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Health Literacy and Antibiotic Use Behavior Among Working Age People in Muak Lek District, Saraburi Province

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Abstract

This cross-sectional study investigated the levels of health literacy, antibiotic use behavior, and their relationships among working age people in Muak Lek Sub-district, Muak Lek District, Saraburi Province. The research instrument was a self-administered health literacy and antibiotic use behavior questionnaire that was completed by 352 respondents. Cronbach's alpha coefficient test produced reliability scores for these two question groups of .98 and .92 respectively. Data were analyzed using descriptive statistics and Pearson's correlation coefficient. The study's results revealed widespread usage of antibiotics by working age people, most of whom had moderate levels of health literacy. Health literacy was positively, but weakly, related to proper antibiotic use behavior at the .001 level of statistical significance ($r = .268$, $p < .001$). Working age people with low levels of health literacy were found to misuse antibiotics; however, rational use of such medications is important since incorrect use of drugs may have negative effects on health. This study provides data about antibiotic usage patterns to support public health professionals and relevant agencies in developing future preventive strategies.

Keywords: *Health literacy, antibiotics use behavior, working age*

Introduction

Health Literacy refers to intellectual and social skills that enable individuals to access health information, to understand how to analyze, evaluate and manage themselves, and to be able to provide health advice to individuals, families and communities (Wattanakul et al., 2020). According to Nutbeam's theory (2008), health literacy consists of six dimensions:

(a) access to health information and health services skills (Access);
(b) knowledge and understanding (Cognitive Skills);
(c) health information communication skills (Communication Skills);
(d) decision-making skills;
(e) self-management skills; and
(f) media literacy skills.

Health literacy encourages individuals to maintain good health, adopt desirable behaviors for taking care of their own health, and help support health operations (Sørensen et al., 2012). It focuses on learning the benefits of information and technology so that they can care for their own health correctly. The 2022 Social Situation Report for Saraburi Province found that the population aged 26–59 years was the largest group, accounting for 50.31% of the total population (Ministry of Social Development and Human Security, Saraburi, 2022). This group is at higher risk of using drugs for self-treatment than other groups. A lack of health literacy may result in undesirable antibiotic use behavior, resulting in more severe illnesses or drug resistance (Papka & Laohasiriwong, 2018).

Antibiotics are drugs that inhibit the growth of microbes such as bacteria or kill them through various biochemical processes, such as inhibiting the synthesis of bacterial proteins, inhibiting the formation of cell walls, interfering with the function of cell membranes, or inhibiting the synthesis of genetic material within bacteria (Khoka & Jitjamnong, 2021). The discovery of antibiotics in 1928 was a great achievement for mankind because it helped save millions of lives from bacterial infections.

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Since humans learned to treat diseases using antibiotics, the survival rate of patients with bacterial infections has markedly increased (American Chemical Society, 1999).

Antibiotics are continuously being developed, improved, and produced to better treat various illnesses and respond to new diseases. However, bacteria have adapted to survive, resulting in antibiotic resistance (Khoka, 2020). Antibiotics that were effective in the past have become ineffective, or their effectiveness has been reduced. The development of drug resistance in bacteria is due to the irrational and excessive use of antibiotics, such as using drugs without proper indication, without evidence supporting their efficacy, where the risk of harm outweighs the benefits, or without considering their cost-effectiveness and affordability. Other factors that may lead to this problem include lacking awareness of the problem of drug resistance, skipping steps when using drugs, or using the wrong dose, the wrong method, the wrong frequency, or the wrong duration when taking antibiotics (Chongtrakul, 2015). Antibiotic resistance in bacteria is occurring faster than new antibiotics can be produced, making it an important global public health problem (Hutchings et al., 2019).

