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Antiretroviral Therapy Adherence among Patients living with HIV/AIDS in Thailand

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Abstract

The importance of antiretroviral therapy adherence for patients living with HIV/AIDS has been well documented. Despite this critical need, many do not follow prescribed regimens. To examine barriers that lead to non-adherence, we used a cross-sectional survey data from a randomized controlled intervention trial in the northern and northeastern Thailand. Of the 507 patients enrolled in the trial, we analyzed 386 patients on antiretroviral therapy to examine the barriers to adherence. In addition to demographic characteristics, depressive symptoms, physical health, access to care, social support, and internalized shame, HIV disclosure and family communication were examined. Correlation analysis revealed that adherence is significantly associated with internalized shame, access to care, depressive symptoms, and family communication. Based on the multiple logistic regression analysis, depressive symptoms ($p < .03$), access to care ($p < .02$), HIV disclosure ($p < .03$), and family communication ($p < .03$) were significant predictors of adherence. Having depressive symptoms remains a significant barrier to adherence, while access to care, HIV disclosure, and family communication play important positive roles. Our findings underscore the critical importance of addressing these various challenges that may influence adherence.

Keywords

adherence; antiretroviral therapy; HIV; Thailand

INTRODUCTION

Antiretroviral therapy (ART) is considered a breakthrough in the battle against HIV/AIDS (Deeks et al., 1997; CDC, 1997; Jones et al., 2007; Crum et al., 2006; Simoni et al., 2008). Available data suggest that long-term treatments with 95% adherence or more could suppress the augmentation of viral loads, improve immune system functioning (Paterson et al., 2002; Chesney, 2003), and reduce HIV/AIDS–related mortality and morbidity (Kalichman et al., 1999; Crum et al., 2006), transforming the disease into a chronic treatable condition. At the same time, evidence shows that lack of adherence can lead to failure of the treatment and even accelerated development of drug-resistant HIV (Amberbir et al., 2008) as well as more rapid progression to AIDS (Bangsberg et al., 2001). Therefore, adherence to prescribed ART regimens becomes an important predictor of treatment success, which has direct impact on the disease progression and patients' quality of life (McInerney et al., 2008).

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Over a decade of studies examining ART adherence in the United States and Europe has identified important factors impacting ART adherence (Simoni et al., 2008). ART adherence research to date includes methodologically rigorous investigations, randomized controlled trials, and systematic reviews examining various factors associated with ART adherence, including the optimal levels of adherence (Bangsberg et al., 2007), association of adherence and viral load suppression (Garner et al., 2008), adherence assessment methodologies (Simoni et al., 2006), predictors and correlates of adherence (Mills et al., 2006), and conceptualization of adherence (DiIorio et al., 2009). In addition, lessons learned from adherence literature identified distinct categories of factors associated with ART adherence: the patient factor, the medication factor, the patient-healthcare provider relationship factor, and the medical care infrastructure factor (Chesney, 2000). For the patient factor and medication factor, failure to adhere to ART may be characterized as erratic, unwitting, or intentional (Donovan & Blake, 1992). Erratic non-adherence refers to patients who know and understand what to do, but for various reasons do not comply with medication instructions (e.g., too busy, forgetful, run out of medicine); unwitting non-adherence refers to patients who fail to take the medication because they do not understand dosing schedules (e.g., due to a compromised psychological state); and intentional non-adherence refers to patients who give multiple reasons for not following their regimen (e.g., the regimen is too complex, it interferes with their lifestyle) (Donovan & Blake, 1992). We observed these behaviors during the early phase of ART introduction in the United States, where challenges to adherence were caused by the complex and inconvenient nature of ART therapy (i.e., many pills to take on a very stringent time schedule, often with visible physical side effects) (Remien et al, 2003). In addition to the patient and medication factors associated with non-adherence, research shows that system level factors (e.g., access to care) might also significantly impact adherence behaviors, directly or indirectly (Sharma et al., 2007).

