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Anxiety and associated factors related to COVID-19 among people living with HIV during later stage of the pandemic: a cross-sectional study in Thailand

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Abstract

Introduction: The outbreak of coronavirus 2019 (COVID-19) has had widespread implications on mental health of people across the globe, including people living with human immunodeficiency virus (PLHIV). This cross-sectional study aimed to assess factors predicting COVID-19 anxiety among Thai PLHIV during later stage of the pandemic.

Material and methods: A set of web-based questionnaires was sent to 204 PLHIV using a simple random sampling technique. Data were collected with a demographic characteristics form, evaluating knowledge, attitudes, and practices towards COVID-19, and anxiety related to COVID-19. Data were analyzed using descriptive and inferential statistics.

Results: The majority of PLHIV reported adequate knowledge, positive attitude, and acceptable preventive behaviors against COVID-19, with anxiety reported at a mild level. COVID-19 anxiety scores were significantly higher in patients aged 60 years and over and in those, who had a family member or close friend infected with COVID-19. Knowledge and preventive practices regarding COVID-19 were significantly related to COVID-19 anxiety. Age, knowledge, and preventive practices against COVID-19 were factors, that predicted COVID-19 anxiety, with an explanatory power of 16.6% (adjusted $R^2 = 0.166$, $F = 5.456$, $p < 0.05$).

Conclusions: COVID-19 outbreak has significantly influenced the anxiety related to COVID-19 among PLHIV. Our findings might be helpful for healthcare providers to develop effective interventions to alleviate COVID-19 anxiety in potential future outbreak.

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Introduction

Thailand was affected by human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) epidemic in the late 1980s. HIV/AIDS epidemic has become a public health concern, globally affecting 38 million people, with 690,000 of them dying from AIDS-related diseases [1]. As of 2020, there were 470,000 people living with HIV (PLHIV) in Thailand and 14,000 AIDS-related deaths [2].

In the global and local efforts to end the HIV epidemic, the novel coronavirus disease (COVID-19) has emerged in December 2019 in Wuhan, China [3]. On January 12, 2020, the first case of COVID-19 was detected in Thailand [4]. After being declared by WHO a global pandemic on March 2020 [5], many important control measures were established by the Thai government. Considering the threat of COVID-19 in Thailand, the Thai Ministry of Public Health (MOPH) has initiated surveillance at public and private hospitals across the country. On March 26, 2020, the government declared a countrywide lockdown. The announcement affected all aspects of Thai society, including people's health. This has been confirmed in a recent study conducted by Yorsaeng and colleagues, who showed that the COVID-19 pandemic and subsequent lockdowns authorized by the Thai government as containment measures, had a profound impact on mental health [6]. Negative mental health impacts of the COVID-19 pandemic, along with realities of living with HIV, can further exacerbate vulnerability to mental health conditions, leading to negative health outcomes, such as non-adherence to medications and missed appointments [7].

Compared with people without HIV infection, a recent study indicated that the risk of mental health problems among PLHIV was elevated during the COVID-19 pandemic [8]. Mental health issues remain unaddressed, although they are as important as physical health [9]. Potential interactions between COVID-19 and HIV can adversely affect mental health outcomes of PLHIV. The negative impacts of the outbreak on mental health include anxiety, stigma, and isolation [10-12]. Previous studies have revealed more negative impacts of the COVID-19 pandemic on mental health among PLHIV than in other populations [10, 13, 14]. These were worsened by anxiety related to COVID-19 due to physical distancing in the rising period of pandemic, and might have adversely affected antiretroviral therapy (ART) adherence [15]. In the case of Thailand lockdown, outpatients' visits of PLHIV were interrupted countrywide [6], and the anxiety related to COVID-19 infection led to a decreased engagement with care among PLHIV in hospitals. A qualitative study conducted among PLHIV, physicians, and nurses in a central region of Thailand reported that some PLHIV missed attending clinical appointments with their physicians because of their concerns related to COVID-19 infection. Further problems encountered among PLHIV were postponements of health appointments, and those whose appointments were rescheduled or cancelled were more likely to be anxious [15, 16]. A recent study conducted among PLHIV in India revealed that there was a great burden of anxiety due to COVID-19 lockdown [10]. In such a situation, knowledge, attitude, and practice (KAP) regarding COVID-19 are vital to prevent anxiety related to COVID-19 [17, 18]. In a general population in Indonesia, Rias and colleagues found that knowledge, attitudes, and practices were significantly associated with anxiety regarding COVID-19 [19]. Consistent with a previous Japanese survey, an association between negative attitude and higher anxiety related to COVID-19 was reported [20]. In addition to studies conducted among general population mentioned above, a study among PLHIV in Italy showed that female gender, age, shorter duration on ART, and not being aware of own viremia, were associated with a higher risk of negative psychological outcomes, including COVID-19-related anxiety. Almost half of the Italian participants experienced significant levels of anxiety associated with COVID-19 [13].

