

# Assessment of factors associated with suboptimal adherence of HIV antiretroviral therapy in Asia: a systematic review

Jessica Audrey<sup>1</sup>, Ayers Gilbert Ivano Kalaij<sup>1</sup>, Fanny Michelle<sup>1</sup>

<sup>1</sup>Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia

## Correspondence should be addressed to

Jessica Audrey, Faculty of Medicine, Universitas Indonesia, Jl. Salemba Raya No. 6, Jakarta 10430, Indonesia.

E-mail:  
jsaudrey8@gmail.com

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## Abstract

**Introduction** Despite efforts done to battle human immunodeficiency virus (HIV) infection, it still remains as one of the leading cause of deaths worldwide. Asia sits as the second region with most HIV prevalence worldwide. Non-adherence to antiretroviral therapy (ART) is one of the factors which contribute to treatment ineffectiveness. Plenty of studies have tried to research on this problem, yet reviews regarding non-adherence factors in Asia are still lacking.

**Objective** To analyze factors associated with ART suboptimal adherence in Asia

**Methods** A systematic review was conducted through PubMed, Scopus, and CENTRAL, searching for observational studies which analyze factors contributing to ART non-adherence in Asia. Studies selected were then assessed for bias risk with STROBE's criteria.

**Results** The search yielded twenty observational studies with a total of 18,546 subjects, consisting of 16 cross-sectional studies and 4 cohort studies. Non-adherence to ART was associated with a number of factors. Personal factors, such as gender, age, and personal backgrounds, as well as socioeconomic factors, such as one's education level and monthly income were significantly associated with adherence. Psychological health of HIV patients also affected their adherence to treatment. Furthermore, distance to health care facilities and patients' relationship with health care providers were also important.

**Conclusions** To conclude, addressing factors related to treatment non-adherence is important to enhance treatment effectiveness. Knowledge of these factors is hoped to help improve strategies and guidelines for ART adherence, especially in Asia, therefore helping to increase treatment effectiveness and reducing HIV mortality worldwide.

**Key words:** human immunodeficiency virus, antiretroviral therapy, adherence, Asia

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## Introduction

Despite various efforts aimed to address this problem, human immunodeficiency virus (HIV) still remains as one of the most prevalent yet incurable infectious disease. According to WHO, HIV has infected 75 million people worldwide and approximately, 32 million of them have died since the beginning of its epidemic.<sup>1</sup> The treatment of antiretroviral therapy has been initiated in countries and regions, due to the concern of the development of acquired immunodeficiency syndrome (AIDS) as the next phase of HIV infection. However, 37.9 million people worldwide were still living with HIV in 2018. It is also highlighted that HIV still remains as one of the leading causes of death worldwide as stated by WHO.<sup>1,2</sup>

A study of global, regional, and national prevalence of HIV showed that the highest prevalence of HIV was found in the region of Africa. In 2017, South Africa had the highest number of new infection with 0.28 million new cases per year.<sup>3,4</sup> Thus, plenty of researches have been done in order to eliminate and conquer the HIV/AIDS epidemic in Africa. Surprisingly, next to Africa, Asia sits next as the region with the second highest HIV prevalence, claiming 16% of all HIV prevalence worldwide. Unfortunately, studies assessing HIV in Asia are still lacking.<sup>4</sup>

Currently, antiretroviral therapy (ART) is the first-line therapy in treating HIV patients, as it decreases the viral load and suppresses the virus.<sup>4,5</sup> Even though ART coverage has increased by 90% across all age groups since 2008, HIV prevalence remains high as shown by the stagnant of change in its incidence.<sup>3,6</sup> Non-adherence to ART is one major concern that contributes to this problem. A nationwide study conducted in Asia has revealed that 29.6% of HIV patients had suboptimal adherence to

ART.<sup>7</sup> Adherence to medication itself actually plays a crucial role in treatment outcomes, therefore, addressing factors related to adherence could be a breakthrough in making the treatment more effective.<sup>8</sup>

To the authors' knowledge, currently no study has comprehensively reviewed the factors related to ART non-adherence specifically in Asian settings, though such review is desperately needed considering the high HIV prevalence in Asian population. Thus, this systematic review aims to assess ART non-adherence factors in Asian HIV patients. Through this endeavor, hopefully, the results of this review can help to improve guidelines of ART adherence in Asian population, as an integral part of achieving United Nations' Sustainable Developmental Program target 3.3 in 2030, which is to ensure healthy lives regarding universal health coverage, via UNAIDS 90-90-90 strategy with the goal of reducing the mortality rate in HIV.<sup>4,5,8</sup>

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## Materials and Methods

### Search strategy

This systematic review of clinical trials is conducted based on PRISMA statement. We explored PubMed, Cochrane Controlled Register of Trials (CENTRAL), Scopus databases up to 10 November 2019 using the following keywords or terms: "ART OR antiretroviral therapy", "adherence", "factors OR risk factors OR factors associated", and "Asia". We limited our literature search to studies with English or Bahasa Indonesia language, as these were the languages compatible with the authors.