Lessons learned from ART research in the United States and Europe have high relevance in ART adherence investigations in Thailand. While fewer than 2% nationally are HIV seropositive, over 610,000 Thais are living with HIV; most are adults older than 15 years (UNGASS, 2007). Therefore, ART adherence is a critical issue for People Living with HIV (PLH) in Thailand. As a result of the reduction in cost of ART in Thailand, the Thai Ministry of Public Health instituted the Access to Care (ATC) program that covered 6000 to 10,000 patients with HIV infection in 2002. In 2004, the National Access to Antiretroviral Therapy for People with HIV/AIDS Program provided more extensive access in 2004 to additional 50,000 Thai patients, and the number is expanding rapidly with additional support from the Thailand Social Security Health Care Scheme in late 2004 and the Universal Health Care Scheme in 2005 (Maneesriwongul et al., 2006).

As Thailand continues the widespread use of ART with PLH, similar challenges are anticipated (Ammassari et al., 2004). In addition, a growing body of evidence suggests that psychosocial factors, including depression, HIV-related stigma, family relationship, and HIV status disclosure, play an important role in ART adherence (Ammassari et al., 2004; Hartzell et al., 2007; Bouhnick et al., 2005; Ncama ee al., 2008; Tucker et al., 2003). Due to their physical debilitation and the psychological impact of coping with HIV infection, PLH remain a highly vulnerable group to social isolation (Singh et al., 1999), and social support may play a significant role in ART adherence (Ncama et al., 2008).

The various factors associated with ART adherence are interconnected. For example, lack of access to care may contribute to ART non-adherence, which in turn could lead to depression caused by physical illness (Sharma et al., 2007). Conversely, PLH's depression could be the result of adverse physical side effects caused by ART, HIV/AIDS-related stigma, strained family relations, and/or a lack of social support (Catz et al., 2000). Serostatus disclosure to significant others has been identified as an indicator of PLH's efforts to seek social support

(Chanard, 2007), although the importance of such support may be in making patients feel safe and wanted in their social circle, rather than being related directly to the disease (Molassiotis et al., 2002). Ultimately, increasing social support and reducing depressive symptoms may result in increased ART adherence (Yun et al., 2005).

As Thailand continues to expand programs to disseminate ART, an examination of the multidimensional factors associated with ART adherence is critical to informing future implementation efforts (Maneesriwongul et al., 2006). Based on the number of personal and social factors that have been identified as possible factors in ART adherence (Simoni et al., 2008; Ammassari et al. 2002; Fogarty et al. 2002; Ickovics et al. 2002), we applied the social cognitive theory (Bandura, 1997) as the guiding framework to examine the multidimensional factors associated with ART adherences. This conceptual model has been successfully applied in the examination of ART adherence (DiIorio et al., 2009). In this study, we examined access to care, social support, family relationships, HIV disclosure, depressive symptoms, and HIV-related stigma.

METHODS

This study uses the baseline data from a randomized controlled family intervention trial designed to improve the quality of life of PLH in the northern and northeastern regions of Thailand (Li et al., 2009, Lee et al., in press). These data were collected in 2007 from four district hospitals in the two regions (two district hospitals per region). The PLH were recruited when they sought medical care from the study hospitals. Health care workers at the hospital informed PLH of the study and interested patients were introduced to the research staff. Research staff specifically hired for the study introduced the study purpose and procedure. Once PLH voluntarily agreed to participate in the study, written informed consent was obtained. Following informed consent, a trained interviewer administered the baseline survey to PLH using computer assisted personal interview (CAPI). The refusal rate for study recruitment was about 7%. Approval of this study was obtained from Institutional Review Boards of the University of California, Los Angeles, and the Thailand Ministry of Public Health Ethical Review Committee for Research in Human Subjects.

Among the 507 PLH enrolled in the intervention trial, 386 PLH (76%) were currently on ART at the time of the assessment. Only those participants who were currently on ART were included in this study. During the interview, participants were asked about their age, gender, annual income, educational status, and questions about their perceived stigma, social support, physical health, access to care, depressive symptoms, HIV disclosure, and family functioning.

