colbert *et al*, 2013). Taken altogether, these findings suggest the importance of health literacy assessment and of using the results to guide HIV management and care plan among people with HIV.

There are about 480,000 (1.1%) Thais living with HIV in 2018 (Avert, 2018). However, no instrument has been used to assess their health literacy. Existing English versions of the HIV Health Literacy Test (Osborn *et al*, 2010) may not be appropriate for use with Thais with HIV given the differences in socioeconomic and clinic contexts. Thus, a Thai-version of a valid and reliable HIV-HLT was developed to measure health literacy levels of Thai people with HIV.

MATERIALS AND METHODS

Study design

This cross-sectional study was conducted at the HIV Clinic, Thammasat University Hospital, Pathumthani, Thailand during October to November 2019 and HIV-infected adult patients were invited to participate.

The study protocol was approved by the Human Research Ethics Committee of the Faculty of Medicine, Thammasat University (approval no. MTU-EC-CF-0-099/62). Prior written consent was obtained from all participants.

Study population

Inclusion criteria for HIV-infected patients were 18-64 years of age and ability to understand, read and write the Thai language. Exclusion criteria were (based on medical records) cognitive impairment,

psychosis disorder, memory impairment, blindness or severely impaired vision not correctable with eyeglasses, deafness or hearing problems uncorrectable with a hearing aid. Self-reported socio-demographic data were recorded (in a private room at the HIV Clinic prior to examination by the attending physician) and clinical data were obtained from medical records.

Assessment scale development

Development of assessment scales was divided into three phases. Phase 1 consisted of a survey of the literature to produce a 27-item Thai version of the HIV-HLT. Phase 2 consisted of an exploratory factor analysis (EFA) to determine the underlying structure of the 27 items, which were classified into two groups, namely, HIV knowledge and adherence to medication. Phase 3 consisted of a confirmatory factor analysis (CFA) to verify the model and measurements.

Statistical analysis

Descriptive statistics were used to analyze patients' characteristics. Principal components (PC) analysis was employed to assess construct validity of the 17-item scale. Corrected item-total correlation index ranges 0-1 and corrected item-total correlation is acceptable at ≥ 0.2 . Cronbach's alpha score (ranging 0-1) was used to determine reliability of derived HIV knowledge and medication adherence, with a score ≥ 0.7 considered to be reliable and indicating items within the same scale measure have the same underlying construct. For factor analysis, factor loading ≥ 0.2 and adjusted goodness of fit index > 0.9 is considered acceptable respectively. All analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 22.0 (IBM Corp, Armonk, NY) and LISREL program

(Scientific Software International Inc, Skokie, IL).

RESULTS

A total of 400 HIV-infected patients participated in the study, mean \pm SD age of 42 ± 12 years, 65% males, 43% single, 31% graduated with a bachelor's degree, and 28% with income $> 25,000$ THB (USD 824) per month (Table 1). Thirty-one percent of the patients had been diagnosed of HIV infection from 1 year to 5 years and 49% for > 5 years, 87% of the participants having a CD4 count > 200 cells/cm³ and 86% a viral load of < 20 copies/ml.

Corrected item-total correlation of the 17-item Thai HIV health literacy questionnaire was > 0.2 , considered acceptable, with a Cronbach's alpha of 0.81 indicating the items were within the same scale measuring the same underlying construct (Table 2). Applying a principal components analysis, the 17 items of the Thai HIV-HLT could be divided into two factors, namely, HIV knowledge (items 1-9) and adherence to ART (items 10-17), with the former having an adjusted goodness of fit index and Cronbach's alpha index of 0.96 and 0.82 respectively and the latter of 0.97 and 0.82 respectively (Table 3).

Evaluation of health literacy among HIV patients showed 51% had inadequate health literacy, but levels of health literacy between male and female patients are not significantly different (Table 4).

DISCUSSION

The study develops and tests a Thai version of HIV-HLT for patients with HIV, consisting of 17 items measuring HIV knowledge and adherence to ART. The instrument was valid and reliable.

Table 1

Demographic profile of HIV-infected participating patients attending the HIV Clinic, Thammasat University Hospital, Pathumthani, Thailand (October to November 2019).

