

Prevalence and Factors Associated with Adequate E-Health Literacy and Willingness to Use Telemedicine Comparing between Seniors and Non-seniors: a Cross-sectional Study from a Middle-Income Country

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Abstract

Background: Currently, the rapid aging of the population around the world, especially in low- and middle-income countries (LMICs), is leading to changing demands on healthcare systems. The preparation of the population for adequate e-health literacy and good digital health is one of the challenges of social policy. The willingness to understand e-health literacy and telemedicine use in the different age ranges of the population will help to understand the loopholes and bottlenecks in the implementation and help to develop appropriate solutions. Currently, studies on the status of e-health literacy in the different age ranges remain limited and scarce.

Objective: In this study, we intend to investigate the prevalence and factors associated with low e-health literacy, including attitudes toward e-health literacy, by focusing on the different age ranges in Thailand, a middle-income country.

Methods: We conducted a cross-sectional, observational study in January-July 2021. A total of 400 participants who visited the outpatient department of Siriraj Hospital were recruited and completed questionnaires, which measured demographic information, frequency of internet use, devices used for accessing the internet, and e-health literacy. E-health literacy was assessed using the eHAELS score. We applied univariable logistic regression analysis to elucidate the factors associated with e-health literacy.

Results: Our study revealed that the senior participants had a lower level of e-health literacy compared to non-senior participants. Additionally, other crucial interesting factors in the senior group associated with low e-health literacy included a low level of knowledge about e-health for finding and utilizing health information to take care of themselves, and a lack of confidence in using information from the internet to make health decisions. Moreover, the attitude and interest toward telemedicine use were among the interesting factors that should be considered in the study. The participants in both groups with low e-health literacy expressed fear of not receiving treatment or being unable to complete treatment by a doctor. They were not confident in using technology correctly, feared not understanding how to use medication, and were more concerned about data security compared to participants with high e-health literacy.

Conclusions: Our study provides valuable information on the e-health literacy of seniors and non-seniors in a middle-income country, which may be used to guide further improvements and promote digital health in the aging societies.

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Original Paper

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Prevalence and Factors Associated with Adequate E-Health Literacy and Willingness to Use Telemedicine Comparing between Seniors and Non-seniors: a Cross-sectional Study from a Middle-Income Country

Background: Currently, the rapid aging of the population around the world, especially in low- and middle-income countries (LMICs), is leading to changing demands on healthcare systems. The preparation of the population for adequate e-health literacy and good digital health is one of the challenges of social policy. The willingness to understand e-health literacy and telemedicine use in the different age ranges of the population will help to understand the loopholes and bottlenecks in the implementation and help to develop appropriate solutions. Currently, studies on the status of e-health literacy in the different age ranges remain limited and scarce.

Objective: In this study, we intend to investigate the prevalence and factors associated with adequate e-health literacy, including attitudes toward e-health literacy and willingness to use telemedicine as an example of digital technologies. We focused the comparison between seniors and non-seniors groups in Thailand, a middle-income country.

Methods: We conducted a cross-sectional, observational study in January-July 2021. A total of 400 participants who visited the outpatient department of Siriraj Hospital were recruited and completed questionnaires collecting demographic information, frequency of internet use, and devices used for accessing the internet. E-health literacy was assessed using the eHAELS questionnaire. We also explored attitude and willingness to use telemedicine. We applied univariable logistic regression analysis to elucidate the factors associated with e-health literacy and willingness to use telemedicine.

Results: Our study revealed that the senior participants had lower level of e-health literacy compared to non-senior participants. Using eHAELS ≥ 26 points as 'adequate e-health literacy', 74.0% of seniors compared to 22.7% of non-seniors had inadequate e-health literacy. Only 19.8% of seniors, compared to 65.1% of non-seniors, had high level of e-health literacy defined by exploring each items in eHEALS. The items with lowest level of e-health literacy among seniors were in relation to the confidence in finding and utilizing health information to take care of themselves, and in using information from the internet to make health decisions. For attitude and interest toward telemedicine use; confidence in security, perceived the convenient of telemedicine and adequate e-health literacy were the three strongest factors associated with willingness to use telemedicine; with OR of 5.90 (95%CI: 3.43-10.15) 5.43(95%CI: 3.12-9.43) and 4.45(95%CI: 2.60-7.62), respectively. Non-senior group was more likely to be interested in using telemedicine with OR of 2.02 (95%CI;1.21-33.37).

