ORIGINAL PAPER

The influence of respondent characteristics and risk behavior on adherence to antiretroviral therapy based on the information-motivation-behavioral skills (IMB) model in HIV-1-infected gay and bisexual people

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Abstract

Introduction: Human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS) is a global health problem. It is estimated that around 37.7 million people have been infected with HIV, with an additional 1.5 million of new HIV-infected cases, while a total of 680,000 have died from AIDS-related diseases. As reported in March 2021, the cumulative number of people living with HIV in Indonesia was 427,201, of whom 27.2% were homosexuals, including a group of male population who have sex with men (26.3%) and transgender people (0.9%). This research aimed to identify the influence of respondent characteristics and risk behavior on adherence to antiretroviral therapy (ART) based on the information-motivation-behavioral skills (IMB) model among HIV-1-infected gay and bisexual individuals living in Surabaya.

Material and methods: Questionnaire data were collected from 57 HIV-1-infected gay and bisexual people. Questionnaire data were analyzed using the IMB model.

Results: The respondent characteristics, such as age, initial HIV diagnosis, and viral load examination, had an influence on adherence to ART, with a moderate category path coefficient (0.476) using the IMB model.

Conclusions: The characteristics of respondent have an influence on adherence to antiretroviral medication, with a medium category path coefficient according to the IMB model.
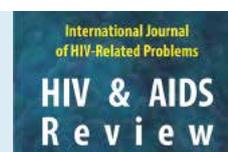
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Introduction

Factors related to patient medication adherence are: 1) socio-demographic: age, gender, ethnicity, race, culture, education, and employment status; 2) socio-economic: income, culture, and economic and geographical conditions; 3) patient characteristics: health beliefs, discipline, and awareness; 4) psycho-social: mental condition/depression, low personality and pessimistic attitude, narrow insight, and laziness; 5) drugs' characteristics: drug regimen, duration of therapy, type and price of medications, their side effects and adverse events; 6) disease characteristics: chronic disease and advanced stage of human immunodeficiency virus (HIV) infection; 7) characteristics of health facilities and workers: ease of accessing health service facilities, responsiveness of staff, empathetic attitude, and ability of healthcare workers to respect patient concerns; 8) communication: the better the communication, the better the compliance; 9) social capital: social support, educational provision, and counseling programs; 10) intervention: motivational, interviewing, reminder device, and one-time educational session [1, 2].

Health behavior theory, especially the information-motivation-behavioral skills (IMB) model, can be employ to describe and understand the factors influencing HIV/acquired immunodeficiency syndrome (AIDS) treatment adherence [3]. People with HIV/AIDS, who fall behind or miss their antiretroviral (ARV) treatment schedule, negatively impact their health, even though the rate of missing schedule is only 5% [4]. Disrupted schedules and frequent delays in taking ARVs can increase the viral load, causing drug resistance and virus mutations [5-7].

Based on the IMB model, non-adherence to HIV treatment is influenced by lack of information, forgetting to take medication, lack of motivation, and side effects of drugs used [8, 9]. Compliance related to information is adequate information about the specific regimen and HIV/AIDS treatment, use of ARV therapy, and immunological response to ARV medications. Compliance is related to motivation, namely a person's attitude to taking drugs as prescribed. Personal motivation consists of attitudes and beliefs about the consequences of complying or not to medication, and plans implemented to ensure compliance with medication. Adherence related to behavior is an objective ability that is associated with skills or self-efficacy, such as consistently taking medication (despite side effects), changing daily schedule, body weakening, and changing eating habits while T cells are decreasing. Information, motivation, and behavior influence medication adherence strategies. Adherence to taking medication is related to the strategies used to always comply with taking medication [8, 10].

This research connected motivation and information. Motivation influence information based on self-determination theory, with motivation described as a person's willingness to get involved in something because of a reward or penalty. This theory states that if someone has strong motivation, they will seek or share information [11]. In this study, HIV-infected gay and bisexual people with motiva-tions related to adherence were seeking information related to adequate ARV therapy and associated theories.

People living with HIV/AIDS (PLWHA) require information, motivation, and behavioral skills associated with adequate adherence to ARVs, information as guidance, knowledge about the importance of using ARV therapy, and increasing self-confidence and efficacy, so that treatment compliance increases optimally, preventing drug resistance and virus mutations [8].