Demographic feature	Number of participants (%) (<i>n</i> = 400)
Gender	
Male	260 (65)
Female	139 (35)
Transgender (female)	1 (<1)
Age (years), mean \pm SD	42 \pm 12
Range	18-64
Sexual Orientation	
Male	157 (39)
Female	232 (58)
Bisexual	11 (3)
Marital status	
Single	173 (43)
Couple	174 (44)
Divorced	53 (13)
Education	
No formal education	8 (2)
Primary school	54 (14)
Junior high school	40 (10)
Senior high school	73 (18)
Diploma degree	40 (10)
Bachelor's degree	125 (31)
Graduate degree	60 (15)
Occupation	
Private	111 (27)
Government service	87 (22)
Military	55 (14)
Employee	49 (12)
Unemployed	40 (10)
State enterprise employee	27 (7)
Student	20 (5)
Agriculturist	11 (3)
Income per month (THB)	
<5,000	44 (11)
5,000-10,000	71 (18)
10,001-15,000	65 (16)
15,001-20,000	107 (27)
20,001-25,000	-
>25,000	113 (28)

Table 1 (Continued)

Demographic feature	Number of participants (%) (n = 400)
Medical scheme	
Civil servant medical benefit scheme	131 (33)
Social security scheme	94 (23)
Private insurance	6 (2)
Universal coverage scheme	59 (15)
Personal	110 (27)
Duration of HIV infection	
<6 months	31 (8)
6 months - 1 year	49 (12)
>1 year - 5 years	123 (31)
>5 years	197 (49)
CD4 count (cell/cm ³)	
<200	50 (13)
200 - 499	173 (43)
500 - 1,500	177 (44)
Viral load (copy/ml)	
<20	344 (86)
>20	46 (12)
No data	10 (2)

THB: Thai Baht; cell/cm³: cell per cubic centimeter; copy/ml: copy per milliliter.

Three levels of HIV health literacy were proposed and about half of the study participants reported inadequate HIV health literacy.

In previous studies, general health literacy instruments measured an individual's ability to act on and understand general health information and medication adherence (Kalichman *et al*, 2000; Kalichman *et al*, 2005; Kalichman *et al*, 1999; Miller *et al*, 2003; Osborn *et al*, 2007; Wolf *et al*, 2007). These existing instruments, such as Newest Vital Sign (Weiss *et al*, 2005), Rapid Estimate Adult Literacy in Medicine (REALM) and Test of Functional Health Literacy in Adults (TOFHLA) (Baker *et al*, 1999) assess patients' general information, such as reading skill or health

vocabulary. The questionnaires are not related to the patients' current diagnosis, such as locating information from various health materials, pronouncing basic health terms or applying general health information for overall self-management (Osborn *et al*, 2010).

On the other hand, the Thai version of HIV-HLT was developed specifically for HIV infection. The instrument had two subscales, similar to Brief Estimate of Health Knowledge and Action (BEHKA)-HIV version, in which the two subscales, namely, HIV knowledge subscale measuring a patient's ability to act and understand HIV information, access health care service, understand laboratory routine concepts, such as VL,

Table 2

Association between HIV health literacy questionnaire and corrected item-total correlation among HIV-infected participants ($n = 400$) attending the HIV Clinic, Thammasat University Hospital, Pathumthani, Thailand (October to November 2019).

Question	Corrected item-total correlation ^a
1. What is CD4?	0.60
2. Is the goal of treatment to make CD4 count go up or down?	0.58
3. What is viral load?	0.62
4. Is the goal of treatment to make viral load go up or down?	0.52
5. If I take my medicine every day, it will decrease opportunistic infection.	0.46
6. If I take my medicine every day, it will decrease drug-resistant virus infection.	0.49
7. If I take my medicine every day, it will decrease HIV transmission.	0.57
8. If I take my medicine every day, it will decrease HIV transmission to partner; however, I must use condom every time I have sexual intercourse.	0.52
9. Antiretroviral drugs can prevent HIV transmission from mother to child.	0.30
10. I do not take my medicine when I feel sad.	0.35
11. I do not take my medicine when I feel good.	0.20
12. I do not take my medicine because it causes weakness.	0.34
13. I do not take my medicine because it causes allergy.	0.36
14. I do not take my medicines because it causes nausea and vomiting.	0.35
15. Doctor does not know I have stopped taking my medicine when I am too tired.	0.38
16. I do not take my medicine when I am drinking alcohol.	0.24
17. I do not take my medicines when I am taking food supplement or vitamins.	0.34

^aMean = 0.21; Cronbach's alpha index = 0.81.