Conclusions: Our study addressed the low level of e-health literacy with more concerning figures among seniors compared to non-seniors in a middle-income country. The willingness to uptake digital technologies related strongly to level of e-health literacy. This information might be beneficial to use for guiding further improvements and promote digital health in LMIC settings entering an aging society.

Keywords: Aging population; Digital health; Digital technology; eHAELS; Health information

Introduction

Nowadays, digital technologies have dramatically changed the world and become easily accessible. Over the past decade, the widespread adoption of digital technologies has created new opportunities for healthcare delivery. Digital health tools, such as mobile applications, telemedicine platforms, and wearable devices, offer a cost-effective and scalable way to improve access to healthcare services, and empower individuals to manage their health more effectively [1]. The shortage of healthcare facilities, inadequate health infrastructure, and a lack of medical professionals, particularly in remote and underserved areas, are all factors that potentially be mitigated with implementing digital health tools [1]. The expanding of digital health technologies would be especially beneficial in resource-limited settings, where infrastructure and resources for traditional healthcare services are often inadequate [1].

During the COVID-19 pandemic, the importance of digital technology has been emphasized

in disseminating critical health information in a non-contact society. Health care services around the world rely more on telehealth and telemedicine to deliver health information and medical care [2]. Telehealth and telemedicine play a crucial role in healthcare, and many studies have reported that they can improve healthcare access, reduce the cost of care, and enhance the quality of care [3]. However, there are many barriers to its use, such as geographical access, availability, affordability, and acceptability [4]. Moreover, the healthcare systems in many low- and middle-income countries (LMICs) face considerable challenges in providing high-quality, affordable, and universally accessible care through online services.

Demographic change is one of the most significant global trends where population aging will be a challenge for health care systems worldwide. The proportion of the senior population will steadily increase at the global level. Given this worrisome change, improving the quality of life for the senior population has become one of the crucial issues in public health policy [5]. With the rapid growth of digital technology in health care and related areas, it will inevitably become the core means to deliver various social and health services that can help improve quality of life for the population, particularly for senior citizens. While older people have higher numbers of chronic health problems requiring continuous management by various medical professionals, the extent of their ability to access that information through digital technology has not been widely studied [6]. It has been shown that older people, who should earn the most benefit from digital health delivery, encountered several difficulties accessing the internet [7]. Moreover, seniors appear to have a high level of anxiety about using smart devices to access health information [8]. These factors may hamper seniors from getting benefits from digital technology, which may negatively affect their health and well-being [8].

Electronic health (e-Health) literacy refers to the ability to access, understand, and use health information obtained through electronic sources to solve health problems [5,9,10]. E-health literacy reflects skills in using digital technology to make decisions regarding health [2]. People with lower e-health literacy had less access to technology devices and to using the internet for health [11,12]. Therefore, they might miss out on opportunities to benefit from several public health interventions delivered through digital tools compared to people with higher e-health literacy [13]. The study of e-health literacy and factors associated with low e-health literacy in people living in LMICs, especially across different age ranges, is essential for developing effective interventions to improve health outcomes and reduce inequalities in the digital world.

It is projected that one-fifth of the world's population will be over the age of 60 by 2050, and 80% of seniors residing in LMICs [14]. Thailand, one of the LMIC countries, is experiencing rapid population ageing and has emerged as the second highest aging population in ASEAN where the number of senior citizens will be one-fourth of the population by the year 2030 [15]. The Ministry of Public Health (MOPH) had strategic plans to promote digital health and implement the use of telemedicine in all hospitals by 2023 [16,17] for which older people would be the main targeted population. However, studies on the status of e-health literacy and willingness to use telemedicine in Thailand, particularly among older people, remain limited. This information, especially across different age ranges, will help understand the loopholes and bottlenecks in policy implementation. Therefore, we aim to study level of e-health literacy comparing between seniors and younger population and the factors associated with attitudes toward e-health literacy among people of different age ranges, to inform health policy guidelines. Furthermore, the findings of this study might serve as a case study for other LMICs that are also approaching an ageing population and aimed to implement digital platforms for older people.