Material and methods

Ethics statement

This research was conducted with the consent of the Health Research Ethics Commission of the Faculty of Dentistry, Airlangga University, with approval number of 680/HRECC.FODM/IX/2022, issued on September 6, 2022. All respondents were enrolled in the study after submitting written consent or filling out informed consent form.

Study participants and sample collection

Sample size consisted of 57 HIV-infected gay and bisexual individuals recruited at the Mahameru Foundation Jl Baratajaya IV No. 79 Surabaya, who were receiving ARV therapy. Data were obtained by using a questionnaire and analyzed with the IMB model. Socio-demographics of respondents were also collected in this study.

Analysis of the IMB model

Data were analyzed using the partial least square (PLS) analysis technique with the SmartPLS 3.0 program. Descriptive statistics were applied to analyze variables, and all variables were associated with adherence to ARV treatment. The questionnaire used in the research is a standard questionnaire, hence it did not require validity and reliability testing. Model fit was evaluated using goodness of fit (GFI) > 0.90, adjusted goodness of fit (AGFI) > 0.90, normed fit index (NFI) > 0.90, comparative fit index (CFI) > 0.90, and root mean square error of approximation (RMSEA) ≤ 0.01.

Results

Characteristics of HIV-1-infected gay and bisexual respondents living in Surabaya

The majority of the study sample were gay (94.7%), and have been members of the gay and bisexual community for a long time, i.e., more than 5 years (73.7%). Most of the respondents had homosexual sexual orientation (71.9%) and were unmarried (84.2%). Majority of them had sexual

partners who were Indonesian/foreign nationals citizens (87.7%), and were mostly aged between 26-35 years (45.6%) (early adulthood category). Javanese ethnicity were reported by 77.2% of the participants, with an educational background of graduating high school (50.9%), working as employees/ in private sector (82.5%), and earning between Indonesian rupiah (IDR) 2,500,000-5,000,000. Most of them had been initially diagnosed with HIV for more than 5 years (33.3%) and infected with HIV through horizontal sexual relations (52.7%), either from partners or from exposure to work as commercial sex workers (CSWs). Most of the respondents did not have nuclear family members infected with HIV, did not use injecting drugs (96.5%), did not have piercings and/ or tattoos (78.9%), and had no history of blood donation or receiving blood transfusions (91.2%). All respondents had received ARV therapy according to WHO recommendations, both first-line treatment (86.0%) with a combination of group 2 NRTI + 1 NNRTI (26.3%), and second-line treatment (14.0%) with a combination of group 2 NRTI + 1 PI (7.0%). The majority of participants undergoing second-line ARV therapy reported that the reason for changing ARV therapy lines was because of forgetting to take medication (37.5%). Moreover, 33.3% of the study sample had undergone ARV therapy for more than 5 years, during which no side effects from ARV treatment was reported by 61.3% of the participants. However, the experienced side effects from ARV treatment included dizziness, nausea, vomiting, sleep disturbances, rashes, itching, hair loss, and increased appetite. While undergoing ARV therapy, majority of the respondents revealed that they did not experience opportunistic infections (84.2%). Those who experienced opportunistic infections reported syphilis, condyloma, warts, and sores of the anus. 94.7% of the study sample have received HIV counseling, and had a viral load check (73.7%). The characteristics of HIV-1-infected gay and bisexual respondents from Surabaya are shown in Table 1.

The influence of respondent characteristics and risky behavior on adherence to ART based on the IMB model among HIV-infected gays and bisexuals from Surabaya

In Table 2, six values of direct influence from exogenous factors to endogenous factors in the inner model are presented. The results of the significance test for the effect value showed that all of them had a significant effect, with t-statistic being more significant than t-count. From the results of testing exogenous factors on endogenous factors above, the research objectives were the study hypotheses, as follow:

1. Respondent characteristics (age, initial HIV diagnosis, viral load examination) influence information related to adherence. Based on the t-statistic value of 3.951, which is greater than the t-table of 1.96, it can be concluded that the characteristics of respondents (age, initial HIV diagnosis, viral load examination) have a significant positive effect on information related to adherence.

