

## ANTI-RETROVIRAL THERAPY ADHERENCE AND INFORMATION, MOTIVATION, BEHAVIORAL SKILL (IMB) MODEL AMONG PEOPLE LIVING WITH HIV-AIDS: A SYSTEMATIC REVIEW

### DEWI RATNA SULISTINA

Doctoral Study Program, Faculty of Public Health, Airlangga University, Surabaya, East Java, Indonesia.  
Email: dewiratnasulistina@gmail.com, dewi.ratna.sulistina-2018@fkm.unair.ac.id

### BUDI PRASETYO

Department of Social Obstetrics and Gynecology, Faculty of Medicine, Airlangga University.

### SANTI MARTINI

Faculty of Public Health, Airlangga University, Surabaya, East Java, Indonesia.

### MARIA INGE LUSIDA\*

Professor, Institute of Tropical Disease, Airlangga University, Surabaya, Indonesia; Department of Microbiology, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia. \*Corresponding Author  
Email: ingelusida@yahoo.com

### Abstract

*Factors that affect ART adherence among people living with HIV (PLWH) based on Information, Motivation, and Behavioral Skill (IMB) model have not been systematically reviewed. The aim of this study was to review factors affecting ART adherence among PLWH based on IMB Model. This study used a systematic review design, using three electronic databases: PubMed, SCOPUS, and CINAHL to obtain articles from 2017 until 2022. The search strategy included the following terms based on MeSH (Medical Subject Headings) that were: information AND (behavior or behaviour or behavioral or behavioural) AND (motivation or motivate or motivating or engagement or participation) AND (adherence or compliance) AND (HIV or aids or acquired human immunodeficiency syndrome or human immunodeficiency virus). We searched the original, English version, also full paper articles. We used JBI critical checklist to criticize the articles. We got 276 studies identified through three electronic databases. In the end, we obtained 17 articles. IMB model predicted ART adherence among PLWH. The domain motivation was personal motivation, social motivation, risk and the pros and cons of methamphetamine use, support system and support deficit, conditional economic incentives, motivational interviewing. The domain behavioral were self-efficacy, skill, ART-taking skill, side effects management, staff behavior, respect patient autonomy, fairness, and apathy. This study is needed to develop determinant factors to promote ART adherence and intervention among PLWH.*

**Keywords:** Information, Motivation, Behavioral, ART, Adherence, HIV

### INTRODUCTION

Human immunodeficiency virus-acquired immunodeficiency syndrome (HIV-AIDS) disease is a global health problem. The number of HIV-AIDS patients has also increased by 2 million people per year in the world (Pandey & Galvani, 2019). Data from 2020 showed that around 37.7 million people in are living with HIV (PLWH) and there are an additional 1.5 million people newly infected with HIV. In 2020,

it was estimated that 80,000 people died from AIDS-related illnesses. Further, it is estimated that around 79.3 million people have been infected with HIV and a total of 36.3 million of them have already death due to this disease (UNAIDS, 2021). In Indonesia, the provinces with the highest number of people living with HIV (PLWH) in January-March 2021 were Central Java, then West Java, DKI Jakarta, East Java, and North Sumatra. Most of them were in the age group of 25-49 years (71.3%) and male (69%). The cumulative number of HIV cases reported up to March 2021 was 427,201 people, while the cumulative number of AIDS reported up to March 2021 was 131,417 people (Dirjen P2P, 2021). HIV and AIDS infection is caused by the Human immunodeficiency virus (HIV) (Kapila et al., 2016). The transmission of the disease can occur due to unsafe sexual behavior between individuals, either homosexual or heterosexual (A. Restar *et al.*, 2020). Anal sex behavior in men who like men (MSM) and transgender people have a high risk of transmitting HIV (Fauci *et al.*, 2019; Jin *et al.*, 2021; WHO, 2016). HIV transmission disease can be transmitted in three ways; horizontal transmission through sexual intercourse, either heterosexual or homosexual, vertical transmission or transmission from mother to child, and blood contact: blood transfusions or sharing needles. In addition, there were severe people at risk for HIV infection such as pregnant women, tuberculosis patients, sexually transmitted diseases (STD), female sex workers, men who have sex with men (MSM), transgender, injection drug users, and people in jail or prison (Kemenkes, 2019; Yamani et al., 2022).