Methods

Study design and participants

This cross-sectional study was conducted at the outpatient department of Siriraj Hospital, a large medical school that serves as a tertiary referral center in Bangkok, from January to July 2021. The inclusion criteria included senior patients and their relatives visiting the outpatient department. Subjects with communication difficulties, such as language or hearing problems, and those who were unable to communicate fluently in Thai, were excluded.

Measurement instruments

The questionnaire was divided into three main sections. Part 1 focused on gathering general information about the participants, including their age, sex, medical benefit occupation, monthly income, number of doctor visits per year, internet usage, duration of daily internet use, devices used for internet access, and experience in telemedicine usage. Part 2 assessed the participants' e-health literacy level using the e-Health Literacy Scale (eHEALS). The scale consists of 8 questions designed to measure self-perceived ability in using technology to gather health information combined with the knowledge, perceived comfort, and ability to find, evaluate, and implement electronic health information [18,19]. The scores are obtained by assessing the degree of agreement using a five-point Likert scale ranging from 1 "strongly disagree" to 5 "strongly agree" for each of 8 items. Therefore, the scores could range from 8 to 40, with higher scores indicating higher levels of e-health literacy [20]. There are several methods for interpreting the results of eHEALS. We decided to utilize the classification using cut-off score to explore factors associated with overall level of e-health literacy. For this purpose, we used the eHEALS cut-off score ≥ 26 to indicate adequate e-health literacy [21]. However, there is another method for classification of eHEALS by exploring each item of the questionnaire and rated the scores of 4 and 5 as 'agreeing'. [22]. The high level of e-health literacy was defined by having 'agreeing' ≥ 5 out of 8 eHEALS items [22]. This method would provide more insight into each issue of e-health literacy and might be more meaningful for considering solutions. Part 3 focused on the participants' attitudes toward accessing telemedicine and included multiple-choice questions and opinion-based questions.

Data collection

Research assistants explained the study to the participants, utilizing an information sheet. Sufficient time was given to the participants to read the information sheet and ask any questions they had before offering written consent. Once consent was obtained, participants were requested to respond to the questionnaire. If any explanations were required, the research assistants would provide additional information to help participants complete the questionnaire.

Ethical Considerations

Ethical approval was obtained from the local ethical board, the Institutional Review Board of Faculty of Medicine, Siriraj Hospital, Mahidol University (SIRB) (COA no. Si 802/2020). Inform consents were obtained from all participants, in accordance with the principle of the Helsinki declaration. Participants' identities were not collected in the case record form.

Statistical Analysis

The determination of sample size for this study was based on the different proportion of e-health literacy with the hypothesis that older people would have higher proportion of inadequate e-health literacy compared to younger population. Inadequate e-health literacy was classified using eHEALS score < 26 . Sample size calculation was estimated based on a previous study [21], where participants classified as inadequate e-health literacy comprised of 72.8% older people and the group with adequate e-health literacy had 57.9 % of older people. When considering a two-sided type I error of 0.05 with 80% power, it was determined that 160 participants would be needed for each group. Anticipation around 20% of incomplete data, a total of 400 participants were planned for the

study.

Demographic information and characteristic variables were summarized using descriptive statistics. Continuous variables were represented by the mean ($\pm$ SD) for normal distributions or median (minimum, maximum) for non-normal distributions. Categorical variables were described using frequency and percentage. For continuous variables, comparisons between the senior and non-senior groups; 2-sample t-test and Mann-Whitney U test were applied after testing for normality of the data. Pearson's chi-square test or Fisher's exact test were used to test categorical variables as appropriate. The analyses were performed using PASW Statistics for Windows, version 29.0, SPSS Inc., Chicago, IL, USA.

Results

A total of 400 participants were recruited for the study, including 131 (32.8%) seniors. The demographic information and baseline characteristics are presented in Table 1. Among 131 seniors, 35.1% were males, and 61.1% had an education level higher than high school. Most were unemployed (67.9%), with an average income of around 10,000 THB (285.86 USD) per month, and had an average expenditure of 300 THB (8.58 USD) per visit to see a doctor. More than half (53.4%) of seniors never use the internet. Among internet users, the frequency of internet use was around 2 hours per day, with smartphones (63.1%) being the most frequently used devices for accessing the internet.