### Inclusion and exclusion criteria

Studies were screened according to the inclusion criteria as follows: (1) studies of factors influencing ART adherence with extractable outcomes, (2) observational study design, namely cohort, case-control,

and cross-sectional studies, and (3) conducted in Asian countries. Afterwards, exclusion criteria were also set, which include (1) irretrievable full-text articles, and (2) inappropriate study types or design. Details of study search strategy are shown in **Figure 1**.

### Data extraction and risk of bias assessment

Subsequently, we extracted data from our selected articles, which include author and year of publication, study design and settings, sample size, mean or range of age of samples, and outcomes as expressed by odds ratio of each factors. Articles were also assessed in terms of quality by using the STROBE's criteria (Strengthening the Reporting of Observational Studies in Epidemiology). The checklist consists of 22 criteria, each scores for one point, with a total maximum of 22 points. Quality assessment was done collaboratively by three reviewers until consensus were reached. Risk of bias assessment was provided in **Appendix 1**.

## Results

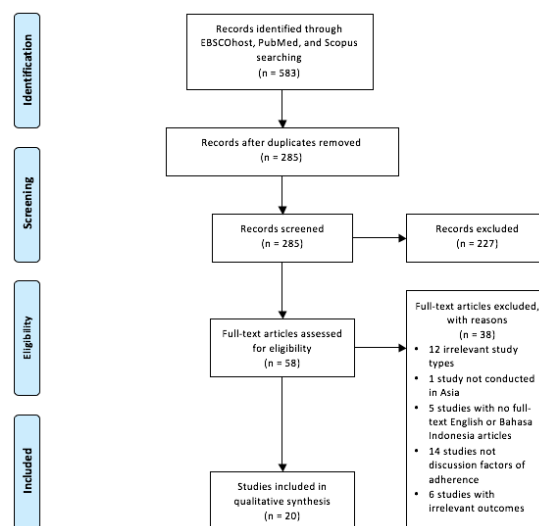
### Study selection

The process of literature searching and selection is illustrated in Figure 1. Initial search from PubMed, EBSCOhost, and Scopus yielded a total of 583 studies. Duplicates were removed, titles and abstracts

### Study characteristics and outcomes

Study characteristic included in this review are shown in **Table 1**. Overall, this review included a total of 18,546 patients. Out of the 20 included studies, 16 were cross-sectional studies and the remaining 4 were cohort studies. Study locations varied across Asia. Outcomes were factors which

were significantly related to ART non-adherence, provided in odds ratio (OR) with their corresponding p-values.



**Figure 1.** Diagram flow of literature search strategy

In terms of risk assessment, out of all studies, the lowest calculated STROBE score was 17.00 out of 22.00 (range: 17.00 to 21.47). This means that in all studies, more than two-thirds of the criteria were fulfilled ( $>14.67/22.00$ ), indicating that the included studies were of low risk of bias and relatively good qualities

## Discussion

### Analysis of the study

Based on the above included studies, we classified the factors into personal-related, socioeconomic, psychological, and healthcare-related factors

#### *Personal-related factors*

Some personal-related factors are associated with elevated risk of non-adherence to ART in HIV/AIDS patients. According to Kim J et al<sup>9</sup>, female gender was a risk factor

for suboptimal adherence to ART compared to male (OR = 1.60), although most HIV-infected individuals were males.<sup>9</sup> This study is in line with cross-sectional studies by Pokhrel<sup>15</sup>, Wasti<sup>16</sup>, and Bhattacharya<sup>27</sup> which also found that being female increased non-adherence to ART by 2.52, 6.91, and 3.15 times respectively. However, one study by Yathiraj<sup>11</sup> demonstrated a different outcome, showing that females were instead more adherent to ART (OR = 0.5). This may be due to the fact that many of the female participants in this study were widows, living with their families who might prompt to always remind them in terms of taking their medications regularly. Similarly, several previous studies also showed that males were more adherent than females.<sup>29-33</sup> These findings indicated that gender correlation to ART adherence was still inconsistent and differed between studies, probably depending on study locations as cultures and gender views differed between countries and ethnic groups. Abdulrahman<sup>28</sup>, for example, in his study showed that Chinese tend to be less adherent to ART (OR=2.01), again implying the possible roles of social cultures toward personal adherence.