The impact of antibiotic resistance worldwide shows that approximately 700,000 people die from drug-resistant infections per year. If this problem is not resolved quickly, the death toll from drug resistance is projected to rise to 10 million by 2050 (Department of Health, 2023). In Thailand, a preliminary study found that approximately 88,000 people are infected with drug-resistant bacteria per year, with approximately 38,000 deaths per year resulting in annual economic losses of up to 40 billion Baht (Department of Health, n.d.). The problem of irrational antibiotic use is found at all levels of Thai health care facilities, with 25%–91% of cases involving the use of antibiotics for diseases not caused by bacteria (Thai Health, 2017). For example, private hospitals prescribe antibiotics for upper respiratory tract infections for children and general patients more often than government hospitals. Data from the National Health Security Office indicate that in treating upper respiratory tract infections, only 3% of about 900 hospitals prescribed antibiotics appropriately, and not exceeding standard dosages (Ministry of Public Health and Ministry of Agriculture and Cooperatives, 2017).

A survey assessing knowledge about antibiotics and usage behavior among 27,762 Thai people aged 15 years and above revealed that 7.9% of respondents aged 15 years or over had used antibiotics, with 70.3% of those antibiotics being obtained from hospitals, 26.7% from pharmacies, and 3.0% from other sources (Chanvatik et al., 2019). It was found that Thai people's knowledge about antibiotics was low. The most common misunderstanding was that antibiotics could treat diseases caused by viruses, and only 17.8% had received advice about the appropriate use of antibiotics (Yana & Chaisombut, 2021).

A survey by the Center for Monitoring and Development of Pharmaceutical Systems on antibiotic use behavior among 1,855 respondents was conducted in 2018 (Center for Drug Monitoring and Development, 2021). The findings indicated that behaviors contributing to antibiotic resistance included self-purchased antibiotics, self-purchasing antibiotics prescribed by healthcare professionals after using up the initial prescription, stopping antibiotic use when symptoms improved without completing the prescribed course, and mimicking the antibiotic use of others. These factors have been found to be significant causes of antibiotic resistance (Phengsuphap & Saeng-Angsumali, 2018).

Currently, only a limited number of research studies in Thailand have addressed antibiotic use and health impacts resulting from antibiotic resistance. Therefore, the present researchers were interested in studying health and antibiotic literacy among working age people in Muak Lek District, Saraburi Province. This study aimed to investigate antibiotic usage behavior and assess the impacts of antibiotic resistance. Such research could contribute data for use by public health professionals and relevant agencies in planning and implementing future preventive strategies against antibiotic resistance.

Research Objectives

1. To study health literacy among working age people in Muak Lek Sub-district, Muak Lek District, Saraburi Province.

2. To study the antibiotic use behavior among working age people in Muak Lek Sub-district, Muak Lek District, Saraburi Province.

3. To study the relationship between health literacy and antibiotic use behavior among working age people in Muak Lek Sub-district, Muak Lek District, Saraburi Province.

Research Hypothesis

A high level of health literacy is associated with proper antibiotic use behavior among working age people in Muak Lek Sub-district, Muak Lek District, Saraburi Province.

Definition of Terms

1. *Health literacy* refers to intellectual and social skills that guide the motivation and ability of individuals to access, understand, and use information in a way that promotes and maintains their own health on an ongoing basis, according to Nutbeam's (2000) six dimensions.

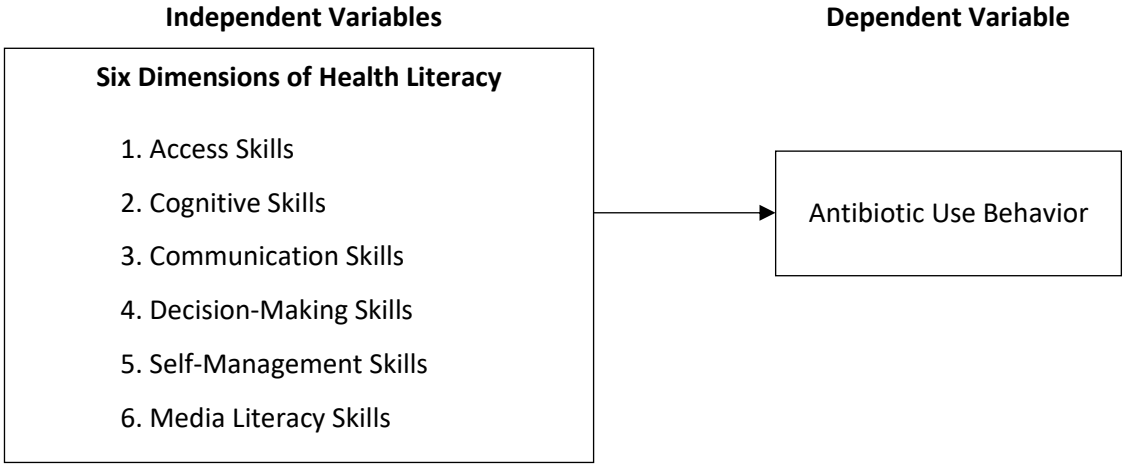
2. *Correct antibiotic use behavior* refers to the appropriate use of antibiotics under the advice and supervision of a doctor or public health official according to the 5R principles: the right person, the right disease, the right amount, the right method, and the right time.