Table 1. Characteristics of HIV-1-infected gays and bisexuals living from Surabaya, Indonesia

Characteristics	Frequency ($n = 57$)	Percentage (%)
Classification of gay and bisexual		
Homo/gay	54	94.7
Queer/banci/bencong/waria	3	5.3
Sexual orientation		
Homosexual	41	71.9
Bisexual	16	28.1
Sex partners		
Indonesian citizens	50	87.7
Indonesian citizens and foreign nationals	7	12.3
Duration/length of being gay and bisexual		
≤ 1 year	1	1.8
> 1-3 years	7	12.3
> 3-5 years	7	12.3
> 5 years	42	73.7
Age (years)		
Late teenagers (17-25)	15	26.3
Early adults (26-35)	26	45.6
Late adults (36-45)	12	21.1
Early seniors (46-55)	3	5.3
Late seniors (56-65)	1	1.8
Ethnic group		
Java	44	77.2
Madura	6	10.5
Chinese	3	5.3
Outside Java (Banjar, Lampung, Minahasa, Batak)	4	7.0
Level of education		
Senior high school	29	50.9
University	27	47.4
Elementary school	1	1.8
Marital status		
Not married	48	84.2
Married	9	15.8
Jobs status		
Employee/private sector	47	82.5
Student	2	3.5
Government employee	1	1.8
Entrepreneur	5	8.8
Unemployed	2	3.5

Table 1. Cont.

Characteristics	Frequency (n = 57)	Percentage (%)
Income (IDR)		
≤ 1,500,000	9	15.8
> 1,500,000-2,500,000	16	28.0
> 2,500,000-5,000,000	23	40.4
> 5,000,000	9	15.8
HIV initial diagnosis		
≤ 2 years	9	15.8
> 2-3 years	9	15.8
> 3-4 years	17	29.8
> 4-5 years	3	5.3
> 5 years	19	33.3
Transmission		
Vertical Mother-to-child (perinatal)	0	0.0
Horizontal Sexual intercourse	30	52.7
Horizontal Intravenous drug use, transfusion, and transplantation	0	0.0
Horizontal Job exposure	8	14.0
Family with HIV		
Nuclear family members infected with HIV	4	7.0
Nuclear family members not infected with HIV	53	93.0
Injecting drug use		
Yes	2	3.5
No	55	96.5
Possession of piercings and/or tattoos		
Yes	12	21.1
No	45	78.9
History of blood transfusion		
Yes	5	8.8
No	52	91.2
Type of antiretroviral therapy		
First-line treatment	49	86.0
3TC+AZT+NVP	4	7.0
TDF+3TC+DTG	14	24.6
3TC+AZT+EFV	15	26.3
TDF+3TC+EFV	13	22.8
FDC	3	5.3

Table 1. Cont.

Characteristics	Frequency (n = 57)	Percentage (%)
Second-line treatment	8	14.0
AZT+3TC+LPV/r	4	7.0
TDF+3TC+DTG	2	3.6
3TC+TDF+LPV	1	1.7
TDF+3TC+IP	1	1.7
Reason for changing lines		
Forgetting to take medication	3	37.5
Problems of access to health facilities	2	25.0
No family support	1	12.5
Experiencing side effects (nausea, allergies)	2	25.0
Therapy side effects antiretroviral therapy		
Nausea/vomiting	4	7.0
Dizziness	8	14.0
Itching	2	3.5
Sleep disorders	3	5.3
Increasing appetite	1	1.8
Rash	3	5.3
Hair loss	1	1.8
No side effects	35	61.3
Opportunistic infection		
Yes (syphilis, condyloma, warts, sores on the anus)	9	15.8
No	48	84.2
Duration of antiretroviral therapy		
≤ 2 years	9	15.8
> 2-3 years	9	15.8
> 3-4 years	17	29.8
> 4-5 years	3	5.3
> 5 years	19	33.3
HIV counseling		
Yes	54	94.7
No	3	5.3
HIV viral load check		
Yes	42	73.7
No	15	26.3

3TC – lamivudine, AZT – zidovudine, NVP – nevirapine, TDF – tenofovir, DTG – dolutegravir, EFV – efavirenz, FDC – fixed-dose combination, LPV/r – lopinavir/ritonavir, IP – inhibitor protease

2. Respondent characteristics (age, initial HIV diagnosis, viral load examination) influence behavior related to adherence (self-efficacy). Based on the t-statistic value of 5.114, which is greater than the t-table of 1.96, it can be concluded that the characteristics of respondents (age, initial HIV

Table 2. Results of testing the effect value between variables on the inner model

Influence between variables	Coefficient	t-statistics	p-value	Description
The influence of respondent characteristics (age, initial diagnosis of HIV, viral load examination) on information (knowledge)	0.364 (moderate)	3.951	0.000	Significant
The influence of respondent characteristics (age, initial HIV diagnosis, viral load examination) on behavior (self-efficacy)	0.476 (moderate)	5.114	0.000	Significant
The influence of respondent characteristics (age, initial HIV diagnosis, viral load examination) on motivation (attitude)	0.469 (moderate)	4.076	0.000	Significant
The influence of information (knowledge) on medication adherence	0.227 (poor)	1.995	0.047	Significant
The influence of behavior (self-efficacy) on medication adherence	0.367 (moderate)	3.045	0.002	Significant
The influence of motivation (attitude) on medication adherence	0.278 (poor)	2.017	0.044	Significant

diagnosis, viral load examination) have a significant positive effect on behavior related to adherence (self-efficacy).