Although in recent literature there are studies on mental health challenges attributed to COVID-19 in various groups, research highlighting anxiety related to COVID-19 among Thai PLHIV is limited. Such studies are extremely needed to effectively respond to the negative impacts of the pandemic. In particular, understanding the mental health impacts of COVID-19 pandemic on PLHIV could emphasize their needs for appropriate psychological well-being services to implement as an online or offline support interventions for this vulnerable group. Therefore, the current study aimed to examine factors associated with anxiety related to COVID-19 among PLHIV in a hospital located in central region of Thailand.

Material and methods

Design, setting, and participants

This sub-study was a part of a parent study entitled, "The assessment of the impacts of COVID-19 epidemic on PLHIV's health in Thailand during the pandemic", with its main purpose to address the impacts of COVID-19 on physical and mental health among Thai PLHIV during the pandemic. In response to the COVID-19 pandemic, a sub-study was designed and embedded within the main study, from which participants were recruited. Benefit of the parent study would be of long-term value, since it may help improving the responses to future public health threats.

From January 1 to February 5, 2021, a cross-sectional online survey was carried out among Thai PLHIV. During the government-imposed lockdown in Thailand, it was not feasible to conduct a hospital-based sampling survey, hence, this study employed a web-based survey for data collection. A simple random sampling technique was used to recruit PLHIV participants, who had access to an ART clinic in a hospital located in central region of Thailand. Investigators created a questionnaire link using a Google survey tool and shared it via a Line application, the most popular and mostly

used social networking site in Thailand. Because PLHIV in this clinic have joined a Line group to discuss their health issues with health providers in the ART clinic, they had an equal chance and likelihood of being selected. Sample size was calculated using G*Power [21] for multivariable linear regression analysis. Based on an effect size of 0.20, with a testing power of 0.80, and a statistically significant level of .05, sample size calculation revealed the need for at least 191 individuals for this study. Inclusion criteria were male and female Thai PLHIV, who were: 1) aged 18 and older; 2) a social media user and being able to access the Internet; 3) having an HIV diagnosis; and 4) willing to voluntarily participate in the study. Out of 310 PLHIV, a total of 204 PLHIV participants completed the survey questionnaires. The response rate was 65.81%, and all were included in final analysis.

Instruments

A set of questionnaires used in this study contained questions assessing demographic characteristics (i.e., gender, age, marital status, education, employment status, monthly income, duration on ART, having family member or close friend who got infected with COVID-19, and source of information regarding COVID-19 as well as KAP score on COVID-19 and anxiety related to the virus.

Knowledge, attitudes, and practice towards COVID-19 questionnaire

The KAP towards COVID-19 scale used in the study was initially developed in English by Zhong and colleagues [22], and this questionnaire contains 16 items with 3 distinct subscales, such as knowledge (e.g., "The main clinical symptoms of COVID-19 are fever, fatigue, dry cough, and myalgia."), attitude (e.g., "Do you agree that COVID-19 will finally be successfully controlled?"), and preventive practices towards COVID-19 (e.g., "In recent days, have you worn a face mask when leaving home?"). A COVID-19 knowledge sub-scale had 12 questions (K1-K12), including 4 on clinical presentations, 3 on transmission routes, and 5 regarding prevention and control of COVID-19. Items on the scale were arranged in a three-category response format (i.e., "True", "False", and "Do not know"), with each correct response given a point value of 1, while incorrect and "Do not know" response were assigned a value of 0. Total knowledge score was computed from correct responses ranging from 0 to 12, with a higher score indicating a greater COVID-19 knowledge. Based on the total number of correct answers, participants were categorized into two groups (sufficient knowledge with 9 or more out of 12, and insufficient knowledge with 8 or less than 8 correctly answered questions). The score of 9/12 was chosen as the fifth percentile of the score range falls on the score of 8/12 [23]. Second sub-scale evaluated attitudes towards COVID-19 using 2 questions (A1 and A2) regarding the agreement on the final control of COVID-19 and the confidence in winning the battle against COVID-19. Third sub-scale assessed practices towards COVID-19 using 2 items (P1 and P2), i.e., going to a crowed place, and wearing a face mask when going out in recent days. The KAP towards COVID-19 scale Thai version has been shown to be reliable and valid tool, while Cronbach's alpha coefficient of this scale was 0.81, indicating acceptable internal consistency.