3. *Working age* refers to the population of residents aged between 15 and 59 years who live in Muak Lek Sub-district, Muak Lek District, Saraburi Province.

Research Conceptual Framework

An analytical cross-sectional approach was adopted in this study. The researchers applied Nutbeam's (2000) health literacy framework, consisting of six aspects, as a conceptual framework to study health literacy and antibiotic use behavior among working-age people in Muak Lek Sub-district, Muak Lek District, Saraburi Province, as illustrated in Figure 1.

Figure 1 *Conceptual Framework of the Research*



Population and Sample

The population used in this research was working age people aged 15–59 years who lived in Muak Lek Sub-district, Muak Lek District, Saraburi Province, totaling 4,164 people.

The sample chosen consisted of 352 working-age people aged 15–59 years in Muak Lek Sub-district, Muak Lek District, Saraburi Province. The sample size was calculated using the ready-made table of Krejcie and Morgan (1970), and a Multi-Stage sampling method was used as follows:

1. Proportional stratified sampling was used, consisting of three sub-district health promotion hospitals: Hin Lap Sub-district Health Promotion Hospital, Lang Khao Sub-district Health Promotion Hospital, and Sao Noi Sub-district Health Promotion Hospital, which served populations of 1,128, 901, and 2,135 individuals, respectively.

2. Convenience sampling was used for each of these groups. The number of samples in the areas served by the three health promoting hospitals in Hin Lap Subdistrict, Lang Khao Subdistrict, and Sao Noi Subdistrict totaled 96, 76, and 180 people, respectively.

The number of samples collected from the subdistrict health promotion hospitals in Muak Lek Sub-district, Muak Lek District, Saraburi Province is presented in Table 1.

Table 1 *Working age Population and Samples Size Classified by Locations* (N = 4,164, n = 352)

Level	District	Institution	Population	Sample Size
1		Hin Lap Subdistrict Health Promoting Hospital	1,128	96
2	Muak Lek	Lang Khao Subdistrict Health Promoting Hospital	901	76
3		Sao Noi Subdistrict Health Promoting Hospital	2,135	180
		Total	**4,164**	**352**

The inclusion criteria characteristics for the sample in this research study were as follows:

1. People aged 15–59 years who had lived in the area for at least 6 months.
2. People who had experience using antibiotics.
3. People who were mentally alert, could communicate in Thai, and were willing to participate in the research study.

Research Instrument

A self-developed research instrument was used, and it was pilot tested on a sample of 30 individuals. This self-administered questionnaire assessed health literacy and antibiotic use behavior among working age individuals in Muak Lek Sub-district, Muak Lek District, Saraburi Province. The questionnaire consisted of three sections as follows:

Part 1: Personal information, consisting of nine multiple-choice questions, including gender, age, marital status, education level, occupation, experience of using antibiotics in the past 6 months, history of drug allergy, number of times receiving advice on antibiotic use, and the sources used for seeking knowledge.

Part 2: Health literacy questions, consisting of 35 items, were developed by the researchers by applying Nutbeam's health literacy concepts (2000) and concepts from the literature review. The six dimensions included: (a) access skills: 5 items, (b) cognitive skills: 6 items, (c) communication skills: 6 items, (d) decision-making skills: 6 items, (e) self-management skills: 6 items, and (f) media literacy skills: 6 items. The questionnaire items utilized a 5-level Likert scale as follows: 5 = *the most*, 4 = *a lot*, 3 = *moderate*, 2 = *a little*, and 1 = *the least*.