Furthermore, age is another factor associated with adherence to ART. Xu<sup>24</sup>, in his study, found that younger patients under 19 years old (16-19 years) were more likely to be adherent to therapy (OR=0.575). On the other hand, study by Kim showed that patients being in their 20s and same or over 50s were significantly associated with non-adherence to ART than those in their 30s (OR 1.6 and OR 1.4 respectively).<sup>9</sup> A plausible explanation for this is the difference in activity and memory of patients across age groups. The 20s patients are still that young that could have too much that they should handle which leads to forgetting of ART consumption. This is also supported by a study by Vinikoor<sup>34</sup> which found that 16- to 29-year-old HIV patients were more likely to have health-neglecting behaviors in relation with the tendency of young adults to

overwork. Yet, factors influencing adherence in each age groups were so diverse, such that it may be difficult to predict which group was most likely to be non-adherent. It is highly dependent on the specific characteristics of the population, therefore, suggesting the need to comprehensively assess each population traits in order to effectively address problems related to adherence in specific regions.

#### Social, economic, and environmental factors

Socioeconomics status, including education levels and social environment, are found to be one of the major risk factors of non-adherence of ART in HIV/AIDS patients. Kim, in his study, found that lower socioeconomic status was a risk factor for non-adherence to ART (OR = 2.10).<sup>9</sup> Lower socioeconomic status is associated with difficulties in dealing with the cost of medical treatment and transportation, prompting them to neglect treatment.<sup>35</sup> Study by Abdulrahman<sup>28</sup> further supported this claim by showing that higher monthly income was associated with optimal adherence (OR=0.28 and 0.19).

A lower socioeconomic status is usually accompanied by lower educational level, thus, lacking awareness in the importance of regular medications which is often associated with low general health perceptions (OR=3.58), thereby negatively affects adherence.<sup>36</sup> Muessig<sup>25</sup> found that having high school, middle school, and less than primary school as last education increases non-adherence by 3.39, 3.31, and 4.52 times. This is consistent with a study by Nguyen<sup>10</sup> included in the above review, which stated that having higher education is a protective factor which reduces the suboptimal adherence to ART (OR=0.36). These results emphasize the importance of educating the public on the importance of medication adherence in HIV/AIDS patients, especially those with a lower socioeconomic status.<sup>9,35</sup>

Table 1. Study characteristics

Author and Year (STROBE score)	Study Design	Location	Sample Size	Range/mean of sample age	Outcome	OR	p value
Kim J et al, 2018. <sup>9</sup> (20.60/22)	Cohort Prospective	Korea	8501	0-50 years	<b>Health-related factor</b>		
					Requiring prophylactic antibiotics	1.70	<0.0001
					Having a history of malignancy	1.60	<0.0001
					Being diagnosed in the earlier years	1.60 to 3.80	<0.0001
					<b>Personal-related factor</b>		
					Female gender	1.60	<0.0001
					Age of 0-19 and same or over 50	1.60	<0.0001
					Age 30-39	1.40	<0.0001
					<b>Socioeconomic factor</b>		
					Lower socioeconomic status	2.10	<0.0001
Nguyen NT et al, 2016. <sup>10</sup> (20.50/22)	Cross-sectional	Vietnam	1050	35.6 years	<b>Psychological factor</b>		
					Greater nicotine dependence	1.10	0.049
					Currently feeling anxiety	1.60	<0.01
					Current smokers reporting current pain	1.92	<0.01
					<b>Socioeconomic and environmental factor</b>		
					Living with spouse/partner	0.45	<0.01
					Having more than a high school education	0.36	0.04
Yathiraj BA et al, 2016. <sup>11</sup> (21.47/22)	Cross-sectional	South India	409	≥18 years	<b>Patient-Related Factors</b>		
					Females	0.50	<0.05
					Not forget to take ART	0.10	<0.05
					Not consuming alcohol	0.30	<0.05
					Good family care	0.30	<0.05
					<b>Medication-Related Factors</b>		
					Absence of opportunistic infection	0.40	0.02
					The sense of feeling better after taking ART	0.60	0.03
					<b>Health System-Related Factors</b>		
					Distance from hospital >25 km	0.40	0.001
Jiamsakul A et Al, 2014. <sup>12</sup> (21.36/22)	Prospective cohort	Asia (Thailand, Hong Kong, Malaysia, the Philippines, and Indonesia)	1316	≤30 – 51+ years	<b>Health-related factors</b>		
					>2 assessments per patients per year	0.7	0.006
					Injecting drug users	1.92	0.004
					Homosexual exposure	0.52	<0.001
					Taking a nucleoside transcriptase inhibitor and protease inhibitor	0.36	0.001
					Time on ART 6 to 12 months	0.59	<0.001
					Time on ART 12 to 18 months	0.40	<0.001
					Time on ART 18 to 24 months	0.35	<0.001
Negi BS et al, 2018. <sup>13</sup> (21.47/22)	Cohort Prospective	Nepal	305	40 years	<b>Personal-related factor</b>		
					Age ≥40s	3.30	<0.042
					<b>Environmental factor</b>		
					Disclosed HIV status	50.0	0.001
					<b>Psychological factor</b>		
Strong PTSD symptoms	5.0	<0.001					
Tran BX et al, 2018. <sup>14</sup> (18.14)	Cross-sectional	Vietnam	1133	18 - ≥45 years	<b>Socioeconomic and environmental factor</b>		
					Self-employed	1.41	<0.01
					Farmers	0.61	<0.05
					<b>Psychological factor</b>		
					Self-care problem	1.79	<0.05
Anxiety and Depression	1.60	<0.01					
Pokhrel KN et	Cross-sectional	Nepal	682	36.3 years	<b>Environmental factor</b>		
					Harmful alcohol drinking	2.48	<0.001