Among 269 subjects who were non-seniors, 80 (29.7%) were males, and 228 (84.8%) had an education level higher than high school. Most were employed (79.9%), with an average income of 20,000 THB (571.72 USD) per month, and had an average expenditure of 400 THB (11.43 USD) per visit to see a doctor. The majority of non-seniors (89.2%) regularly use the internet, spending an average of 5 hours per day on it. Two-hundred fifty-four (94.8%) of non-seniors use smartphones to access the internet.

When comparing the two age groups, the senior group was more likely to have a lower educational level ($p < 0.001$), be unemployed ($p < 0.001$), and have lower income ($p < 0.001$). The senior group was also less likely to have experience using the internet ($p < 0.001$) and spent less time online among those who did use it ($p < 0.001$).

Table1. Demographic information and baseline characteristics of the included population compared between non-senior and senior groups.

Variables	Non-senior Group (<60 years) [n=269]	Senior Group (≥ 60 years) [n=131]	p-value
Gender, n (%)			
Male	80 (29.7)	46 (35.1)	.303
Educational level, n (%)			
$\geq$ High school	228 (84.8)	80 (61.1)	$<.001$
Occupation, n (%)			
Employed	215 (79.9)	43 (32.8)	$<.001$
Average income (THB/month)	20,000 (500, 300,000)	10,000 (500, 300,000)	$<.001$
Average cost to see a doctor (THB/time)	400 (0, 8,000)	300 (0, 11,000)	.063

Experience in using internet, n (%)			
Yes	240 (89.2)	61 (46.6)	<.001
^a Frequency of internet use (hr./day)	5 (1, 20)	2 (30 mins, 18)	<.001
^b Digital devices for using the internet, n (%)			
Computer	45 (16.8)	7 (5.4)	<.001
Notebook	45 (16.8)	8 (6.2)	.004
Tablet	38 (14.2)	9 (6.9)	.046
Smartphone	254 (94.8)	82 (63.1)	<.001

Abbreviation: THB, Thai baht.

^a Specified only patient who has access the internet.

^b One person may use more than one device.

Table 2 presents detailed comparisons of competency in each area of e-health literacy between the senior and non-senior groups. The results indicate that seniors exhibited significantly lower levels of knowledge in all dimensions of e-health literacy. Most seniors do not know how to use the internet to find health information for self-care. The results revealed that less than one-fifth of seniors knew how to use the internet to find health information and how to utilize health information on the internet for taking care of themselves. Moreover, less than one-fifth of seniors were confident in identifying the quality of retrieved information and using it to make health decisions.

Table2. E-Health Literacy comparison between the non-senior and senior groups.

E-Health Literacy, n (%)	Agree (Score4-5)	
	Non-senior Group (<60 years) [n=269]	Senior Group (≥60 years) [n=131]
1. I know what health resources are available on the internet.	183 (68.0)	32 (24.4)
2. I know where to find helpful health resources on the internet.	187 (69.5)	33 (25.2)
3. I know how to find helpful health resources on the internet.	197 (73.2)	32 (24.4)
4. I know how to utilize the internet to answer my questions about health.	193 (71.7)	25 (19.1)
5. I know how to utilize the internet information I find to help me.	185 (68.8)	26 (19.8)
6. I have the necessary skills to evaluate the health resources I find on the internet.	151 (56.1)	26 (19.8)
7. I can identify high-quality health resources from low-quality health resources.	135 (50.2)	22 (16.8)
8. I feel confident in using information from the internet to make my health decisions.	131 (48.7)	22 (16.8)
The high score (4-5) of e-health literacy in 5 questions and higher.	175 (65.1)	26 (19.8)

Regarding the adequacy of e-health literacy, Table 3 displays factors associated with e-health literacy adequacy and attitudes toward telemedicine compared between senior and non-senior

groups. Around one-fourth of seniors and three-fourths of non-seniors had adequate e-health literacy. In both the senior and non-senior groups, level of education was significantly associated with a level of e-health literacy. Participants with adequate e-health literacy are more likely to be interested in telemedicine, leading to a positive attitude and greater confidence in using telemedicine. Nevertheless, a substantial proportion of both the senior group (32.4%) and the non-senior group (24.0%) with adequate e-health literacy remained not confident in using the new technology and declined to use telemedicine. Concerns not directly related to technological competency, such as the adequacy of treatment received through telemedicine and willingness to have physical examinations by doctors, did not significantly differ between groups with adequate and inadequate e-health literacy in both age groups. Concerns regarding data security and the adequacy of information received were not significantly different between seniors with adequate and inadequate e-health literacy.