Antiretroviral (ARV) therapy is starting to be used for the treatment of HIV-AIDS disease, so this disease can be controlled. However, ARV therapy (ART) also has side effects and sometimes failure due to drug resistance, hence it requires laboratory monitoring. Several reports indicate that ART resistance trigger the mutations of HIV-1 strain in many countries (Kemenkes, 2019; Yamani et al., 2022). PLWH who miss their schedule of taking ARV therapy affect their health, even though only 5% missing of their schedule (Paterson et al., 2000). Disrupted schedules and frequent delays in ART will also increase viral load (Ruiz et al., 2000, García et al., 1999, Friedland and Williams, 1999).

ART adherence can be explained using health behavior theory, especially the information, motivation, and behavioral skill model (IMB). This theory can be used to explain the factors that influence medication adherence (Fisher and Fisher, 1992). Based on the IMB model, nonadherence of ART is influenced by lack of information, forgetting to take medication, lack of motivation due to side effects of drugs, as well as behavior skill (Kalichman et al., 2001, Amico et al., 2005). Adherence related to information is adequate information about the specific regimen and treatment of HIV-AIDS, using ART, and the immunological response to ART (Amico et al., 2005). Adherence related to motivation is a person's attitude to take medication as prescribed. Personal motivation consists of attitudes and beliefs about the consequences of non-adherence of medication treatment and plans in order to compliant with taking medicine (Amico et al., 2005). Adherence related to behavior is related to skill or self-efficacy such as consistently taking medicine even though there are side effects, changing daily schedules, feeling weak, disturbing the body, and T Cell is decreasing (Bandura, 1977, Amico et al., 2005). Thus far, factors that affecting ART adherence among people living with HIV (PLWH) based on IMB model have not been systematically reviewed. The aim of this study was to review factors that affecting ART adherence among PLWH. This study is needed to develop determinant factors to promote ART adherence among PLWH.

## **RESEARCH METHODS**

### **Literature Search Strategy**

This study used a systematic review design and we followed the previous study to guide our study (Dhar et al., 2017). A literature search was conducted using three electronic databases: PubMed,

SCOPUS, and CINAHL to obtain articles from 2017 until 2022. the PRISMA guidelines was used to report the systematic review.(PRISMA, 2021) The search strategy included the following terms based on MeSH (Medical Subject Headings), that were: information AND (behavior or behaviour or behavioral or behavioural) AND (motivation or motivate or motivating or engagement or participation) AND (adherence or compliance) AND (HIV or aids or acquired human immunodeficiency syndrome or human immunodeficiency virus). We also made tables to present the result of the articles.

**Inclusion criteria and outcome**

We searched the original article, English version article, and full paper article, in addition, it was already published, so it was not a master thesis or dissertation paper. The independent variables were based on the information-motivation-behavioral skill model (Fisher et al., 2003). The outcome of this study was ART adherence, this variable can be measured using a questionnaire, interview, or pill count. We only included articles about HIV patients. The types of study in this review were qualitative study, cross-sectional study, and randomized control trial study.

**Risk of Bias**

The articles were screened by two independents assistant. We used JBI critical checklist (Tufanaru C, 2020). There were several questions to criticize the articles. Articles must have score more than 50% to avoid risk of bias.