al, 2018. <sup>15</sup> (20.27/22)					<b>Personal-related factor</b>		
					Women	2.52	0.005
Wasti SP et al, 2012. <sup>16</sup> (20.47/22)	Cross-sectional mixed methods study	Nepal	282	35.8 years	<b>Socioeconomic and environmental factor</b>		
					Non-disclosure of HIV status	17.99	0.014
					Alcohol use	12.89	<0.001
					Being illiterate	4.58	0.015
					<b>Personal-related factor</b>		
					Being female	6.91	0.001
					<b>Health-related factors</b>		
					Side effects	6.04	0.025
					ART started ≤24 months	3.18	0.009
					Travel time to hospital >1 hour	2.84	0.035
Weaver ER et al, 2014. <sup>17</sup> (19.80/22)	Cross-sectional study	Indonesia	261	33.4 years	<b>Socioeconomic and environmental factor</b>		
					Some level of social support	0.328	0.018
					Good level of social support	0.399	0.039
Sagaon-Teyssier L et al, 2017. <sup>18</sup> (18.13/22)	Cross-sectional study	Cambodia	1316	42 years	<b>Socioeconomic and environmental factor</b>		
					Psychosocial actors present	0.62	<0.05
					Stigmatising events	1.13	<0.001
					<b>Healthcare-related factors</b>		
					Health care outside capital city	6.15	<0.05
					Respect from health workers	0.25	<0.05
					Paid for consultation	5.61	<0.001
Wang X et al, 2007. <sup>19</sup> (19.27/22)	Cross-sectional study	China	181	47.8 years	<b>Health-related factors</b>		
					Knowledge about side effects	0.124	<0.001
					Belief towards ART	0.313	0.016
					Reminder tools	0.287	0.010
					Trust in doctor	0.128	0.027
Wang YY et al, 2018. <sup>20</sup> (20.27/22)	Cross-sectional study	China	516	34.4 years	<b>Health-related factors</b>		
					Having confidence in ART	0.20	0.040
					<b>Socioeconomic and environmental factor</b>		
					More homosexual sex partners	1.50	0.049
Venkatesh KK et al, 2010. <sup>21</sup> (18.80/22)	Cross-sectional study	India	198	-	<b>Health-related factors</b>		
					CD4 cell counts >500 cells per microliter	2.22	0.038
					On HAART for >24 months	3.07	0.007
					<b>Socioeconomic and environmental factor</b>		
					Reported alcohol use	5.68	0.001
					Low general health perceptions	3.58	0.021
					<b>Psychological factors</b>		
					High distress	3.32	0.022