Anxiety related to COVID-19

The coronavirus anxiety scale (CAS) developed by Lee [24] was employed to evaluate anxiety related to COVID-19. It is a five-item questionnaire, with each CAS item rated on a 5-point scale: from 0 ("Not at all") to 4 ("Almost every day"), based on experiences during last 14 days (i.e., "I felt dizzy, lightheaded, or faint, when I read or listened to news about the coronavirus"). A CAS total score ≥ 9 indicates probable dysfunctional coronavirus-related anxiety, whereas a total score lower than 9 shows non-problematic symptoms regarding coronavirus-related anxiety. Elevated scores on a particular item or a high total score (≥ 9) may specify problematic symptoms for an individual, which might warrant further assessment and/ or treatment. The CAS reliability in the current study was acceptable, with Cronbach's $\alpha = 0.90$ [24].

For this study, both the KAP of COVID-19 scale and CAS complied with a forward and back-translation into Thai by a bilingual Thai researcher, and were sent to two renounced bilingual Thai nurse scientists to examine the difference and suitability of the questionnaires. Subsequently, a pilot study was conducted before the commencement of the current research.

Ethical considerations

Before the study began, the study protocol was reviewed and approved by the Institutional Review Board (IRB) of College of Nursing in Thailand (approval number: 045/2563). Initially, participants were shown a short paragraph about study procedures. In this research, all participants provided informed electronic consent for anonymous participation, after which they were invited to complete the survey.

Data collection

Data collection was conducted via a structure questionnaire developed by Google survey tool (Google Forms) using a consent form attached to it. A link of online questionnaires was sent through the network of participants via Line application. Upon receiving and clicking the link, patients were automatically forwarded to study information and informed consent. After agreeing to participate in that online survey, they filled up their socio-demographics characteristics. A set of online questionnaires consecutively appeared, which were supposed to be answered and completed. Since

Table 1. Demographic characteristics of participants (*N* = 204)

Characteristics	*n* (%)
Gender	
Male	108 (52.9)
Female	96 (47.1)
Age (years)	
18-29	13 (6.4)
30-49	123 (60.3)
50-59	50 (24.5)
≥ 60	18 (8.8)
Marital status	
Single	122 (59.8)
Married	77 (37.7)
Others (divorced, separated, or widowed)	5 (2.5)
Education	
Primary school	113 (55.4)
Secondary school	59 (28.9)
High school	11 (5.4)
Vocational school	4 (2.0)
Diploma	5 (2.5)
Bachelor	12 (5.9)
Employment status	
Employed	187 (91.7)
Unemployed	17 (8.3)
Monthly income (in Baht, $1 = 32 Baht)	
< 5,000	108 (52.9)
5,001-10,000	62 (30.4)
10,001-20,000	22 (10.8)
20,001-30,000	8 (3.9)
> 30,000	4 (2.0)
Duration on ART (years)	
< 1	28 (13.7)
1-5	60 (29.4)
> 5	116 (56.9)
Having family member or close friend infected with COVID-19	
Yes	59 (28.9)
No	145 (71.1)
Resources of information on COVID-19	
Scientific resource	43 (21.1)
Inner circle	33 (16.2)
Social media	63 (30.9)
Visual media	52 (25.5)
Printed media	13 (6.4)

this was the online survey study, only those with access to the Internet either on their smartphones or at home were able to participate in the study.