**Table 1: Risk of Bias**

Title	Criteria (checklist "v")													Value (%)	Type of study			
	1	2	3	4	5	6	7	8	9	10	11	12	13					
(Aunon et al., 2020)	v	v	v	v	v	v	v	v	v	v							100%	Qualitative study
(Sabin et al., 2018)	v	v	v	v	v	-	v	v	v	v							90%	Qualitative study
(Dunn Navarra et al., 2020)	v	v	v	v	v	v	v	v	v	v							100%	Qualitative study
(Go et al., 2019)	v	v	v	v	v	-	v	v	v	v							90%	Qualitative study
(Graham et al., 2018)	v	v	v	v	v	v	v	v	v	v							100%	Qualitative study
(Hartzler et al., 2019)	v	v	v	v	v	-	v	v	v	v							90%	Qualitative study
(Movahed et al., 2019)	v	v	v	v	v	v	v	v	v	v							100%	Qualitative study
(Starks et al., 2017)	v	v	v	v	v	v	v	v	v								100%	Cross-sectional
(Ramaiya et al., 2020)	v	v	v	v	v	v	v	v	v								100%	Cross-sectional
(Nutor et al., 2020)	v	v	v	v	v	v	v	v	v								100%	Cross-sectional
(Babicz et al., 2021)	v	v	v	v	v	v	v	v	v								100%	Cross-sectional
(Morowatisharifabad et al., 2019)	v	v	-	v	v	v	v	v									87.5%	Cross-sectional
(Peng et al., 2021)	v	v	-	v	v	v	v	v									87.5%	Cross-sectional
(Parsons et al., 2018)	v	v	v	v	v	v	v	v	v	v	v	v	v				100%	RCT
(Jadgal et al., 2022)	v	-	-	-	v	v	v	v	v	v	v	v	v				70%	RCT
(Dworkin et al., 2019)	v	-	-	-	v	v	v	v	v	v	v	v	v				70%	RCT
(Ekwunife et al., 2018)	v	-	-	-	v	v	v	v	v	v	v	v	v				70%	RCT

**Qualitative study:** 1. Is there congruity between the stated philosophical perspective and the research methodology? 2. Is there congruity between the research methodology and the research question or objectives? 3. Is there congruity between the research methodology and the methods used to collect data? 4. Is there congruity between the research methodology and the representation and analysis of data? 5. Is there congruity between the research methodology and the interpretation of results? 6. Is there a statement locating the researcher culturally or theoretically? 7. Is the influence of the researcher on the research, and vice-versa, addressed? 8. Are participants, and their voices, adequately represented? 9. Is the research ethical according to current criteria or, for recent studies,

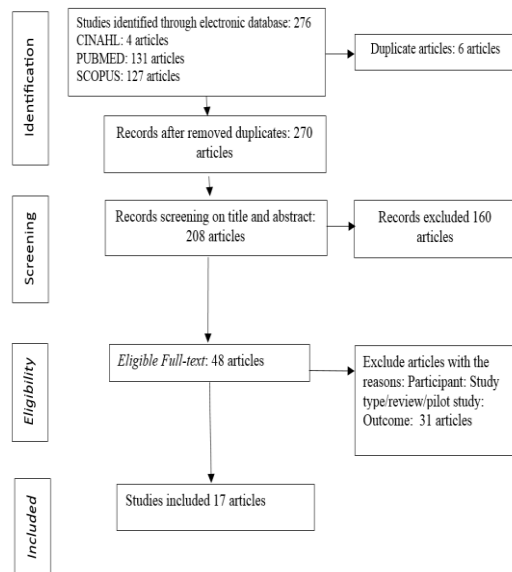
and is there evidence of ethical approval by an appropriate body? 10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?

**Cross-sectional** 1. Were the criteria for inclusion in the sample clearly defined? 2. Were the study subjects and the setting described in detail? 3. Was the exposure measured in a valid and reliable way? 4. Were objective, standard criteria used for measurement of the condition? 5. Were confounding factors identified? 6. Were strategies to deal with confounding factors stated? 7. Were the outcomes measured in a valid and reliable way? 8. Was appropriate statistical analysis used?

**RCT** 1. Was true randomization used for assignment of participants to treatment groups? 2. Was allocation to treatment groups concealed? 3. Were treatment groups similar at the baseline? 4. Were participants blind to treatment assignment? 5. Were those delivering treatment blind to treatment assignment? 6. Were outcomes assessors blind to treatment assignment? 7. Were treatment groups treated identically other than the intervention of interest? 8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed? 9. Were participants analyzed in the groups to which they were randomized? 9. Were participants analyzed in the groups to which they were randomized? 10. Were outcomes measured in the same way for treatment groups? 11. Were outcomes measured in a reliable way? 12. Was appropriate statistical analysis used? 13. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?