CD4 or CD4 T-lymphocyte cell count, and a subscale measuring application of the information for health decision making (Osborn *et al*, 2010). Most studies demonstrated subscales on HIV knowledge and medication adherence are important and have a high potential for clinical application (Kalichman *et al*, 2000; Wolf *et al*, 2004; Wolf *et al*, 2005; Osborn *et al*, 2010; Tique *et al*, 2017).

Assessment of health literacy among HIV patients using the Thai version of HIV-HLT demonstrated 51% had inadequate

health literacy, women higher inadequate health literacy than men but the level of health literacy is not significant between the two genders. In a study by Waldrop-Valverde *et al* (2009) on health literacy, health numeracy and HIV medication management among participants visiting medical centers in southeastern USA, using reading comprehension to measure health literacy, Woodcock Johnson-III Tests of Achievement, a mathematical test allowing participants to read aloud to determine appropriate calculation, to measure health

Table 3

Principal components analysis of items in the Thai version of HIV-health literacy test given to HIV-infected participants ($n = 400$) attending the HIV Clinic, Thammasat University Hospital, Pathumthani, Thailand (October to November 2019).

Question	Factor loading	Adjusted goodness of fit index	Cronbach's alpha index
1. What is CD4?	0.83	0.96	0.82
2. Is the goal of treatment to make the CD4 count go up or down?	0.73		
3. What is viral load?	0.78		
4. Is the goal of treatment to make the viral load go up or down?	0.61		
5. If I take my medicine every day, it will decrease opportunistic infection.	0.45		
6. If I take my medicine every day, it will decrease drug-resistant virus infection.	0.36		
7. If I take my medicine every day, it will decrease HIV transmission.	0.51		
8. If I take my medicine every day, it will decrease HIV transmission to partner; however, I must use condom every time I have sexual intercourse.	0.51		
9. Antiretroviral drugs can prevent HIV transmission from mother to child.	0.45		
10. I do not take my medicine when I feel sad.	0.65	0.97	0.82
11. I do not take my medicine when I feel good.	0.51		
12. I do not take my medicines because it causes weakness.	0.68		
13. I do not take my medicine because it causes allergy.	0.71		
14. I do not take my medicine because it causes nausea and vomiting.	0.80		
15. Doctor do not know I have been stopped taking my medicine when I am too tired.	0.73		
16. I do not take my medicine when I am drinking alcohol.	0.67		
17. I do not take my medicine when I am taking food supplement or vitamins.	0.82		

numeracy, the results showed no major disparity between men and women in health literacy, men have notably higher

scores than women in numeracy test and men perform better in understanding HIV medication information.

Table 4
Evaluation of health literacy among HIV-infected participants using the Thai version of HIV-health literacy test.

Level of health literacy	Number of males (%) (n = 261)	Number of females (%) (n = 139)	Total number (%) (n = 400)
16-17 (adequate)	66 (25)	46 (33)	112 (28)*
14-15 (marginal)	56 (21)	28 (20)	84 (21)*
≤13 (inadequate)	139 (54)	65 (47)	204 (51)*

*p-value = 0.45 using chi-square test.

The Thai version of HIV-HLT had two limitations. Firstly, medication adherence was assessed using self-reporting, and without direct methods, such as a random pill, drug level or pharmacokinetic laboratory assessment, patients may under-report missed doses (Osborn *et al*, 2010). And secondly, participants were recruited from only one clinical setting and the findings may have limited ability to generalize to other settings.

In summary, the Thai version of HIV-HLT developed with 17 items is valid, reliable and specific to HIV infection. Three levels of HIV health literacy were proposed, namely, adequate, marginal and inadequate. The instrument should have applicability in a clinical setting in identifying patients with limited HIV health literacy.

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REFERENCES

Avert. Global information and education on HIV and AIDS. HIV and AIDS in

Thailand 2018 [cited 2020 Mar 3]. Available from: URL: <https://www.avert.org/professionals/hiv-around-world/asia-pacific/thailand>

Baker DW, Williams MV, Parker RM, Gazmararian JA, Nurss J. Development of a brief test to measure functional health literacy. *Patient Educ Couns* 1999; 38: 33-42.

Baker DW, Wolf MS, Feinglass J, Thompson JA, Gazmararian JA, Huang J. Health literacy and mortality among elderly persons. *Arch Intern Med* 2007; 167: 1503-9.