Data management and data analysis

Data were electronically captured on an Excel sheet, and Statistical Package for the Social Sciences (SPSS version 23.0 for Windows) was used to analyze the data. As appropriate, descriptive statistics (mean, standard deviation [SD], percentage, and frequency distribution) were employed to describe different variables. Prior to conducting the analysis, basic assumptions of the regression analysis were computed. To confirm normality of data, skewness and kurtosis were determined. Tolerance and variance inflation factor were examined to identify multi-collinearity issue, revealing that multi-collinearity was not a concern. Subsequently, the main analyses were performed. Data with normal distribution were analyzed using independent *t*-test to compare two groups, and one-way ANOVA was applied for more than two groups. Additionally, Pearson's correlation coefficient was employed to examine the associations between variables. Multivariable linear regression technique was utilized to determine factors associated with anxiety related to COVID-19 and the proportion of variance in anxiety related to COVID-19 described by the variables. All variables found to be significantly associated with anxiety related to COVID-19 in one-way ANOVA, and correlation analyses were entered into the model as independent variables. The independent variables of the study included gender, age, marital status, education, employment status, monthly income, duration on ART, having family member or close friend infected with COVID-19, and resources of information on COVID-19. The dependent variable of the study was CAS score.

Results

Demographic characteristics

Of the 204 PLHIV who completed the survey, 108 (52.9%) were male and 60.3% of the participants were aged between 30 and 49 years. Approximately 60% were single, and more than half of the participants (55.4%) finished primary school. Most of them (91.7%) were employed, and majority reported monthly income of less than 5,000 Thai Baht, while nearly 57% reported being on ART for more than 5 years. About 28.9% of the individuals revealed having a family member or close friend infected with COVID-19. About 30.9% reported using social media as the most common source of information about COVID-19 (Table 1).

Knowledge, attitude, and preventive practices towards COVID-19

Table 2 shows the descriptive analysis of KAP scores. The correct answer rates of the 12 questions regarding COVID-19 knowledge were 86.8-98%. The overall mean knowledge score was 11.38 (SD: 1.53; range, 0-12), suggesting an overall correct rate of 94.83% (11.38/ 12*100) in this knowledge test. The majority (98%) of participants knew that isolation and treatment of people infected with COVID-19 are the effective ways to reduce the spread of the virus. Most par-

Table 2. Knowledge, attitude, and preventive practice towards COVID-19 scores among PLHIV (*N* = 204)

Knowledge (K)	**Mean**	**SD**	**Correct (%)**	**Incorrect (%)**	
K1. The main clinical symptoms of COVID-19 are fever, fatigue, dry cough, and myalgia.	0.91	0.29	185 (90.7)	19 (9.3)	
K2. Unlike the common cold, stuffy nose, runny nose, and sneezing are less common in persons infected with the COVID-19 virus.	0.92	0.27	188 (92.2)	16 (7.8)	
K3. There currently is no effective cure for COVID-19, but early symptomatic and supportive treatment can help most patients recover from the infection.	0.98	0.14	200 (98.0)	4 (2.0)	
K4. Not all persons with COVID-19 will develop severe stages. Only elderly, with chronic illnesses, and obese are more likely to be considered severe cases.	0.91	0.28	186 (91.2)	18 (8.8)	
K5. Eating or contacting wild animals would result in the infection of COVID-19.	0.92	0.27	188 (92.2)	16 (7.8)	
K6. Persons with COVID-19 cannot transfer the virus to others when a fever is not present.	0.88	0.32	180 (88.2)	24 (11.8)	
K7. The COVID-19 virus spreads via respiratory droplets of infected individuals.	0.96	0.19	196 (96.1)	8 (3.9)	
K8. Ordinary residents can wear general medical masks to prevent the infection of COVID-19.	0.98	0.15	199 (97.5)	5 (2.5)	
K9. It is not necessary for children and young adults to take preventive measures against infection with COVID-19.	0.87	0.34	177 (86.8)	27 (13.2)	
K10. To prevent the infection with COVID-19, individuals should avoid going to crowded places, such as train stations, and avoid using public transportation.	0.94	0.24	192 (94.1)	12 (5.9)	
K11. Isolation and treatment of people infected with COVID-19 are effective ways to reduce the spread of the virus.	0.98	0.14	200 (98.0)	4 (2.0)	
K12. People, who have a contact with someone infected with the COVID-19 virus should be immediately isolated in a proper place. In general, the observation/ isolation period is 14 days.	0.98	0.15	199 (97.5)	5 (2.5)	
Total knowledge score	**11.38 (1.54)[b]**				
Attitude (A)	**Mean**	**SD**	**Agree (%)**	**Disagree (%)**	**Do not know (%)**
A1. Do you agree that COVID-19 will finally be successfully controlled?	0.82	0.38	168 (82.4)	36 (17.6)	0 (0)
	Mean	**SD**	**Yes (%)**	**No (%)**	
A2. Do you have confidence that Thailand can win the battle against the COVID-19 virus?	0.85	0.35	174 (85.3)	30 (14.7)	
Total attitude score	1.69 (0.69)[b]				
Practice (P)	**Mean**	**SD**	**Yes (%)**	**No (%)**	
P1. In recent days, have you gone to any crowded places?	0.17	0.38	35 (17.2)	169 (82.8)	
			Yes (%)	**No (%)**	
P2. In recent days, have you worn a mask when leaving home?	1.00	0.07	203 (99.5)	1 (0.5)	
Total practice score	1.72 (1.83)[b]				