Results Interpretation: Overall health literacy was divided into three levels according to Bloom's (1968) criteria as follows:

1. A score range of 140–175 points meant High Health Literacy.
2. A score range of 105–139 points meant Moderate Health Literacy.
3. A score range of ≤ 104 points meant Low Health Literacy.

Interpretation of each item: Health literacy had six dimensions: Dimension 1 had 5 items, and Dimensions 2–6 had 6 items each. The scores for each dimension were divided into three levels according to Bloom's (1968) criteria as follows:

For Dimension 1:

- A score range of 20–25 points meant High Health Literacy.
- A score range of 15–19 points meant Moderate Health Literacy.
- A score range of ≤ 16 points meant Low Health Literacy.

For Dimensions 2-6:

- A score range of 24–30 points meant High Health Literacy.
- A score range of 18–23 points meant Moderate Health Literacy.
- A score range of ≤ 17 points indicated Low Health Literacy.

Part 3: Antibiotic use behavior questions: The researchers developed 15 items based on the literature review. The questions were answered using a 4-level Likert scale as follows: 4 = *always*, 3 = *often*, 2 = *rarely*, and 1 = *never*.

Interpretation: The antibiotic use behavior level was divided into 3 levels according to the criteria of Bloom (1971) as follows:

- A score range of 48–60 points meant Good Antibiotic Use Behavior.
- A score range of 36–47 points meant Moderate Antibiotic Use Behavior.
- A score range of ≤ 35 points meant Poor Antibiotic Use Behavior.

Validity of the Instrument

The content validity was checked by three experts. The item-objective congruence (IOC) index needed to be between .60 and 1.00. The reliability was tested with 30 respondents having similar characteristics. The Cronbach's Alpha Coefficient was calculated; a score of .98 was obtained for the health literacy questions, and .92 for the antibiotic use behavior questions.

Respondent Protection and Data Collection Procedure

This research study was approved by the Human Research Ethics Review Committee of Asia-Pacific International University, number AIU.RO. 08/2022. Data was collected using a convenience sampling method, with village health volunteers (VHVs) serving as data collectors. The researchers provided explanations and instructions regarding the questionnaire to ensure understanding. Subsequently, the VHVs collected data from the participants, who signed informed consent forms as part of the research process. Participants retained the right to withdraw from the study at any time with no negative consequences, and all collected data were kept confidential, with the source of the information anonymized. The findings are presented in aggregate form only, and utilized solely for educational and research purposes.

Research Results

The demographic profile of respondents in this study was recorded in nine main sections: gender, age, marital status, educational level, occupation, experiences in using antibiotics in the past 6 months, history of drug allergy, number of times receiving advice on antibiotic use, sources for and knowledge seeking. Frequency and percentage results are shown below in Table 2.

Table 2 *Demographic Profile of Respondents: Muak Lek Sub-district, Muak Lek District, Saraburi Province* (n = 352)

Personal Information	Number	Percentage
1. Gender		
Male	127	36.1
Female	225	63.9
2. Age (Years) ($\bar{x}$ = 39.6, *SD* = 12.9, Min = 15, Max = 67)		
15 – 28 years old	94	26.7
29 – 41 years old	86	24.4
42 – 54 years old	126	35.8
55 – 67 years old	46	13.1
3. Marital Status		
Single	121	34.4
Married	192	54.5
Widowed	22	6.3
Divorced	6	1.7
Separated	11	3.1
4. Educational Level		
Never been in school	11	3.1
Primary education	102	29.0
Secondary education	123	34.9
Vocational Certificate, Higher Vocational Certificate	74	21.0
Bachelor's degree	40	11.4
Higher than a Bachelor's degree	2	0.6
5. Occupation		
No occupation	62	17.6
Farmers	39	11.1
Trade/Personal business	78	22.2
Employee	155	44.0
Government service/state enterprise	18	5.1
6. Experience in using Antibiotics in the Past 6 Months		
1–2 times	233	66.2
3–4 times	86	24.4
5 times or more	33	9.4
7. History of Drug Allergy		
No allergy	323	91.8
Have had an allergy	29	8.2
8. Number of Times Receiving Advice on Antibiotic Use		
Never	58	16.5
1–2 times	171	48.6
3–4 times	75	21.3
5 times or more	48	13.6
7. Sources Used for Seeking Knowledge		
Line, Facebook, YouTube, etc.	249	70.7
Telephone	58	16.5
Radio	9	2.6
Newspapers/brochures/advertising sheets	36	10.2