Measures

Internalized shame was measured as a subscale of HIV-related stigma, based on the work of Herek and Capitanio (1993), and validated by the Thai investigators in Nakhon Ratchasima Province, Thailand (Apinundecha et al., 2007). The subscale was based on nine items (e.g., I am punished by evil; My life is tainted; I am a disgrace to society). Response categories ranged from 1 (strongly disagree) to 5 (strongly agree). Composite scores were created for *internalized shame* (range = 9–45). The Cronbach's $\alpha = 0.80$ for this scale suggested high inter-item reliability.

Social support was constructed as a composite variable based on the Medical Outcomes Study Social Support Scale (Sherbourne & Stewart, 1991) and was used in the same group in Thailand (Li et al., 2009). The scale reflects tangible social support, consisting of four items: 1) someone to help you if you are confined to bed; 2) someone to take you to a doctor if you need it; 3) someone to prepare your meals if you are unable; and 4) someone to help

you with daily chores if you are sick. Responses to individual items ranged from 1 (none of the time) to 5 (all of the time). This summative composite score ranged from 4 to 20, with a satisfactory internal consistency (α = 0.81).

Physical health was assessed by the MOS-HIV physical health subscale, consisting of six items (Revicki et al., 1998) and was used in the sample population in Thailand (Li et al., in press). PLH were asked what activities they might do during a typical day. They were asked to report how much their health limited these activities (0 = not limited; 1 = marginally limited; 2 = greatly limited). The six items were: 1) vigorous activities such as lifting heavy objects, running, or participating in strenuous sports; 2) moderate activities such as moving a table or carrying groceries; 3) walking uphill or climbing; 4) bending, lifting, or stooping; 5) walking around for one block; and 6) eating, dressing, bathing, or using the toilet. The subscale was transformed into a 100-point scale with high internal consistency (α = 0.83).

Access to care was measured by using seven items created into a single composite variable as a proxy to access to care: 1) I have regular visits to my doctor or medical providers; 2) If I get sick, I know where to go get treatment; 3) If I need more information about my illness, I know where to get it; 4) I know to go for my check-up regularly even when I am not sick; 5) I know where to get information to protect myself from getting sick (e.g., opportunistic infections); 6) I know where to get information to eat right to get proper nutrition to stay healthy; and 7) I know where to get information to exercise to stay healthy. The Cronbach's α for this variable was 0.55

Depressive symptoms was assessed with a 15-item screening test that was developed and used previously in Thailand (Thai Department of Mental Health, 2006). As a screening tool, this measure captures depressive symptomatology and has been used in this population (Li et al., 2009, Rotheram-Borus et al., 2009). These questions asked about problems that had bothered participants in the past week (e.g., feeling depressed most of the time; feelings of hopelessness or worthlessness; loss of self-confidence; fear of death), with response categories from 0 (not at all) to 3 (usually [5–7 days a week]). A summative composite scale was developed, with a range of 0 to 45 and an excellent internal consistency (α = 0.91).

HIV disclosure was a single composite measure based on the extent to which PLH disclosed their serostatus to various people (0 = no one, 1 = some, 2 = all) (e.g., sexual partners, co-workers, family members outside of their household, healthcare workers, village leaders, village health volunteers, or other people in the community). Based on the eight items, a summative composite scale was developed, with a range of 0 to 16 (α = 0.79). (Lee et al, in press).

Family functioning (communication) was a subscale from the Thai Family Functioning Scale (TFFS), which was adapted from the Family Assessment Device (FAD) developed by the Butler/Brown Family Research Group. The FAD is based on the McMaster Model of Family Functioning (Epstein et al., 1983). Consisting of eight items (e.g., family members hardly expressed their love and care; I could not tell what my family members felt by the words they spoke; when family members got mad, they did not talk to each other), it is scored on a 0 (never) to 3 scale (always). A summative composite subscale was developed, with a range of 0 to 24 (α = 0.65) and was validated among this group (Rotheram-Borus et al., 2009).

Socio-demographic characteristics included gender, age (in years), marital status, education, employment status, years since HIV diagnosis, and annual income.