3. Respondent characteristics (age, initial HIV diagnosis, viral load examination) influence motivation related to adherence. Based on the t-statistic value of 4.076, which is greater than the t-table of 1.96, it can be concluded that the characteristics of respondents (age, initial HIV diagnosis, viral load examination) have a significant positive effect on motivation related to adherence.

4. Information related to adherence affect medication adherence. Based on the t-statistic value of 1.995, which is greater than the t-table of 1.96, it can be concluded that information related to adherence have a significant positive effect on medication adherence.

5. Behavior related to adherence (self-efficacy) influences medication adherence. Based on the t-statistic value of 3.045, which is greater than the t-table of 1.96, it can be concluded that behavior related to adherence (self-efficacy) has a significant positive effect on medication adherence.

6. Motivation related to adherence affects medication adherence. Based on the t-statistic value of 2.017, which is greater than the t-table of 1.96, it can be concluded that motivation related to adherence has a significant positive effect on adherence to taking medication.

Based on the results of testing the significance of influence between the variables above, it can be concluded that all relationships between variables in the inner model have a significant influence value.

Discussion

Characteristics of the study respondents

Public opinion on the acceptance of the gay and bisexual community issues vary (pros and cons), depending on cultural background, religion, social groups, media, family, peer relationships, gender, and interactions with the above community. Individuals infected with HIV virus from gay and bisexual communities receive discriminatory treatment, especially to access healthcare services, employment, education, and in community environment. The Mahameru Foundation, which oversees the gay and bisexual community with HIV-infected individuals in Surabaya, has helped them to assess health facilities for HIV treatment and humanitarian services as well as in increasing the performance productivity of the community (71.9%).

In the study, a predominance of 84.2% of the respondents declared homosexual orientation who decided not to marry due to the lack of support from the government regarding marital status and adoption based on Law No. 1/1974, and provisions involving the contents of resident card stipulated in the Population Administration Law No. 23/2006. According to the characteristics of the participants, majority of them were high school (50.9%) and university graduates (47.4%). They had adequate jobs, with income ranging IDR 2,500,000-5,000,000, categorized as the middle economics. From these findings, it can be concluded that there is no discrimination related to education and work among gay and bisexual community who are infected with HIV. The characteristics of respondents related to transmission route of HIV infection were dominated by the horizontal route of sexual intercourse (52.7%), both from partners and exposure to work as CSWs. This finding is in line with the results of previous studies, reporting the rate of HIV transmission from risky sexual behaviors ranging from 42.1% to 89.0% [12-18]. The participants in our study had received ARV therapy according to WHO treatment guidelines, i.e., first-line ARV treatment was administered in a combination of drugs from group 2 NRTI + 1 NNRTI, while second-line in a combination from group 2 NRTI + 1 PI. There were some respondents who experienced side effects of the therapy, such as dizziness, nausea, vomiting, sleep disturbances, rashes, itching, hair loss, and increased appetite. Side effects were short-term, lasting up to several weeks after first dose, and improved as the body adjusted to the treatment given. Several opportunistic infections were also experienced by the respon-

dents, including syphilis, condyloma, warts, and sores of the anus. Opportunistic infections are generally experienced by HIV sufferers, and co-trimoxazole prophylaxis is needed for treatment. All the respondents who experienced opportunistic infections were given treatment according to HIV treatment standards (WHO recommendations).

ARV therapy failure can be detected by viral load examination. In patients with good adherence, a viral load above 1,000 copies/ml based on 2 viral load tests, 3-6 months apart, can be considered as a limit to define virological failure. Therefore, viral load testing and HIV counseling with healthcare workers are urgently needed by the gay and bisexual community who are infected with HIV.