The personal data indicated that a majority of respondents were female (63.9%), aged between 42–54 years (35.8%), married (54.5%), had obtained a secondary education (34.9%), were employed (44.0%), had used antibiotics within the past 6 months (66.2%), were not allergic to drugs (91.8%), had received advice on using antibiotics 1–2 times (48.6%), and sought knowledge about antibiotics through online media such as LINE, Facebook, YouTube, etc. (70.7%).

The levels of health literacy across all six domains are presented, including the means, standard deviations, and interpretation of health literacy levels for each item, and as an overall assessment; please see these findings in Table 3.

Table 3 *Health Literacy Levels Among Working Age Respondents* (n = 352)

Health Literacy	Mean	Standard Deviation	Health Literacy Level
Dimension 1 Access Skills	19.15	3.32	Moderate level
Dimension 2 Cognitive Skills	22.74	3.90	Moderate level
Dimension 3 Communication Skill	21.86	3.91	Moderate level
Dimension 4 Decision-Making Skills	22.47	3.72	Moderate level
Dimension 5 Self–Management Skills	22.56	3.79	Moderate level
Dimension 6 Media Literacy Skills	21.16	3.98	Moderate level
Overall Health Literacy	129.99	18.77	Moderate level

The overall level of health literacy was found to be at a moderate level (Mean = 129.99, *SD* = 18.77). When considering health literacy by individual dimension, it was found that the level of health literacy for each dimension was at a moderate level.

The level of proper antibiotic use behavior and interpretation of results are shown in Table 4.

Table 4 *Proper Antibiotic Usage Behavior of Respondents* (n = 352)

Behavior	Mean	Standard Deviation (*SD*)	Antibiotic Use Behavior Level
Correct Antibiotic Use Behavior	38.87	7.69	Moderate level

The study's findings showed that the level of proper antibiotic use behavior among working-age people in Muak Lek Sub-district, Muak Lek District, Saraburi Province was at a moderate level (Mean = 38.87, *SD* = 7.69).

The correlation results between health literacy and antibiotic use behavior are shown in Table 5.

Table 5 *Relationship between Overall Health Literacy and Proper Antibiotic Use Behavior* (n = 352)

Overall Health Literacy	Appropriate Antibiotic Use Behavior		
	r	*p*-value	Relationship Level
Overall Health Literacy	.268	< .001*	Weak relationship

Note. Weak = .00 to .30; Moderate = .31 to .70; Strong ≤ .71.

The study's results showed that health literacy had a positive but weak relationship with appropriate antibiotic use behavior (*r* = .268), which was statistically significant at the .001 level.

The relationship between health literacy and antibiotic use behavior is shown in Table 6.

Table 6 *Relationship between Health Literacy and Proper Antibiotic Use Behavior by Dimension* (n = 352)

Health Literacy	Appropriate Antibiotic Use Behavior		
	r	*p*-value	Relationship Level
Dimension 1 Access Skills	.086	.107	-
Dimension 2 Cognitive Skills	.213	< .001*	Weak relationship
Dimension 3 Communication Skills	.234	< .001*	Weak relationship
Dimension 4 Decision-Making Skills	.183	.001*	Weak relationship
Dimension 5 Self–Management Skills	.245	< .001*	Weak relationship
Dimension 6 Media Literacy Skills	.347	< .001*	Moderate relationship

Note. Weak = .00 to .30; Moderate = .31 to .70; Strong ≤ .71.