[b]*Mean (standard deviation)*

ticipants (98.0%) also knew that currently, there is no effective cure for COVID-19, but early symptomatic and supportive treatment can help most patients to recover from the infection. The overall mean attitude score of the individuals was 1.69 (SD: 0.69). About 82.4% agreed that COVID-19 will finally be successfully controlled, and 85.3% were confident

that Thailand can win the battle against COVID-19. The overall mean preventive practice score was 1.72 (SD: 1.83). Most participants had not gone to any crowded place (82.8%), and wore a mask when leaving home (99.5%) in recent days.

Anxiety related to COVID-19 among PLHIV

As shown in Table 3, an average score for each question on the CAS scale varied between 1.48 ± 0.77 and 1.60 ± 0.98, while the average total score was 7.62 ± 4.08.

Anxiety associated with COVID-19 among PLHIV according to descriptive characteristics

As shown in Table 4, CAS scores were statistically significantly greater in those aged 60 years and over and in those, who had family member or close friend infected with COVID-19 ($p < 0.05$). There was no significant association between CAS scores, gender, marital status, education, employment status, monthly income, duration on ART, and resources of information on COVID-19 ($p > 0.05$).

Associations between knowledge, attitude, preventive practices regarding COVID-19, and anxiety related to COVID-19

Table 5 presents the associations between the studied variables. There was a significant negative correlation between knowledge of COVID-19 and anxiety related to COVID-19 ($r = -0.33$, $p < 0.05$). Similarly, the preventive practices of COVID-19 were significant and positively associated with COVID-19-related anxiety ($r = 0.22$, $p < 0.05$).

Factors predicting anxiety related to COVID-19

As displayed in Table 6, multivariable linear regression analysis was used to evaluate the associations and predictive ability between the independent variables and the dependent variable, and anxiety related to COVID-19. Findings revealed that age, knowledge of COVID-19, and preventive practices regarding COVID-19, together explained 16.6% (adjusted $R^2 = 0.166$, $F = 5.456$, $p < 0.05$) of the total variance in anxiety related to COVID-19. Age ($B = 0.13$, $t = 1.96$, $p < 0.05$), knowledge of COVID-19 ($B = -0.34$, $t = -5.04$, $p < 0.05$), and preventive practices regarding COVID-19 ($B = 0.26$, $t = 4.01$, $p < 0.05$) were statistically significant factors influencing anxiety related to COVID-19.

Discussion

Currently, COVID-19 outbreak has dramatically changed people's lives. With the limited literature on COVID-19 at the beginning of the pandemic, information have gradually been updated and shifted gradually towards an increased amount of research. The significant findings suggested that three factors were important in describing anxiety related to COVID-19 among Thai PLHIV. These factors included age, knowledge of COVID-19, and preventive practices re-

Table 3. Anxiety related to COVID-19 among PLHIV ($N = 204$)

Items	Average score, mean ± SD	Not at all, *n* (%)	Rare, less than a day or two, *n* (%)	Several days, *n* (%)	More than 7 days, *n* (%)	Almost every day over the last 2 weeks, *n* (%)
1. I felt dizzy, lightheaded, or faint, when I read or listened to news about the coronavirus.	1.60 ± 0.98	125 (61.3)	57 (27.9)	11 (5.4)	1 (0.5)	10 (4.9)
2. I had trouble falling or staying asleep because I was thinking about the coronavirus.	1.53 ± 0.86	123 (60.3)	67 (32.8)	7 (3.4)	0 (0)	7 (3.4)
3. I felt paralyzed or frozen when I thought about or was exposed to information about the coronavirus.	1.48 ± 0.77	128 (62.7)	65 (31.9)	5 (2.5)	2 (1.0)	4 (2.0)
4. I lost interest in eating when I thought about or was exposed to information about the coronavirus.	1.50 ± 0.81	126 (61.8)	65 (31.9)	5 (2.5)	4 (2.0)	4 (2.0)
5. I felt nauseous or had stomach problems when I thought about or was exposed to information about the coronavirus.	1.51 ± 0.84	127 (62.3)	64 (31.4)	5 (2.5)	2 (1.0)	6 (2.9)
Total score	7.62 ± 4.08					