Data Analysis

All analyses were performed using SAS statistical software version 9.1 (SAS Institute, Inc., Cary, NC). Descriptive statistics were used to describe PLH's treatment adherence by demographics, followed by calculating Pearson correlation coefficients to examine the relationships between ART adherence, demographics, internalized shame, social support, physical health, access to care, depression, HIV disclosure, and family functioning. These variables were determined *a priori* to be included in the logistic regression model, based on existing literature and previous studies. The logistic regression model was performed with the ART adherence variable, simultaneously controlling for participants' demographic characteristics, internalized shame, social support, physical health, access to care, depression, HIV disclosure, and family functioning. For the final logistic regression model, continuous predictors (e.g., internalized shame, social support, access to care) were transformed into dichotomous variables by designating the median value as the cut-off point. The significance of the predictors remained consistent to the model where the predictors were considered as continuous variables. The transformation was done to facilitate interpretation of the findings. Odds ratios from multiple logistic regression estimation and their significant levels (*P* values) are reported.

RESULTS

Demographic Characteristics of the Sample

Participant age ranged from 23 to 64 years (Table 1), with a mean age of 38.0 years (SD = 6.4). The majority of participants were women (67.3%). The high percentage of women in the sample reflects the result of the heterosexual transmission in the region, with a large proportion of women who lost their husbands due to AIDS and subsequently finding out about their HIV status. Most participants (85.4%) had less than a high school education. Most PLH on ART reported being employed (84.5%) and reported being married/living with a partner (59.3%). The average individual annual income was 30,623 baht per year (equivalent to US$875). Over a third of the PLH on ART (37.6%) reported knowing their serostatus for more than seven years.

ART Adherence

Almost a third (n=121; 31.4%) of PLH reported ever forgetting to take their prescribed ART. We found no significant differences in demographic characteristics (gender, age, education, employment, marital status, and years since diagnosis) when examining the relationship with never forgetting ART medication, with the exception of personal income. PLH who reported failing to adhere to ART reported significant higher income ($P < 0.05$) (Table 1).

Among the 121 PLH who reported failing to adhere to ART, 49 PLH (40.5%) reported failing to adhere to ART in the past month. A majority of the PLH who reported failing to adhere to ART in the past month reported that they simply forgot to take the medication (78%) (Table 2). About a fifth of the PLH (18%) reported that the reason for non-adherence was because they were afraid of stigma if their HIV status was disclosed. Other reasons given were: trouble visiting doctor (6%); running out of medication (6%); not understanding the medication or believing that the medication would not help (6%); and being too sick to retrieve the medication from the hospital or wanted to avoid side effects (4%).

Correlation Analyses

The correlation coefficients among ART adherence, demographic characteristics, social support, internalized shame, physical health, access to care, depression, HIV disclosure, and family functioning are presented (Table 3). Significant negative correlations were observed

between ART adherence and internalized shame ($r = -0.12$, $P < 0.05$) and depression ($r = -0.15$, $P < 0.05$). On the other hand, significant positive correlations were found between ART adherence and access to care ($r = 0.14$, $P < 0.05$) and positive family functioning ($r = 0.15$, $P < 0.05$). As expected, internalized shame was negatively correlated with physical health ($r = -0.26$, $P < 0.0001$) and positively correlated with depression ($r = 0.44$, $P < 0.0001$). Physical health was also negatively correlated with depression ($r = -0.38$, $P < 0.0001$) and positively correlated with family functioning ($r = 0.11$, $P < 0.05$), which was positively correlated with access to care ($r = 0.12$, $P < 0.05$) and negatively correlated with depression ($r = -0.24$, $P < 0.0001$).

Significant correlations were also found among PLH's demographic characteristics and tangible social support, internalized shame, physical health, access to care, depression, HIV disclosure, and family functioning. For example, being female was significantly correlated with depression ($r = 0.15$, $P < 0.05$) and education was positively correlated with tangible social support ($r = 0.22$, $P < 0.0001$), access to care ($r = 0.11$, $P < 0.05$), and family functioning ($r = 0.13$, $P < 0.05$).