**RESULTS**

Figure 1 presented the flowchart of the study selection. We got 276 studies identified through three electronic databases. CINAHL: 41 articles, PUBMED: 131 articles, SCOPUS: 127 articles. Then, we got 270 articles after removing duplicate articles. The next step we screened on title and abstract of 270 articles, and we obtained 208 articles. Eligibility study only 48 articles, then we excluded articles due to not following the inclusion criteria. So, in the end we obtained 17 articles in this review.



**Figure 1: Flowchart of the study selection Information, motivation, and behavioral**

Table 1 showed factors that affect ART adherence among HIV and AIDS patients, selected information, motivation, and behavior. There were 6 articles in this table. One article transformed information,

motivation, and behavior into M-health (Aunon et al., 2020). The domain motivation in this table was personal motivation, social motivation, risk perception (Jadgal et al., 2022, Morowatisharifabad et al., 2019, Movahed et al., 2019), and the pros and cons of methamphetamine use (Starks et al., 2017). The domain behavioral were self-efficacy, skill, ART-taking skill, and side effects management (Jadgal et al., 2022, Movahed et al., 2019, Starks et al., 2017).

**Table 2: Summary of variables of factors investigated by the studies (information, motivation, and behavioral)**

First author	Study setting	Study design	Variable being investigated	Sample size	Population	Measurement of medication adherence
(Aunon et al., 2020)	Mombasa, Kenya	Qualitative study	M-Health <ul style="list-style-type: none"> <li>• Information</li> <li>• Motivation</li> <li>• Behavior</li> </ul>	23	Female sex workers	Interview
(Jadgal et al., 2022)	Kerman, Iran	RCT	Information	117	Mean age 42.29	Questionnaire
			Motivation <ul style="list-style-type: none"> <li>• Personal motivation</li> <li>• Social motivation</li> <li>• Risk perception</li> </ul> Behavior <ul style="list-style-type: none"> <li>• Self-efficacy</li> <li>• Skill</li> </ul>			
(Morowatisharifabad et al., 2019)	Kerman, Iran	Cross-sectional	Information	119	Mean age 41.59	Questionnaire
			Motivation <ul style="list-style-type: none"> <li>• Personal motivation</li> <li>• Social motivation</li> <li>• Risk perception</li> </ul> Behavior <ul style="list-style-type: none"> <li>• Self-efficacy</li> <li>• Skill</li> </ul>			
(Movahed et al., 2019)	Iran	Qualitative study	Information Taking ART regularly Drug interactions Drug side effects and management	10	Age range between 30-49	Questionnaire
			Motivation <ul style="list-style-type: none"> <li>• Individual motivation</li> <li>• Social motivation</li> <li>• Risk perception</li> </ul> Behavioral skills <ul style="list-style-type: none"> <li>• Self-efficacy</li> <li>• ART-taking skill and side effects management</li> </ul>			
(Peng et al., 2021)	Shanghai, China	Cross-sectional	Information <ul style="list-style-type: none"> <li>• Perceived effect</li> <li>• Knowledge</li> </ul>	426	Age ≥ 18	Questionnaire

First author	Study setting	Study design	Variable being investigated	Sample size	Population	Measurement of medication adherence
			Motivation Behavior			
(Starks et al., 2017)	USA	Cross-sectional	Information <ul style="list-style-type: none"> <li>• Knowledge</li> </ul> Motivation <ul style="list-style-type: none"> <li>• pros and cons of methamphetamine use</li> </ul> Behavioral skill <ul style="list-style-type: none"> <li>• Self-efficacy</li> </ul>	210	Gay and bisexual men	14-day timeline follow-back (TLFB) interview

Table 3 showed selected information and motivation affecting medication adherence among HIV and AIDS patients. There was one article that showed behavior not affected medication adherence among HIV and AIDS patients (Ramaiya et al., 2020).

**Table 3: Summary of variables of factors investigated by the studies (information and motivation)**

First author	Study setting	Study design	Variable being investigated	Sample size	Population	Measurement of medication adherence
(Ramaiya et al., 2020)	Haiti	Cross-sectional	Information	128	Adults	Questionnaire
			Motivation			
			Not behavioral			

Table 4 showed selected motivation and behavior affected medication adherence among HIV and AIDS patients. There were three articles in this table. The domain of motivation in this table were support system and support deficit (Dunn Navarra et al., 2020). The domain behavioral in this table were staff behavior, respect patient autonomy, and fairness (Hartzler et al., 2019).