Table 4. Anxiety related to COVID-19 among PLHIV according to descriptive characteristics (*N* = 204)

Descriptive characteristics	Mean (SD) of CAS	*p*-value
Gender		
Male	7.50 (3.97)	0.65++
Female	7.76 (4.22)	
Age (years)		
18-29	5.38 (1.38)	< 0.05*+
30-49	7.68 (4.01)	
50-59	7.50 (3.73)	
≥ 60	9.16 (6.02)	
Marital status		
Single	7.61 (4.45)	0.20+
Married	7.43 (3.37)	
Others (divorced, separated, or widowed)	10.80 (3.96)	
Education		
Primary school	7.61 (3.64)	0.47+
Secondary school	7.44 (4.33)	
High school	6.18 (2.44)	
Vocational school	8.75 (4.35)	
Diploma	7.60 (2.51)	
Bachelor	9.58 (7.35)	
Employment status		
Employed	10.28 (4.51)	0.11++
Unemployed	12.02 (9.48)	
Monthly income (in Baht, $1 = 32 Baht)		
< 5,000	7.37 (4.14)	0.42+
5,001-10,000	8.22 (4.08)	
10,001-20,000	7.95 (4.50)	
20,001-30,000	5.62 (1.76)	
> 30,000	7.25 (2.21)	
Duration on ART (years)		
< 1	6.48 (2.87)	0.27+
1-5	7.80 (4.51)	
> 5	7.82 (4.08)	
Having family member or close friend infected with COVID-19		
Yes	7.96 (4.23)	< 0.05*++
No	7.41 (3.98)	
Resources of information on COVID-19		
Scientific resource	9.14 (4.16)	0.12+
Inner circle	8.09 (4.51)	
Social media	7.89 (5.33)	
Visual media	6.66 (3.35)	
Printed media	6.78 (2.48)	

**p < 0.05. +One-way ANOVA test. ++Independent t-test.*

Table 5. Associations between knowledge, preventive practices, and anxiety related to COVID-19 (*N* = 204)

Variables related to COVID-19	Anxiety related to COVID-19 correlation coefficient (*r*)	*p*-value
Knowledge	–0.33	< 0.05*
Preventive practice	0.22	< 0.05*

**Significance level at p < 0.05*

garding COVID-19. These variables showed a significant extent of the variance in anxiety related to COVID-19 among PLHIV in Thailand.

About 94.83% of the study participants were knowledgeable about COVID-19, demonstrating optimistic attitudes towards the COVID-19 pandemic. As for preventive practices, the individuals seriously adhered to precautionary measures to prevent COVID-19 infection, such as not going to crowded places and wearing a mask when leaving home. These findings are consistent with those of previous study among Iranians [25] using the same questionnaire. Also, our findings are in line with a study conducted among PLHIV in an ART clinic located in Kigali, Rwanda, which found that most participants reported a high knowledge score, good attitude, and appropriate practices towards COVID-19 [26]. Compared with a study done on general population of Thailand during early period of the pandemic [27], our participants reported higher scores of KAP. One explanation is that the current study was conducted at the later stage of COVID-19 pandemic, where the virus's pattern of morbidity has been reflected in public media worldwide, which has drawn the participants' attention and had a great impact on their KAP scores regarding COVID-19. In addition, social media are the most common information sources of COVID-19 in the current study. Unsurprisingly, social media, such as Line and Facebook, play a vital role worldwide in diffusion of information and sensitizing people regarding potential threat of COVID-19 [28]. Therefore, social media might be the appropriate platforms for controlling transmission of COVID-19.