Wang H et al, 2008. <sup>22</sup> (20.80/22)	Cross-sectional study	China	308	41 years	<b><i>Socioeconomic and environmental factor</i></b>							
					Active heroin use	2.50	0.040					
					Not using reminder	5.50	0.0001					
Lee S et al, 2016. <sup>23</sup> (20.60/22)	Retrospective cohort	Korea	247	42 years	<b><i>Health-related factors</i></b>							
					ART-starting age <30 years	4.08	0.036					
					No non-HIV related comorbidity	2.94	0.046					
					Baseline CD4 cell count >300 cells/ $\mu$ L	3.58	0.012					
Xu L et al, 2017. <sup>24</sup> (20.47/22)	Cross sectional mixed methods	Thailand	568	12-19 years	<b><i>Personal-related factors</i></b>							
					Age 16-19	0.575	0.037					
					<b><i>Socioeconomic and environmental factor</i></b>							
					Having a boy/girlfriend	1.965	0.007					
					Caregiver-assessed poor intellectual ability	2.886	0.004					
					Having grandparents as the primary caregiver	1.649	0.039					
					Having other family members as the primary care giver	2.100	0.003					
					<b><i>Health-related factors</i></b>							
					Self-reported easiness in asking doctors questions	0.510	0.012					
					<b><i>Psychological factors</i></b>							
					Self-reported happy	2.420	0.004					
					Self-reported average happiness	2.716	0.002					
					Self-reported unhappy or very unhappy	3.849	<0.001					
					Muessig KE et al, 2014. <sup>25</sup> (17.74/22)	Cross sectional	Guangzhou, China	813	$\geq 18$ years	<b><i>Socioeconomic and environmental factor</i></b>		
										High school as last education	3.39	0.011
Middle school as last education	3.31	0.008										
$\leq$ Primary school as last education	4.52	0.002										
Not cohabitating/married	1.49	0.049										
Drinking alcohol several times a month	3.76	0.002										
Drinking alcohol several times a week	2.31	0.001										
<b><i>Health-related factor</i></b>												
1 to 3 years on ART	1.76	0.020										
Pahari S et al, 2015. <sup>26</sup> (18.74/22)	Cross sectional	West Bengal, India	128	$\geq 18$ years	<b><i>Health-related factor</i></b>							
					7-12 month of ART intake	7.8	0.03					
					<b><i>Socioeconomic and environmental factor</i></b>							
					Non-disclosure of HIV status to family members	4.9	0.02					
Bhattacharya M et al, 2011. <sup>27</sup> (17.74/22)	Cross sectional	New Delhi, India	90	9.5 years	<b><i>Socioeconomic and environmental factor</i></b>							
					Caregiver not educated beyond 5 <sup>th</sup> grade	4.19	0.01					
					Orphan	3.57	0.03					
					<b><i>Health-related factor</i></b>							

					Increasing duration of ART	1.08	0.01
					Efavirenz-based regimen	3.65	0.04
					<b><i>Personal-related factor</i></b>		
					Female gender	3.15	0.04
Abdulrahman SA et al, 2017. <sup>28</sup> (17.00/22)	Cross sectional	Selangor, Malaysia	242	33.4 years	<b><i>Personal-related factor</i></b>		
					Chinese ethnic	2.01	0.044
					<b><i>Socioeconomic and environmental factor</i></b>		
					Monthly income 3500-4999 RM	0.28	0.044
					Monthly income >5000 RM	0.19	0.008

Notes: HIV, human immunodeficiency virus; ART, antiretroviral therapy; HAART, highly active antiretroviral therapy. PTSD, post-traumatic stress disorder



Social environment is also found to be the important in achieving optimal adherence. Several studies reviewed above demonstrated that living with spouse/partner (OR=0.45)<sup>10</sup>, good family care (OR=0.30)<sup>11</sup>, some level of social support (OR=0.328), and good level of social support (OR=0.399)<sup>17</sup> are factors that often associated with decrease in non-adherence. Living surrounded by supportive family and caregivers could help to properly educate and remind patients to take their medications regularly. Moreover, good social support also motivates patients to achieve better health outcomes. In contrast, having other people other than parents as primary caregivers (OR=2.1)<sup>24</sup>, not married (OR=1.49)<sup>25</sup>, and being orphan (OR=1.965)<sup>27</sup> were shown to increase non-adherence, again due to the lack of surrounding social support.

Public perceptions and attitudes towards HIV/AIDS is also an especially important social factor. Stigmatising events were found to increase non-adherence to ART by 1.13 times.<sup>18</sup> Internalizing stigma may happen when an HIV-infected individual accepts the stigmatizing beliefs held by a majority of the community and takes it as a valid belief. Therefore, HIV patients tend to keep their disease to themselves and delay disclosure until concealment is no longer possible. Concealment in turn may lead to treatment interruption, as the fear of disclosure and worrying about others finding out make them susceptible to skipping their medications when others are around.<sup>37</sup> This is consistent with the findings from our review that non-disclosure is an important factor contributing to non-adherence, as shown by studies by Pahari<sup>26</sup> and Wasti<sup>16</sup> (OR=4.9 and 17.99 respectively). Thus, interventions aimed to improve social support towards HIV patients and targeting social influences are needed to ensure that treatment is effective.