Table3. Factors associated with adequacy of e-health literacy and the willingness to use telemedicine, compared between non-senior and senior groups.

Variables	Non-senior Group (<60 years) [n=269]			Senior Group (≥60 years) [n=131]		
	Inadequate e-health literacy (n=61)	Adequate e-health literacy (n=208)	<i>p</i> -value	Inadequate e-health literacy (n=97)	Adequate e-health literacy (n=34)	<i>p</i> -value
Living Status, n (%)						
Living with family	48 (78.7)	119 (57.2)	.003	69 (71.1)	25 (73.5)	.789
Living alone	13 (21.3)	89 (42.8)		28 (28.9)	9 (26.5)	
Educational level, n (%)						
≥ High school	38 (62.3)	190 (91.3)	<.001	50 (51.5)	30 (88.2)	<.001
Occupation, n (%)						
Employed	50 (82.0)	165 (79.3)	.651	30 (30.9)	13 (38.2)	.435
^aFrequency of internet use (hr./day)	2 (1, 18)	6 (1, 20)	<.001	2 (30 min, 12)	3 (1, 18)	.025
^bDigital devices for using the internet, n (%)						
Computer	4 (6.6)	41 (19.8)	.018	1 (1.0)	6 (17.6)	.001
Notebook	3 (4.9)	42 (20.3)	.003	3 (3.1)	5 (14.7)	.029
Tablet	3 (4.9)	35 (16.9)	.020	4 (4.2)	5 (14.7)	.052

Smartphone	48 (78.7)	206 (99.5)	<.001	49 (51.0)	33 (97.1)	<.001
Attitude of telemedicine, n (%)						
Know or have experience in telemedicine	8 (13.1)	92 (44.2)	<.001	6 (6.2)	17 (50.0)	<.001
Interested in using telemedicine	40 (65.6)	188 (90.4)	<.001	66 (68.0)	30 (88.2)	.022
What would be the reason for declining the use of telemedicine? , n (%)						
Wish to have a physical examination by a doctor	42 (68.9)	120 (57.7)	.117	70 (72.2)	22 (64.7)	.413
Not confident in using new technology	38 (62.3)	50 (24.0)	<.001	64 (66.0)	11 (32.4)	.001
Concerns about data security	20 (32.8)	38 (18.3)	.015	20 (20.6)	5 (14.7)	.450
Concerns of not receiving adequate treatment	32 (52.5)	104 (50.0)	.736	60 (61.9)	15 (44.1)	.072
Concerns of not receiving adequate information	18 (29.5)	25 (12.0)	.001	17 (17.5)	4 (11.8)	.431

^a Specified only patient who has access the internet.

^b One person may use more than one device.

Factors associated with interest in using telemedicine are demonstrated in Table 4. Lower age, higher education level, higher income, high e-health literacy, experience in using telemedicine, and belief in the safety and convenience of the service were all significantly associated with willingness to use telemedicine.

Confidence in the safety and convenience of the service, along with adequate e-health literacy, were the three strongest factors associated with interest in telemedicine, with odds ratios (OR) of 5.90 (95% CI 3.43-10.15, $p=0.001$), 5.43 (95% CI 3.12-9.43, $p=0.001$), and 4.45 (95% CI 2.60-7.62, $p=0.001$), respectively. The non-senior group was more likely than the senior group to accept using telemedicine, with an OR of 2.02 (95% CI 1.21-3.37, $p=0.007$).

Table4. The factors associated with interest in using telemedicine.