Regarding anxiety related to the virus, our participants reported a mild level of anxiety related to COVID-19. This finding is inconsistent with a previous study conducted among middle-aged and older PLHIV in Lima, Peru, showing that a majority of patients expressed an increased anxiety (64%) since the beginning of pandemic [7]. The finding of the present study could be attributed to a connectivity to regular updates and COVID-19 information distributed daily by the Center for COVID-19 Situation Administration (CCSA) of Thailand via Thai television channels and social media, such as YouTube and Facebook [29]. Additional explanation is that our study was conducted during the later stage of the pandemic and the Thai government had officially announced easing of lockdown. Thus, this might be another contributing factor to mild level of anxiety related to COVID-19 among our participants.

Table 6. Factors predicting anxiety related to COVID-19 (N = 204)

Variables	B	SD	β	*t*	*p*-value
Constant	13.54	2.91	–	4.65	< 0.001
Age	0.715	0.36	0.13	1.96	< 0.05*
Knowledge on COVID-19	–0.889	0.18	–0.34	–5.04	< 0.05*
Preventive practice against COVID-19	0.58	0.14	0.26	4.01	< 0.05*
R = 0.449, R^2 = 0.202, adjusted R^2 = 0.166, F = 5.456, p < 0.05					

**Significance level at p < 0.05*

According to the results of our study, COVID-19 anxiety scores were greater in those aged 60 years and over. Our findings correspond with previous international evidence. Nguyen *et al*. [30] conducted surveys in March 2020 among 100 American older adults living with HIV during the COVID-19 pandemic. They found that older adults living with HIV were more anxious about contracting COVID-19 than young people. A possible explanation for our results may be as follows: When the older adults realize that they are more susceptible to COVID-19 infection than their younger counterparts and that the effective treatment for COVID-19 remains limited, they might become more anxious of being COVID-19-infected. Thus far, the clinical evidence shows that COVID-19 mortality and fatality rates are related to older ages [31, 32].

In addition, our findings demonstrated that the participants, who had family member or close friend infected with COVID-19 were more anxious than their counterparts. This could be explained by the fact that our participants were anxious and likely worried about their own health, their family member, or close friends health status, the transmission of COVID-19 to family members, and the uncertainty of disease progression. Being familiar with somebody who is infected with the virus enhance the perceived risk of getting infected, which can negatively impact the mental health of an individual [33]. Therefore, knowing someone in community, who is a confirmed case of COVID-19 can increase one's anxiety. Consistently, a recent study showed that anxiety proved to be prevalent among older adults living with chronic conditions, such as HIV [34]. This is congruent with a previous study conducted among adults aged above 50 years, who had lived with HIV for more than 10 years in Uganda. The participants reported high level of anxiety of contracting COVID-19, especially in a situation of having no one around to support them, with feelings of uncertainty and worry at the same time [35].

Interestingly, our results revealed a significant negative association between knowledge and anxiety related to COVID-19, suggesting that an increased knowledge of COVID-19 is associated with a decreased level of anxiety. This is in line with previous global evidence [18, 28, 36], and might be explained by the fact that in this study, most of the participants were knowledgeable about COVID-19 and their anxiety level was at a mild level. Thus, increased knowledge has enabled them to have a higher confidence that relieved anxiety, and to cooperate more fully with the government policies to control the spread of COVID-19 in Thailand. Moreover, it is crucial to recognize and support PLHIV by providing accurate COVID-19 knowledge, with simple strategies leading to reduce anxiety related to COVID-19. Many Thai PLHIV use social media as sources of credible information, but a spread of inaccurate knowledge and misinformation via social media might be a severe threat to individual' s mental health [37].

Moreover, there is a significant positive correlation between preventive practices regarding COVID-19 and anxiety related to COVID-19 in our participants. This finding is consistent with a study conducted among a population from 12 countries in Latin America and the Caribbean region, showing that the practices of preventive behaviors had a significant positive correlation on COVID-19 anxiety level among participants [38]. The explanation might be that anxiety related to COVID-19 may lead population to engage in preventive practices to protect themselves from infection, which has been evident in previous studies related to preventive practices during time of health crisis as COVID-19 [39, 40]. Nevertheless, recent evidence from most studies conducted among people living without HIV demonstrated that the coronavirus may not replicate in this population. Further studies are needed to clarify causal relationships between these variables.