Logistic Regression Analyses

Table 4 outlines the logistic regression model examining factors associated with ART adherence. Controlling for demographic variables, depression remained a significant negative predictor to ART adherence (OR = 0.69, $P = 0.03$). In addition, higher access to care (OR = 1.98, $P = 0.02$), HIV disclosure (OR = 1.70, $P = 0.03$), and positive family functioning (OR = 1.74, $P = 0.03$) were all significantly associated with ART adherence. Internalized shame, physical health, and social support were not significant predictors of ART adherence in the final logistic regression model.

DISCUSSION

Antiretroviral therapy has transformed HIV infection into a treatable, chronic condition. However, successful treatment and sustained viral suppression require high levels of adherence to prescribed regimens. Our study revealed that ART adherence in Thailand remains a significant challenge. A modest percentage of participants (69%) on ART were committed to adequate adherence; if social desirability bias was taken into consideration, the real ART adherence rate could be lower. Among the 121 PLH who reported failing to adhere to ART, 49 PLH (40%) reported failing to adhere to ART in the past month. Challenges associated with ART are anticipated to escalate in Thailand. For example, given the high number of treatment experienced inpatients in Thailand, examination of virologic response and ART resistance are essential (Maneersriwongul et al., 2006).

PLH in Thailand displayed all three features of ART non-adherence (erratic, unwitting, and intentional). These findings are consistent with existing literature (Amberbir et al., 2008; Donovan & Blake, 1992), and suggest that PLH on ART in Thailand face the same type of challenges faced by patients in the United States and other countries. Murphy et al.(2000) found that patients who had predictable daily schedules often had an easier time adhering to ART. A common strategy was to tie their ART to routine daily events, such as eating breakfast or right before taking a child to school. As Thailand prepares to disseminate ART in more hospitals, it is important to understand how patients integrated ART in the context of their daily lives and what strategies should be used to motivate them to sustain good adherence.

Consistent with existing literature (Singh et al., 1996; Carrieri et al., 2006; Berg et al., 2007; Horberg et al., 2008), presence of depressive symptoms proved to be a barrier to ART adherence in this study. This finding sheds light on the complexity between the associations

of depressive symptoms with ART adherence. For example, ART non-adherence caused by other factors (e.g., adverse side effects) may cause PLH to develop depressive symptoms. On the other hand, PLH's depressive symptoms may directly contribute to the failure to adhere to ART. Our finding underscores the importance of addressing patients' mental health in order to improve ART adherence. Moreover, several factors showed a significant association with depressive symptoms in the univariate analysis, such as being female, internalized shame, or poor physical health. Although they were not significant in the multiple logistic regression analysis, these associations suggest "warning signs" healthcare providers should be aware of (e.g., more attention should be paid to female AIDS patients). Continuous efforts will be needed to reduce stigma and discrimination from the perspectives of the community and the patients themselves.

Having better access to care was significantly associated with better ART adherence. Our access to care measure captured whether PLH had regular visits to their doctors as where as whether they had knowledge on how and where to access care. This finding is important because having access to care can have direct positive effects on ART adherence as well as depressive symptoms. It is also evidence of the positive role that healthcare providers can play during ART. A study conducted in China showed that the patient-provider relationship positively impacted patients and their ability to maintain their health, especially when they were isolated from other sources of support due to intense AIDS stigma (Chen et al., 2007). Thailand has successfully expanded access to HIV treatment and support services for PLH and their families. ART has been included in the National Health Security Scheme, and the government issued two compulsory licenses for ART drugs (UNAIDS, 2007). As of 2007, the number of PLH in Thailand undergoing antiretroviral treatment reached 133,539 persons (UNGASS, 2008). The estimate of coverage of PLH who should receive ART—Thai standards include symptomatic and asymptomatic patients with a CD4 level lower than 200 cell/cu mm—was found to be 41.0% to 52.9% (UNGASS, 2008). Given the wide variation in potential barriers and challenges to basic access to care, our findings underscore the critical importance of ensuring access to care and positive patient-provider relationships in Thailand.