Variables	Interested in telemedicine use		Univariate analysis OR (95% CI)	p-value
	Not Interested (n=76)	Interested (n=324)		
Gender, n (%)				
Male	17 (22.4)	109 (33.6)	1.76 (0.97-3.16)	.059
Age, n (%)				
<60 Years	41 (53.9)	228 (70.4)	2.02 (1.21-3.37)	.007
Education Level, n (%)				
≥ High school	49 (64.5)	259 (79.9)	2.19 (1.27-3.77)	.005
Occupation, n (%)				
Employed	42 (55.3)	216 (66.7)	1.62 (0.97-2.69)	.063
Average income (THB), n (%)				
≥10,000 (≥ 285.86 USD)	38 (65.5)	214 (80.8)	2.20 (1.18-4.11)	.012
Average Internet use (hour/day), n (%)				
≥5	10 (25.0)	135 (51.3)	3.16 (1.48-6.73)	.003
E-Health literacy, n (%)				
Adequate E-Health literacy (eHEALS≥26)	24 (31.6)	218 (67.3)	4.45 (2.60-7.62)	<.001
Knowledge of telemedicine, n (%)	15 (19.7)	108 (33.3)	2.03 (1.10-3.74)	.023
Confident in security issue, n (%)				
Vary safe	24 (31.6)	237 (73.1)	5.90 (3.43-10.15)	<.001
Convenient of telemedicine compared to face-to-face service, n (%)				
More convenient	41 (53.9)	280 (86.4)	5.43 (3.12-9.43)	<.001
Having digital devices for assessing the internet, n (%)	52 (70.3)	287 (88.9)	3.37 (1.83-6.19)	<.001

Abbreviation: THB, Thai baht; USD, US dollars.

Discussion

Our study highlights the very low level of e-health literacy among seniors compared to non-seniors in a middle-income country. Moreover, competency in several aspects of e-health literacy in both senior and non-senior groups was also unsatisfactory. Several factors associated with a low level of e-health literacy in this study, such as age, income level, and education level, were non-modifiable. However, e-health literacy itself is modifiable through several interventions. The level of e-health literacy further influences the acceptance and ability to undertake digital healthcare services. Factors affecting e-health literacy and attitudes toward accepting telemedicine are key factors to explore and intervene in when planning to implement novel digital technologies at the population level.

Several socioeconomic disadvantages are associated with lower levels of e-health literacy. The present study showed results concordance with previous studies [3,23,24,25], indicating that participants with lower levels of e-health literacy were more likely to be older and have lower levels of educational attainment. Additionally, low e-health literacy appears to be related to inadequate financial resources, resulting in less exposure to digital devices and technologies. This trend was evidenced more prominently among the senior group in our study, similar to findings from previous studies [23,26].

The concept of e-health literacy among older people has been explored separately [3] from the younger population, as the need for support and barriers to implementation would be substantially different. It has been emphasized that e-health literacy increases with age among young adults, but decreases among older adults [3,23,25,26,27,28]. Among senior participants in the present study, the reported difficulties in e-health literacy were related to having a low level of knowledge and skills in using the internet. This might also lead to the finding that they were unconfident in using information from the internet to make health decisions. There are several systematic reviews, and a recent scoping review demonstrated the benefit of interventions to improve level of e-health literacy [29,30,31]. Most studies employed health behavior and learning theories. Interventions materials commonly utilized were existing or self-designed websites or applications, with some incorporating standardized training materials. Outcome measures included information, psychological motivation, and behavioral change, with limited studies reporting improved health outcomes. Nevertheless, it could still be considered when delivery policy for implementing digital technologies among older people, not only to include standard materials and tools, but to deliver with more sessions of training programs to enhance confidence for senior citizens.

During the COVID-19 pandemic, the importance of digital technologies has skyrocketed for disseminating health information and providing necessary services [22]. Telemedicine was one of the popular technologies that was widely expanded to cover a boarder range of health conditions, including preventive, curative, and rehabilitative aspects. The services also expanded to include several chronic medical conditions, including older people with frailty and dementia [32]. Nevertheless, there were some barriers to the uptake of technology among seniors. The top barriers to using telemedicine among seniors were related to a low level of e-health literacy, such as lack of knowledge, difficulty learning, and using the technology [8,21,22,33]. Moreover, concerns related to the privacy and security of the technology, as well as the health outcomes of using online services, were also raised [22]. Our studies discovered similar findings regarding those barriers, which appear to be modifiable through several interventions. However, age-related challenges such as hearing and vision impairments, functional limitations, and ergonomic difficulties, [22] which were not directly addressed in our study, also significantly impact accessibility. For instance, older adults with visual impairments may require larger font sizes, while those with degenerative joint conditions might benefit from specially designed interfaces. While current conventional digital tools might not well be equipped for these changes and prevent older people from using it. These factors were not explored in our study but should also be considered when contemplating plans to implement digital technologies for older people.