#### Psychological factors

Aside from social factors discussed above, individual psychological states of patients were also found to contribute significantly towards treatment adherence. Five studies showed that feeling of anxiety (OR=1.6)<sup>10</sup>, pain (OR=1.92)<sup>10</sup>, post-traumatic stress disorder (PTSD) (OR=5.0)<sup>13</sup>, problem with self-care (OR=1.79)<sup>14</sup>, depression (OR=1.60)<sup>14</sup>, high distress (OR=3.32)<sup>21</sup>, and unhappiness (OR=3.85)<sup>24</sup> were associated with increased risks of treatment non-adherence. Furthermore, people who were not mentally well were also at risk in falling into drug use or substance abuse, which again was related significantly to treatment non-adherence, as shown by several studies in our review.<sup>10,12,15-16,21-22,25</sup> Conversely, a study by Sagaon-Teyssier<sup>18</sup> also found that the presence of psychosocial actors was associated with lower non-adherence (OR=0.62), probably due to the psychological support given to HIV patients. Such adherence may probably arise from increased confidence and motivation to engage in their disease management as their depressive symptoms subsided. In fact, these results were consistent with other studies which found that psychosocial interventions can positively affect medication adherence of people living with HIV.<sup>38-39</sup> This highlights the importance of properly assessing and addressing underlying mental problems in order to improve adherence.

#### Healthcare-related factors

Another factor that affects adherence to ART is health care provision. According to Wasti et al<sup>16</sup>, patients who needed to travel more than 1 hour to the hospital were more likely to be non-adherent to ART. This is supported by the finding that patients treated outside the capital city were also more likely to be non-adherent.<sup>18</sup> Thus, this means that patients tend to be adhere more to therapy if they can receive treatment easily. However, one study showed conflicting results; according to Yathiraj et al<sup>11</sup>, patients who needed to travel further distance ( $\geq 25$ km) in order to receive ART

were instead more adherent to therapy. This is probably due to patients' preference for a specific further health center, or perhaps, so that they could worry less about unintentionally disclosing their HIV status to nearby family, friends, or neighbors.

Furthermore, the relationship between the patient and their health care provider also affects their adherence. According to Sagaon-Teyssier<sup>18</sup>, respect from health workers made the patients more likely to adhere to the therapy (OR=0.25). The patient's trust and easiness to ask questions to the doctor affect their adherence as well.<sup>19,24</sup> This implies the significance of doctors or other health care providers to constantly maintain a respectful and friendly attitude, as well as communicate effectively with their patients in such a way that they could easily understand and aware of the importance and possible side effects from their therapy.<sup>18</sup>

### Study strengths and limitations

The strength of this study lies on the fact that it comprehensively assesses the risk factors related to ART non-adherence and the relatively large number of samples. Moreover, study locations also vary across different countries in Asia. However, the exclusion of inaccessible full-text articles and studies with incompatible language may present as a limitation.

### Future application and research

The result of the above systematic review can be further applied to formulate strategies to address problems related to ART non-adherence, thus improving effectiveness of treatment outcomes. Based on the above assessed factors, we suggest the implementation of the following approach:

1. Assess patients' characteristics and understand their personal and cultural backgrounds to identify possible personal factors to non-adherence
2. Improve social support and abolish stigma towards HIV patients

3. Properly address and identify patients' mental health

Facilitate improvement of HIV-related healthcare facilities and encourage a better doctor-patient relationship in dealing with HIV/AIDS problems

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## Conclusion

To conclude, based on the above review, non-adherence to ART in HIV patients is associated with various factors. Our study showed that personal factors such as gender, age, and personal backgrounds, socioeconomic and environmental factors, psychological factors such as anxiety and depression, as well as healthcare-related factors were associated with suboptimal adherence to ART. Such non-adherence would then result in treatment ineffectiveness.

We hope that the assessment of above risk factors could help formulate strategies and comprehensive guidelines to prevent HIV ART non-adherence in Asia. Moreover, knowledge regarding these factors could also raise the awareness of health workers to pay specific attention to patients who are at risk of being non-adherent, as well as encourage the public to have a proper perception and attitude towards people living with HIV. In doing so, it is hoped that non-adherence rate could decrease, increasing treatment effectiveness especially in Asia, thus helping to reduce mortality rate of HIV worldwide