**Table 4: Summary of variables of factors investigated by the studies (Motivation and Behavior)**

First author	Study setting	Study design	Variable being investigated	Sample size	Population	Measurement of medication adherence
(Dunn Navarra et al., 2020)	New York	Qualitative study	Motivation <ul style="list-style-type: none"> <li>• Support systems and support deficit</li> </ul> Behavior <ul style="list-style-type: none"> <li>• Mental and behavioral challenge</li> </ul>	20	Adult	Interview
(Hartzler et al., 2019)	USA	Qualitative study	Motivation	44	Mean age 52.3	Interview
			Behavior <ul style="list-style-type: none"> <li>• Staff behavior</li> <li>• Respect patient autonomy</li> <li>• Fairness</li> </ul>			
(Parsons et al., 2018)	New York	RCT	Motivational interviewing Cognitive behavioral skill	210	Gay and bisexual men	Self-report questionnaire

Table 5 showed that there were three articles that mentioned information affected medication adherence among HIV and AIDS patients. There were two articles that transformed information into m-Health (Sabin et al., 2018) and mobile phone intervention (Dworkin et al., 2019).

**Table 5: Summary of variables of factors investigated by the studies (Information)**

First author	Study setting	Study design	Variable being investigated	Sample size	Population	Measurement of medication adherence
(Dworkin et al., 2019)	Chicago	RCT	Information <ul style="list-style-type: none"> <li>• Mobile phone intervention</li> </ul>	43	Teenagers	Questionnaire
(Go et al., 2019)	Indonesia, Ukraine, Vietnam	Qualitative study	Information <ul style="list-style-type: none"> <li>• Lack of information</li> </ul>	62	People who inject drugs	Interview
(Sabin et al., 2018)	China	Qualitative	Information <ul style="list-style-type: none"> <li>• mHealth</li> </ul>	20	Adults	Self-report questionnaire
					Male	

Table 6 showed that there were two articles that mentioned motivation affected medication adherence among HIV and AIDS patients. The domain in the motivation were conditional economic incentives, motivational interviewing (Ekwunife et al., 2018).

**Table 6: Summary of variables of factors investigated by the studies (Motivation)**

First author	Study setting	Study design	Variable being investigated	Sample size	Population	Measurement of medication adherence
(Ekwunife et al., 2018)	Nigeria	RCT	Motivation <ul style="list-style-type: none"> <li>• Conditional economic incentives</li> <li>• Motivational interviewing</li> </ul>	240	Teenagers	Measured using pill count

Table 7 showed that there were two articles that mentioned behavior affected medication adherence among HIV and AIDS patients. The domain in the behavior was apathy (Babicz et al., 2021) and support from providers, family, and friends (Graham et al., 2018).

**Table 7: Summary of variables of factors investigated by the studies (Behavior)**

First author	Study setting	Study design	Variable being investigated	Sample size	Population	Measurement of medication adherence
(Babicz et al., 2021)	California	Cross-sectional study	Behavior <ul style="list-style-type: none"> <li>• Apathy</li> </ul>	85	Mean Age 46.3	Questionnaire
(Nutor et al., 2020)	Zambia	Cross-sectional	Behavioral belief	150	Women	Questionnaire
(Graham et al., 2018)	Kenya	Qualitative study	Behavior <ul style="list-style-type: none"> <li>• Support from providers, family, and friends</li> </ul>	30	Gay, bisexual, men sex with men	Interview, ART status



## DISCUSSION

This article provided evidence regarding determinant factors affecting ART adherence among PLWH using a systematic review design in the last 5 years from 2017 until the end of 2022 based on Information-Motivation-Behavioral Skill Model (IMB Model) (Fisher and Fisher, 1992). This study is similar to the previous studies, however, the previous studies used different designs to assess factors that affect ART adherence among PLWH. There were 17 articles included in this study.