Previous studies have shown the benefits of arranging various styles of interventions to

improve e-health literacy in older people, conducted in high-income countries [34]. It has been shown that older people can become proficient in using technology, just like younger adults, with adequate support, understandable explanations of its benefits, and a suitable learning pace [35]. Therefore, encouragement to gain knowledge and skills in digital technologies and having a positive attitude toward the use of telemedicine could enhance uptake in digital health for seniors. LMICs will soon have the highest proportion of older people, along with an expected shortage in several resources for delivering on-site health care services. Using digital health in appropriate service areas would be a promising solution for those settings. Being well prepared by including a training program for senior users would increase the chances of successful implementation. Older people have the potential to learn and uptake novel technologies, not less than the younger population, but at different paces. Having volunteers in their communities to provide training through public health centers or activities clubs might be one of the interesting policies to reach more senior groups. The process requires considerable work, such as developing local content, coordinating governments and private organizations to provide funding for e-health literacy projects, and empowering community members to take the initiative to improve their health. However, this will be a sustainable option for the long term. Therefore, to overcome several limitations for older people in resource-limited settings, it is essential to implement a comprehensive policy with ongoing support from public and private sectors to enhance internet accessibility, improve digital literacy and competencies for people in the community. The establishment of a program such as the Intergenerational e-health Literacy Program (I-HeLP) with additional support to explore and resolve structural limitations would be beneficial. The I-HeLP program is designed to leverage the technological expertise of younger generations to teach older adults how to search for, understand, and evaluate health information from electronic sources, and apply the knowledge acquired to address health-related issues [36]. Adding a provision program to solve infrastructure issues would be essential. Such comprehensive policy would be an effective strategy to reduce barriers to access to digital technologies and to ensure sustainability.

Our study has some strengths and limitations. Firstly, we used eHAELS questionnaire, a standardized tool that has been validated across several countries with various settings. Secondly, we compared the level of e-health literacy between older people and younger encounter in the LMIC setting where previous studies mostly conducted from high-income countries and not comparing across age-groups. However, there are several limitations in our studies worth mentioning. Firstly, the study was conducted using cross-sectional design which limits the ability to assess changes in e-health literacy over time. Secondly, the study used self-reported questionnaires to assess e-health literacy and internet usage which might lead to some reporting bias. Nevertheless, several interventional studies exploring benefits of e-health literacy and recent systematic reviews demonstrated that eHAELS is the most used and has been widely validated that allowed us to compare across settings [37]. Thirdly, our study was conducted in Thailand, one of the LMIC countries. The fact that it was conducted in one country, it might not be generalized to other countries with different settings. Fourthly, physical factors affecting e-health literacy was not explored in this study. Lastly, other psychological aspects, apart from anxiety, such as perceived usefulness; ease of use and complexity of navigation of the sources, might also be affecting the willingness to engage with digital technology. These aspects were not explored in the present study.

Conclusions

Our study provides insight into the low level of e-health literacy among seniors compared to non-senior participants in a middle-income country. We also address the barriers to uptake innovative modes of healthcare delivery that could be modifiable by providing suitable interventions. Providing information and service through digital technology for seniors would be more successful if adequate support were also prepared.

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Data Availability

The datasets generated or analyzed during this study are not publicly accessible but they are available from the corresponding author on reasonable request.

Authors' Contributions

SS collected the data, drafted, and edited and reviewed the manuscript. YP collected the data, conceptualized the study. PP designed the methodology, collected and curated the data. RP analyzed the data. AS conceptualized the study. VS conceptualized the study, acquired funding, designed the methodology, supervised the study, and edited and reviewed the manuscript.

Conflicts of Interest

None declared.

Abbreviations

eHEALS: e-Health Literacy Scale

eHealth: Electronic health

ETDA: Electronic Transactions Development Agency

MOPH: Ministry of Public Health

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Supplementary Files

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