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### Conflict of Interest

The authors declare no conflict of interest

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## References

1. World Health Organization. Global health observatory data: summary of the global HIV epidemic (2018) HIV/AIDS [Internet]. Geneva: World Health Organization; 2019 [cited 2019 Nov 13]. Available from: <https://www.who.int/gho/hiv/en/>
2. UNAIDS. Global HIV&AIDS statistics – 2019 fact sheet [Internet]. Geneva: UNAIDS; 2019 [cited 2019 Nov 13]. Available from: <https://www.unaids.org/en/resources/fact-sheet>
3. GBD 2017 HIV Collaborators. Global, regional, and national incidence, prevalence, and mortality of HIV, 1980–2017, and forecasts to 2030, for 195 countries and territories: a systematic analysis for the Global Burden of Diseases, Injuries, and Risk Factors Study 2017. *The Lancet HIV*. 2019 Aug; S-2352-3018(19):30196-1.
4. HIV.gov. The global HIV/AIDS epidemic [Internet]. United States: U.S. Department of Health and Human Services; 2019 [cited 2019 Nov 13]. Available from: <https://www.hiv.gov/hiv-basics/overview/data-and-trends/global-statistics>
5. United States Department of Health and Human Services. AIDSinfo glossary of HIV/AIDS-related. 9<sup>th</sup> Edition. United States: United States Department of Health and Human Services; 2018
6. Girum T, Wasie A, Worku A. Trend of HIV/AIDS for the last 26 years and predicting achievement of the 90-90-90 HIV prevention targets by 2020 in Ethiopia: a time series analysis. *BMC Infect Dis*. 2018;18(1):320.
7. Kim, J., Lee, E., Park, B. et al. Adherence to antiretroviral therapy and factors affecting low medication adherence among incident HIV-infected individuals during 2009–2016: A nationwide study. *Sci Rep* 8, 3133 (2018).
8. Rosenberg J. While adherence to ART regimens has improved among people with HIV, rates remain suboptimal [Internet]. United States: *The American Journal of Managed Care*; 2019 [cited 2019 Nov 13]. Available from: <https://www.ajmc.com/newsroom/while-adherence-to-art-regimens-has-improved-among-people-with-hiv-rates-remain-suboptimal>
9. Kim J, Lee E, Park B, Bang J, Lee J. Adherence to antiretroviral therapy and factors affecting low medication adherence among incident HIV-infected individuals during 2009–2016: A nationwide study. *Scientific Reports*. 2018;8(1).
10. Nguyen N, Tran B, Hwang L, Markham C, Swartz M, Vidrine J et al. Effects of cigarette smoking and nicotine dependence on adherence to antiretroviral therapy among HIV-positive patients in Vietnam. *AIDS Care*. 2015;28(3):359-364.
11. Yathiraj BA, Unnikrishnan B, Ramapuram J, Kumar N, Mithra P, Kulkarni V et al. Factors influencing adherence to antiretroviral therapy among people living with HIV in Coastal South India. *Journal of the International Association of Providers of AIDS Care (JIAPAC)*. 2016;15(6):529-533.
12. Jiamsakul A, Kumarasamy N, Dintangco R, Li PC, Phanuphak, Sirisanthana T, et al. Factors associated with suboptimal adherence to antiretroviral therapy in Asia. *J Int AIDS Soc*. 2014 May 16;17:18911
13. Negi B, Joshi S, Nakazawa M, Kotaki T, Bastola A, Kameoka M. Impact of a massive earthquake on adherence to antiretroviral therapy, mental health, and treatment failure among people living with HIV in Nepal. *PLOS ONE*. 2018;13(6):e0198071.
14. Tran B, Fleming M, Do H, Nguyen L, Latkin C. Quality of life improvement,

- social stigma and antiretroviral treatment adherence: implications for long-term HIV/AIDS care. *AIDS Care*. 2018;30(12):1524-1531.
15. Pokhrel K, Gaulee PK, Neupane S, Sharma V. Harmful alcohol drinking among HIV-positive people in Nepal: an overlooked threat to anti-retroviral therapy adherence and health-related quality of life. *Global Health Action*. 2018;11(1):1441783.
  16. Wasti S, Simkhada P, Randall J, Freeman J, van Teijlingen E. Factors influencing adherence to antiretroviral treatment in Nepal: a mixed-methods study. *PLoS ONE*. 2012;7(5):e35547.
  17. Weaver E, Pane M, Wandra T, Windiyarningsih C, Herlina, Samaan G. Factors that influence adherence to antiretroviral treatment in an urban population, Jakarta, Indonesia. *PLoS ONE*. 2014;9(9):e107543.
  18. Sagaon-Teyssier L, Mmadi Mrenda B, Khol V, Ferradini L, Mam S, Ngin S et al. Adherence to PI-based 2nd-line regimens in Cambodia is not simply a question of individual behaviour: the ANRS 12276 2PICAM study. *Tropical Medicine & International Health*. 2017;22(11):1428-1435.
  19. Wang X, Wu Z. Factors associated with adherence to antiretroviral therapy among HIV/AIDS patients in rural China. *AIDS*. 2007;21(Suppl 8):S149-S155.
  20. Wang Y, Wang T, Yan H, D'Amato R, Wang W, Li S. Evaluating the relationship between adherence to Highly Active Antiretroviral Therapy (HAART) and social and clinical characteristics in Chinese patients with HIV. *AIDS Care*. 2018;31(1):14-18.
  21. Venkatesh K, Srikrishnan A, Mayer K, Kumarasamy N, Raminani S, Thamburaj E et al. Predictors of nonadherence to highly active antiretroviral therapy among HIV-infected South Indians in clinical care: implications for developing adherence interventions in resource-limited settings. *AIDS Patient Care and STDs*. 2010;24(12):795-803.
  22. Wang H, He G, Li X, Yang A, Chen X, Fennie K et al. Self-Reported Adherence to Antiretroviral Treatment among HIV-Infected People in Central China. *AIDS Patient Care and STDs*. 2008;22(1):71-80.
  23. Lee S, Lee S, Lee S, Kim K, Lee J, Cho H et al. Predictors of poor retention in care of HIV-infected patients receiving antiretroviral therapy in Korea: five-year hospital-based retrospective cohort study. *Journal of Korean Medical Science*. 2016;31(3):376.
  24. Xu L, Munir K, Kanabkaew C, Le Coeur S. Factors influencing antiretroviral treatment suboptimal adherence among perinatally HIV-infected adolescents in Thailand. *PLOS ONE*. 2017;12(2):e0172392.
  25. Muessig K, McLaughlin M, Nie J, Cai W, Zheng H, Yang L et al. Suboptimal antiretroviral therapy adherence among HIV-infected adults in Guangzhou, China. *AIDS Care*. 2014;26(8):988-995.
  26. Pahari S, Roy S, Mandal A, Kuila S, Panda S. Adherence to anti-retroviral therapy & factors associated with it: A community based cross-sectional study from West Bengal, India. *Indian Journal of Medical Research*. 2015;142(3):301.
  27. Bhattacharya M, Dubey A. Adherence to antiretroviral therapy and its correlates among HIV-infected children at an HIV clinic in New Delhi. *Annals of Tropical Paediatrics*. 2011;31(4):331-337.
  28. Abdulrahman S, Rampal L, Othman N, Ibrahim F, Kadir Shahar H, Radhakrishnan A. Socioeconomic Predictors of Adherence Behavior Among HIV-Positive Patients Receiving Antiretroviral Therapy in Selangor, Malaysia. *Asia Pacific Journal of Public Health*. 2017;29(4):304-314.