The relationships between health literacy and appropriate antibiotic use behavior of working age people in Muak Lek Sub-district, Muak Lek District, Saraburi Province by dimension showed that Cognitive Skills, Communication Skills, and Self-Management Skills were positively but weakly related to proper antibiotic use behavior (r = .213, .234, and .245), significant at the .001 level. Media Literacy Skills was the dimension with the highest score (r = .347), revealing a moderate relationship to antibiotic use behavior. Decision-making skills were positively but very weakly related to proper antibiotic use behavior (r = .183) at the .01 level. Access to health information and health services skills (Access Skills) was very weakly related to proper antibiotic use behavior (r = .086) at a level that was not statistically significant (.107).

Discussion

The findings obtained revealed that respondents' overall health literacy was at a moderate level (Mean = 129.99, *SD* = 18.77). When considering each dimension of health literacy separately, it was found that the level of health literacy for all dimensions was also at a moderate level. The level of proper antibiotic use behavior was also at a moderate level (Mean = 38.87, *SD* = 7.69). These results were consistent with the findings of Koonlawong (2021), who studied knowledge about antibiotics and the self-care behavior of individuals with upper respiratory tract infections, acute diarrhea, open wounds from accidents, and self-care behavior when a patient was sick at Thung Fon Hospital. It was found that the sampled group had a moderate level of overall health literacy knowledge (Mean = 7.77, *SD* = 2.87) and a moderate level of proper overall antibiotic use behavior (Mean = 27.4, *SD* = 3.54). These findings were also consistent with the study of Yilmaz and Kil (2018), who studied individuals' health literacy levels and their knowledge and practices with respect to rational drug use. It was found that participants had a moderate level of health literacy, and there was a negative but significant relationship between age and health literacy scores.

The relationship between health literacy and proper antibiotic use behavior showed a positive but weak relationship (r = .268) that was statistically significant at the .001 level. Cognitive, communication, and self-management skills also had weak positive relationships with proper antibiotic use behavior (r =.213, .234, and .245), respectively. The relationship between media literacy scores and proper antibiotic use was slightly stronger (r = .347). Decision-making skills were positively related to proper antibiotic use behavior at a low level (r = .183), which was consistent with the study of Nunkong (2023) who studied the relationship between rational drug use literacy and drug use behavior among people in Kantang District, Trang. Her findings showed a low but positive correlation between the understanding of labeled drugs and drug packets with drug use behavior that was statistically significant at the .01 level (r = .428 and r = .424). For rational drug use literacy, awareness of advertising media and the choice to purchase and use drugs was very weakly, but positively correlated with proper drug use behavior at the .01 and .05 levels, respectively (r = .180 and r = .106). These results were also consistent with the study of Nopasert et al. (2022), who studied health literacy and health behavior of the 45–59 year-old working age group in Phayuha Khiri District, Nakhon Sawan Province.

This analysis of the relationship between health literacy and appropriate health behavior levels indicated weak to moderate statistically significant correlations (r = .183 to .347, p < .001). These results were consistent with Elkhadry and Tahoon's (2024) cross-sectional study of health literacy and its association with proper antibiotic use and knowledge of antibiotics among the Egyptian population, which showed inadequate levels of health literacy. A strong positive link was found between scores of antibiotic knowledge and health literacy (r = .876; p = .001)

Conclusion

From this study of health literacy and proper antibiotic use behavior among the working age group in Muak Lek Sub-district, Muak Lek District, Saraburi Province, it was found that the sampled respondents possessed moderate levels of health literacy and appropriate antibiotic use behavior. Furthermore, a positive correlation was found between health literacy and proper antibiotic use

behavior, both of which were still at a weak to moderate level. Additional studies have demonstrated that enhancing health literacy can be an effective strategy for improving proper antibiotic use behavior among working age individuals. Therefore, it is imperative to promote health literacy, thus mitigating the risks associated with inappropriate antibiotic use.

Suggestions for Applying Research Results and for Future Research

1. This research data could be used as a basis for studying health literacy about other drug groups and other drug use behaviors.

2. Research and development of innovative ways to enhance health literacy, change health behaviors, determine strategies, and design development guidelines to promote health literacy regarding proper antibiotic use should be conducted so that working aged people can use antibiotics effectively, efficiently, and with the highest safety.

3. Further studies should be conducted on health literacy and proper antibiotic use behavior in other population groups, such as the elderly.

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