Regarding the predictors of anxiety related to COVID-19, our finding showed that age, knowledge of COVID-19, and preventive practices regarding COVID-19, were the significant predictors of anxiety related to COVID-19. These findings are consistent with those of Delle Donne and colleagues, who discovered that increasing age was a significant predictor of a higher risk of negative psychological outcomes, including anxiety related to COVID-19, among PLHIV in Italy [13]. Additionally, this finding is in line with study conducted in Peru by Diaz and colleagues, demonstrating that older age was a statistically significant predictor of poor mental health outcomes in PLHIV, as in more than two-thirds of participants expressed more anxiety compared with before the COVID-19 pandemic [7]. It is likely that the contribution of older age resulted in negative mental health outcome (anxiety related to COVID-19) in PLHIV, as reflected in our study, in which those aged 60 years and over reported anxiety compared with pre-pandemic time. Furthermore, our findings confirmed that

knowledge of COVID-19 and preventive practices regarding COVID-19 were significant predictors of anxiety related to COVID-19. These is in line with findings of Anikwe and colleagues, who discovered that COVID-19 knowledge and its preventive practices were significant predictors of anxiety related to COVID-19 among female patients in Ebonyi State, Nigeria [41]. The explanation for this result can be that increased knowledge has always enabled individuals to possess higher confidence, which relieves anxiety, cooperating more entirely with government policies to control the transmission of COVID-19. Moreover, in our study, preventive practices regarding COVID-19 have apparent sufficiency, which is also significant predictor of participants' anxiety related to COVID-19. A higher use of preventive measures against COVID-19 was associated with an increased anxiety level, described by Wong *et al.* [42]. A possible explanation for this finding is that our study was conducted at the later stage of the pandemic in Thailand, where the government and social media networks (i.e., Facebook and Line application) had profoundly emphasized the prevention of COVID-19 infection during our data collection period. Furthermore, the easy availability and accessibility of health information online improve COVID-19 knowledge among individuals [43]. As a result, our participants might be knowledgeable about COVID-19.

Findings of our study indicate that PLHIV are another key population, whose mental health has been affected during the COVID-19 pandemic, and requires further attention, such as increase of mental health services. There may be an increase in the number of PLHIV, who seek mental health services following the outbreak. Nevertheless, it is of note that mental health impact due to COVID-19 may not be immediately apparent for every HIV-positive individual following the pandemic. Perhaps in the coming years, there will be a higher need for mental healthcare providers to support the mental health of previously COVID-19-infected individuals [44]. Preventing, detecting, and promptly responding to mental health issues should be an important component of short- and long-term global health efforts for this vulnerable population.

Study limitations

The limitations of the study need to be acknowledged. Firstly, this was an online survey study and data were collected using social media platform (Line application). Therefore, Thai PLHIV who participated in the study were those with the Internet access only. During data collection period, it was not feasible to conduct face-to-face interview because of COVID-19 outbreak. Thus, the online survey was a vital alternative for the current study. Secondly, this study used a cross-sectional study design and self-administered questionnaires; therefore, it was difficult to establish causal inferences. Thirdly, the study was conducted in only one location in semi-rural area of Thailand, and this might not allow generalizability of the findings to other locations. Lastly, data collection was conducted at the later stage of COVID-19 pandemic in Thailand; therefore, our findings might differ from the early period of the pandemic. Despite the limitations, the findings of the current study have important implications for healthcare services during the time of health crisis. Healthcare providers may formulate and implement response plans to tackle COVID-19 pandemic among PLHIV. Our study is the first step to assess anxiety related to COVID-19 among such vulnerable population.

Conclusions

This study provides preliminary evidence of anxiety related to COVID-19 reported by Thai PLHIV in a selected hospital. Our findings showed that Thai PLHIV possessed adequate knowledge, demonstrated an optimistic attitude, and conducted practices appropriate for preventive behaviors against COVID-19 infection. Also, they reported a mild level of anxiety related to COVID-19. Additionally, our findings suggest that anxiety level is high in those aged 60 years and over and in those, who had a family member or close friend infected with COVID-19. There were associations between knowledge, preventive practices, and anxiety related to COVID-19. Age, knowledge, and preventive practices regarding COVID-19 are significant predictors of anxiety related to COVID-19. Caring for mental health among PLHIV should be a concern in the context of the outbreaks of emerging infectious diseases, such as the COVID-19 pandemic.

Disclosures

1. Institutional review board statement: The study protocol was reviewed and approved by the Institutional Review Board (IRB) of College of Nursing in Thailand (approval number: 045/2563).
2. Assistance with the article: None.
3. Financial support and sponsorship: None.
4. Conflicts of interest: None.

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