29. Achappa B, Madi D, Bhaskaran U, et al. Adherence to antiretroviral therapy among people living with HIV. *N Am J Med Sci*. 2013;5(3):220–223
30. Bam K, Rajbhandari RM, Kar-macharya DB, Dixit SM. Strengthening adherence to Anti Retroviral Therapy (ART) monitoring and support: operation research to identify barriers and facilitators in Nepal. *BMC Health Serv Res*. 2015;15:188. 22.
31. Aragoné's C, Sa´nchez L, Campos JR, Pe´rez J. Antiretroviral therapy adherence in persons with HIV/AIDS in Cuba. *MEDICC rev*. 2011;13(2):17–23. 26.
32. Saha R, Saha I, Sarkar AP, et al. Adherence to highly active antiretroviral therapy in a tertiary care hospital in West Bengal, India. *Singapore Med J*. 2014;55(2):92–98.
33. Uzochukwu BS, Onwujekwe OE, Onoka AC, et al. Determinants of non-adherence to subsidized anti-retroviral treatment in southeast Nigeria. *Health Policy Plan*. 2009;24(3):189–196.
34. Vinikoor M, Joseph J, Mwale J, Marx M, Goma F, Mulenga L et al. Age at Antiretroviral therapy initiation predicts immune recovery, death, and loss to follow-up among HIV-infected adults in urban Zambia. *AIDS Research and Human Retroviruses*. 2014;30(10):949-955.
35. Simoni JM, Huh D, Wilson IB, Shen J, Goggin K, Reynolds NR, et al. Racial/Ethnic disparities in ART adherence in the United States: findings from the MACH14 study. *J Acquir Immune Defic Syndr*. 2012 Aug 15; 60(5):466-72.
36. Macdonell KE, Naar-King S, Murphy DA, Parsons JT, Harper GW. Predictors of medication adherence in high risk youth of color living with HIV. *J Pediatr Psychol*. 2010 Jul; 35(6):593-601.
37. Katz I, Ryu A, Onuegbu A, Psaros C, Weiser S, Bangsberg D et al. Impact of HIV-related stigma on treatment adherence: systematic review and meta-synthesis. *Journal of the International AIDS Society*. 2013;16:18640.
38. Wagner G, Ghosh-Dastidar B, Robinson E, Ngo V, Glick P, Mukasa B et al. Effects of Depression Alleviation on ART Adherence and HIV Clinic Attendance in Uganda, and the Mediating Roles of Self-Efficacy and Motivation. *AIDS and Behavior*. 2016;21(6):1655-1664.
39. Spaan P, van Luenen S, Garnefski N, Kraaij V. Psychosocial interventions enhance HIV medication adherence: A systematic review and meta-analysis. *Journal of Health Psychology*. 2018;:13591053187