Colbert AM, Sereika SM, Erlen JA. Functional health literacy, medication-taking self-efficacy and adherence to antiretroviral therapy. *J Adv Nurs* 2013; 69: 295-304.

Davis TC, Wolf MS, Bass PF 3rd, *et al*. Low literacy impairs comprehension of prescription drug warning labels. *J Gen Intern Med* 2006; 21: 847-51.

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.

Institute of Medicine (IOM). Health literacy: a prescription to end confusion, 2004 . Washington DC: National Academies Press; 2004 [cited 2020 Mar 3]. Available from: URL: <https://doi.org/10.17226/10883>

Kalichman SC, Amaral CM, Stearns H, *et al*. Adherence to antiretroviral therapy assessed by unannounced pill counts conducted by telephone. *J Gen Intern Med*

- 2007; 22: 1003-6.
- Kalichman SC, Benotsch E, Suarez T, Catz S, Miller J, Rompa D. Health literacy and health-related knowledge among persons living with HIV/AIDS. *Am J Prev Med* 2000; 18: 325-31.
- Kalichman SC, Cherry J, Cain D. Nurse-delivered antiretroviral treatment adherence intervention for people with low literacy skills and living with HIV/AIDS. *J Assoc Nurses AIDS Care* 2005; 16: 3-15.
- Kalichman SC, Ramachandran B, Catz S. Adherence to combination antiretroviral therapies in HIV patients of low health literacy. *J Gen Intern Med* 1999; 14: 267-73.
- 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.
- Liu H, Miller LG, Hays RD, et al. A comprehensive evaluation of survey questions for adherence to antiretroviral medications and exploratory analyses for identifying optimal sets of survey questions. *AIDS Patient Care STDS* 2006; 20: 760-72.
- Miller LG, Liu H, Hays RD, et al. Knowledge of antiretroviral regimen dosing and adherence: a longitudinal study. *Clin Infect Dis* 2003; 36: 514-8.
- Osborn CY, Davis TC, Bailey SC, Wolf MS. Health literacy in the context of HIV treatment: introducing the Brief Estimate of Health Knowledge and Action (BEHKA)-HIV version. *AIDS Behav* 2010; 14: 181-8.
- Osborn CY, Paasche-Orlow MK, Davis TC, Wolf MS. literacy: an overlooked factor in understanding HIV health disparities. *Am J Prev Med* 2007; 33: 374-8.
- 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.
- Scott TL, Gazmararian JA, Williams MV, Baker DW. Health literacy and preventive health care use among medicare enrollees in a managed care organization. *Med Care* 2002; 40: 395-404.
- Sudore RL, Mehta KM, Simonsick EM, et al. Limited literacy in older people and disparities in health and healthcare access. *J Am Geriatr Soc* 2006; 54: 770-6.
- Tique JA, Howard LM, Gaveta S, et al. Measuring health literacy among adults with HIV infection in mozambique: development and validation of the HIV literacy test. *AIDS Behav* 2017; 21: 822-32.
- Waldrop-Valverde D, Jones DL, Jayaweera D, Gonzalez P, Romero J, Ownby RL. Gender differences in medication management capacity in HIV infection: the role of health literacy and numeracy. *AIDS Behav* 2009; 13: 46-52.
- Waldrop-Valverde D, Osborn CY, Rodriguez A, Rothman RL, Kumar M, Jones DL. Numeracy skills explain racial differences in HIV medication management. *AIDS Behav* 2010; 14: 799-806.
- Weiss BD, Mays MZ, Martz W, et al. Quick assessment of literacy in primary care: the newest vital sign. *Ann Fam Med* 2005; 3: 514-22.
- Wolf MS, Davis TC, Arozullah A, et al. Relation between literacy and HIV treatment knowledge among patients on HAART regimens. *AIDS Care* 2005; 17: 863-73.
- Wolf MS, Davis TC, Cross JT, Marin E, Green K, Bennett CL. Health literacy and patient knowledge in a southern US HIV clinic. *Int J STD AIDS* 2004; 15: 747-52.
- Wolf MS, Davis TC, Osborn CY, Skripkauskas S, Bennett CL, Makoul G. Literacy, self-efficacy, and HIV medication adherence. *Patient Educ Couns* 2007; 65: 253-60.
- Wolf MS, Davis TC, Tilson HH, Bass PF 3rd, Parker RM. Misunderstanding of prescription drug warning labels among patients with low literacy. *Am J Health Syst Pharm* 2006; 63: 1048-55.