The articles included in this study were conducted in Kenya (2 articles), Iran (4 articles), USA (4 articles), China (2 articles), Haiti, Chicago, Indonesia, Ukraine, Vietnam, Iran, California, and Zambia. The total population in this study was 1,937 and the population in the articles was female sex workers, the adult population, LGBT, people who inject drugs, women, and teenagers. However, the majority of the population in the study was the LGBT group. This study is in line with a previous study that mentioned that LGBT was a vulnerable population for getting transmission of HIV disease due to the risk of sexual behavior, such as men sex with men (Fauci *et al.*, 2019; Jin *et al.*, 2021; WHO, 2016).

In summary information, motivation, and behavioral skill are needed to increase ART adherence (medication adherence) among PLWH. This study in line with previous study in the final article that included in this study, which mentioned that IMB had effect on ART adherence (Peng *et al.*, 2021, Starks *et al.*, 2017, Ramaiya *et al.*, 2020). Based on these articles, information means respondents understand about how each ARV works in their body. Motivation refers to respondents did not like to take HIV medication because it can remind their disease. And behavior means respondents make HIV medication as part daily of life (Ramaiya *et al.*, 2020). The definition is similar with original model (Fisher and Fisher, 1992).

There are three studies to transform information, motivation, and behavior into M-health or mobile phone intervention (Aunon *et al.*, 2020, Sabin *et al.*, 2018, Dworkin *et al.*, 2019). This M-health can support nurses and healthcare providers to increase ART adherence. This M-health also can assist PLWH to understand drugs or medication. M-health also provides positive support from health care (motivation). Further, M-health also can assist strategies to support adherence (Aunon *et al.*, 2020).

This study revealed that information had effect on ART adherence among PLWH. Information has domain perceived effect of ART and knowledge (Movahed *et al.*, 2019, Peng *et al.*, 2021, Starks *et al.*, 2017). Information is needed for PLWH, especially regarding drug interaction, drug side effects, and taking ART regularly. Health care provider must provide health education, so it can increase knowledge among PLWH as well as their family.

Motivation also factors that affecting ART adherence among PLWH. Participants also experienced lack of motivation due to limited knowledge (Morowatisharifabad *et al.*, 2019, Go *et al.*, 2019). There are Pro and cos using ART (Starks *et al.*, 2017), they assumed that taking medicine will remind them about their disease. However, motivation can be increased among respondents if they get incentive to take medicine (Ekwunife *et al.*, 2018).

Majority of respondents also forgetfulness to take the ART, lack of social support and away from home, it refers to behavioral skill. Behavioral skill also factors that affected ATR adherence among PLWH. Policy makers and health care system are needed to solve this problem. Such as provide daily and weekly medicine boxes, psychological support, and reduce cost of transportation or provide medical delivery system (Jadgal *et al.*, 2022, Movahed *et al.*, 2019, Dunn Navarra *et al.*, 2020). Further, health care provider must reduce stigma and provide support system (Dunn Navarra *et al.*, 2020). Behavioral also can transform into cognitive behavioral therapy intervention. The aim of this



intervention is to provide health education among PLWH (Hartzler et al., 2019, Parsons et al., 2018). Behavioral also had domain self-efficacy (Starks et al., 2017). Seld efficacy refers to belief that patients can take the ART as prescribed. Behavioral also related to apathy (Babicz et al., 2021, Nutor et al., 2020). Apathy refers to loss of interest to enjoy the activities, in this study, PLWH loss of interest to take the medicine.

This evidence in line with previous meta-analysis that showed financial can trigger motivation, and this motivation can increase adherence (Kim et al., 2014).

### **LIMITATION**

There are some limitations in this study. This study only included English articles and selected articles had potential bias, however we used JBI to minimize it. The articles in this review used different methods, which can limit comparability. However, this review showed the evidence IMB (information, motivation, and behavioral) can promote ART adherence among PLWH.

### **CONCLUSION**

IMB (information, motivation, and behavioral) can promote ART adherence among PLWH. The domain motivation was personal motivation, social motivation, risk and the pros and cons of methamphetamine use, support system and support deficit, conditional economic incentives, motivational interviewing. The domain behavioral were self-efficacy, skill, ART-taking skill, side effects management, staff behavior, respect patient autonomy, fairness, and apathy. This model is needed to develop the intervention for increasing ART adherence.

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