HIV disclosure was a significant predictor of increased adherence to ART, after adjusting for other variables. This is consistent with previous studies showing that HIV disclosure is a necessary facilitator to ART adherence (Ncama et al., 2008). Our findings suggest that it is very important for physicians to know their patients' disclosure status before administering ART, and disclosure should be discussed during pre-ART counseling. For those who have not disclosed their HIV status, providers should explain the importance of disclosure for the success of ART and help them to make a disclosure plan, if possible. However, as a general principle, the decision should be made by patients and providers should always respect their choice. Additional efforts should be made to ensure adherence for patients who do not wish to disclose their status (e.g., taking medication with routine daily events, using medication box). Furthermore, it is very important to establish a supportive environment that will facilitate the disclosure decision not only for the purpose of ART but also so PLH can lead a normal life.

Having positive family communication was a significant contributor to ART adherence, as family members provide medication reminders for daily treatment, support to overcome side effects, and reinforce a stable routine life. Moreover, patients who perceive a need to meet family responsibilities may be motivated to stay healthy (Watt et al., 2009). Contrary to some previous studies (Gonzalez et al., 2004; Vyavaharkar et al., 2007), we did not find a statistical association between social support and treatment adherence in either univariate or multivariate analyses. However, we showed that family communication was significantly

associated with social support and adherence, suggesting that social support may influence adherence through an associated increase in positive family communication.

This study shares with others some of the general limitations related to data based on patients' self-reports, which may be affected by social desirability or recall bias. Thus, the rate of treatment adherence reported in this study should be interpreted cautiously in light of possibility of a self-reporting bias. The ART measure we used in our study poses limitations (e.g., self-report on lifetime ART adherence, 30-day recall among non-adherent PLH). However, given that our measure of lifetime adherence is based on PLH reporting ever forgetting to take ART medicines, we believe that this is a measure of strict adherence and the rate of non-adherence in our study is conservative and would tend to underestimate the level of non-adherence. In addition, the 30-day recall follow-up question among those who reported ever forgetting to take ART is consistent with other studies using similar 30-day recall question. This measure has been used with the same population in Thailand (Rotheram-Borus et al., 2009). Second, as our analyses were limited to PLH who were already on ART, characteristics of the study participants may be different compared to PLH not on ART. Finally, because we used cross-sectional data for this study, our findings cannot be interpreted as causal relationships. Despite the limitations, our findings highlight the complex and multidimensional nature of ART adherence. For instance, HIV disclosure significantly impacts PLH's mental health, which in turn may influence ART adherence. In addition, lack of access to care may contribute to increased depressive symptoms as well as not having enough resources to assist PLH with HIV disclosure, which in turn influences their ART adherence. Further studies on HIV disclosure, access to care, depressive symptoms, and family functioning are necessary to gain better understanding of their relationship with ART adherence.

Our study underscores the critical importance of establishing a comprehensive therapeutic alliance between patients and clinicians to assess and address the various factors that influence a patient's treatment adherence in developing countries where the second line of ART regimen is not readily available. These identified factors are amenable to health and behavioral intervention. For example, depressive symptoms should be recognized and treated in a timely way. A multidisciplinary approach is necessary to address psychological, social, and behavioral challenges. Based on our study findings and past lessons learned from past behavioral interventions in resource-poor developing countries (Simoni et al., 2008), we are currently mounting an intervention trial to examine the barriers and concerns around ART adherence within the district hospitals in northern and northeastern Thailand. The findings from this study will shed light on the design of future interventions and programs addressing the barriers and challenges around ART adherence in Thailand and other countries.

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Table 1

Characteristics of PLH by ART adherence (N = 386).

	ART Adherence		
Characteristics	**Yes 264 (68.6%)**	**No 121 (31.4%)**	**Total n (%)**
Gender			
Female	179 (67.8%)	80 (66.1%)	259 (67.3%)
Male	85 (32.2%)	41 (33.9%)	126 (32.7%)
Age			
< = 30 years old	22 (8.3%)	15 (12.5%)	37 (9.7%)
31–40 years old	158 (60.3%)	70 (58.3%)	228 (59.7%)
41–50 years old	74 (28.2%)	27 (22.5%)	101 (26.4%)
> 50 years old	8 (3.1%)	8 (6.7%)	16 (4.2%)
Education			
Less than elementary	45 (17.8%)	11 (10.0%)	56 (15.4%)
Elementary/Junior	175 (69.2%)	79 (71.8%)	254 (70.0%)
> = Some high school	33 (13.0%)	20 (18.2%)	53 (14.6%)
Employment			
Employed	219 (82.6%)	107 (88.4%)	326 (84.5%)
Unemployed	46 (17.4%)	14 (11.6%)	60 (15.5%)
Marital Status			
Married/cohabit	151 (57.6%)	76 (62.8%)	227 (59.3%)
Divorced/separated	39 (14.9%)	17 (14.1%)	56 (14.6%)
Widowed	70 (26.7%)	26 (21.5%)	96 (25.1%)
Never married	2 (0.8%)	2 (1.7%)	4 (1.0%)
Personal income[a]			
< = 35000 baht	200 (75.8%)	67(55.4%)	267 (69.2%)
35001–55000 baht	44 (16.6%)	34 (28.1%)	78 (20.2%)
> = 55001 baht	21 (7.9%)	20 (16.5%)	41 (10.6%)
Years since diagnosis			
> 7 years	102 (38.5%)	43 (35.5%)	145 (37.6%)
< = 7 years	163 (61.5%)	78 (64.5%)	241 (62.4%)

[a] $p < .05$.

Table 2

Reasons for not adhering to ART in the past month (N = 49).

Reasons	N	%
Forgot to take the medication	38	78%
Afraid of stigma if HIV status is disclosed to others	9	18%
Trouble visiting a doctor at a hospital	3	6%
Ran out of the medications	3	6%
Believed medications cannot help them/did not understand the methods	3	6%
Too sick to get medication at the hospital/wanted to avoid side effects	2	4%

Table 3

Correlation coefficients and significance levels across demographics and predictors of ART adherence.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. ART adherence	1													
2. Female	.03	1												
3. Age	.01	.13[a]	1											
4. Education	−.02	.02	.18[a]	1										
5. Annual income	−.05	−.09	.06	.10	1									
6. Marital status	−.04	−.19[a]	.16[a]	−.05	−.02	1								
7. Employed	−.07	−.08	.02	−.01	.05	.24[b]	1							
8. Years since diagnosis	.03	.17[a]	.10	.01	−.03	−.03	−.02	1						
9. Social support (tangible)	.03	.06	.04	.22[b]	.08	.01	−.06	.04	1					
10. Internalized shame	−.12[a]	.05	−.06	−.16[a]	.02	−.04	.01	.00	−.05	1				
11. Physical health	.02	−.02	.04	.07	.04	.07	.14[a]	.01	.01	−.26[b]	1			
12. Access to care	.14[a]	.04	.01	.11[a]	−.03	.08	.05	.07	.11	−.08	.06	1		
13. Depressive symptoms	−.15[a]	.15[a]	.06	−.02	−.05	−.03	−.04	.07	−.08	.44[b]	−.38[b]	−.01	1	
14. HIV disclosure	.09	.19[a]	−.04	−.02	−.08	−.17[a]	.03	.17[a]	.08	.01	−.06	.04	.09	1
15. Family functioning (communication)	.15[a]	.01	−.08	.13[a]	.08	.03	−.04	−.07	.43[b]	−.10	.11[a]	.12[a]	−.24[b]	.04

[a] $p < .05$

[b] $p < .0001$

Table 4

Multiple logistic regression examining predictors of ARV adherence.

	95% Confidence Limits			
	Odds Ratio	**Lower**	**Upper**	***P***
Female	1.023	0.63	1.71	0.90
Age	1.11	0.66	1.87	0.69
Married	1.10	0.84	1.45	0.50
Education	0.67	0.36	1.24	0.21
Employment	0.60	0.30	1.20	0.15
Years since diagnosis	0.97	0.60	1.57	0.89
Internalized shame	0.83	0.51	1.36	0.46
Social support (tangible)	1.07	0.68	1.71	0.76
Physical health	1.23	0.76	1.99	0.40
Depressive symptoms	0.69	0.41	0.98	0.03
Access to care	1.98	1.10	3.59	0.02
HIV disclosure	1.70	1.07	2.70	0.03
Family functioning (communication)	1.74	1.06	2.83	0.03