The influence of respondent characteristics and risky behavior on adherence to ARV therapy based on the IMB model in the study group

According to the influence test between variables, there is a positive influence between the corresponding variables. If the value of variable X increases, the value of variable Y also increases. This is in line with previous studies, showing that compliance is related to motivation and behavior, the higher the motivation and behavior, the higher the person's adherence in taking medication as prescribed [9, 10]. Our results on adherence and motivation are in line with previous research, reporting that non-adherence to HIV treatment was influenced by a lack of information, forgetting to take medication, lack of motivation, and treatment side effects [8, 9]. This was confirmed by prior study, highlighting that motivation is able to influence information, based on self-determination theory, which states that if someone has a strong motivation, they seek or share information [11]. Age has no relationship with the level of understanding according to the impact of drug information service provision. Age, education, and gender have a relationship as well as an influence on mass media consumption behavior, which occurs in consumers [19]. Age has an influence on a person's ability to search for information. The more information found, the more knowledge obtained. Age affects a person's motivation in carrying out a job. Maturer respondents are considered to have a tendency to be more responsible, orderly, and conscientious compared with younger persons [20]. Initial diagnosis of HIV and checking HIV virus load influence a person's attitude or motivation in seeking ARV drugs, which in turn affect the person's adherence in taking ARV treatment. Self-efficacy is a learning process that lasts throughout life. Mature-aged people are considered to have more experience than younger persons, so that older people are capable of dealing with problems [21]. Age, early HIV diagnosis, and HIV viral load testing affect self-efficacy of HIV sufferers through increased experience, while augmented wisdom, decision-making accuracy, and high motivation, all affect self-efficacy. High self-efficacy later influence the decision of HIV sufferers whether to comply with ARV treatment. Good knowledge impacts adherence to ARV therapy, meaning that good knowledge influences a person's attitudes and actions, including taking ARVs [22]. On the other hand, non-adherence to HIV treatment is influenced by lack of information, forgetting to take medication, lack of motivation, and side effects of treatment [8, 9]. A person's good knowledge about what they are suffering from, influence behavior, in this case, adherence to ARV therapy. Good knowledge of HIV/AIDS make patients comply with ARVs in order to protect themselves/those closest to them from the risk of contracting HIV and dangers of being resistant to ARVs. Motivation is the biggest capital to make someone move to take an action; for example, high motivation in children encourage them to do things well [23]. The stronger the motivation, the higher the person's adherence to taking medication as prescribed [8, 9]. A positive attitude accompanied by good motivation leads to positive behavior as well (in this case) the behavior of taking ARV treatment as prescribed. Motivation does not only come from oneself, but can also grow with the support of people around, such as parents, partners, children, and peers. Therefore, internal and external motivation is very important for HIV-infected people because it helps them facing stigma of being gay and bisexual with HIV. Compliance is a condition where a person adheres to clinical recommendations from the treating doctor as long as the patient's behavior is in accordance with the provisions set by the clinician. Therefore, it can be said that compliance is taking drugs according to the rules, which include the right drug, the right time to take the drug, and the right way to take it. In HIV patients, non-compliance with drug consumption can affect CD4+ count in the body. If CD4+ is lower than 200 cells/ml, the body's immune system not work optimally. Good self-efficacy in HIV sufferers give a positive impact on compliance with ARV therapy intake [23, 24]. The better the person's behavior, the higher the person's adherence to taking medication as prescribed [8, 9]. Self-efficacy related to one's experience influences adherence to ARV treatment. Referring to such experience, if one does not take ARVs, HIV symptoms worsen, progressively leading to AIDS.

Limitation of this study

Further research is needed investigating the IMB model combined with other theories related to adherence to ARV medications, to determine the factors influencing compliance with ARV therapy. From the characteristics of the respondents, IMB model is limited to the factors, including age, initial HIV diagnosis, and HIV viral load examination.

Conclusions

The characteristics of HIV-infected gay and bisexual individuals who responded to the questionnaire, include homosexual orientation, age between 26 and 35 years (early adulthood), being single, having Indonesian sex partners, Javanese, high school and university graduates, working as

employees/in private sector, having income ranging IDR 2,500,000-5,000,000, being diagnosed with HIV for more than 5 years, being infected with HIV through sexual intercourse either from partner or from exposure to work as a prostitute, not having an HIV-infected nuclear family member, not using injecting drugs, not having piercings and/or tattoos, no history of ever receiving blood transfusions, having received ARV treatment (treated) both first- and second-line, not experiencing side effects nor opportunistic infections, and having had HIV counseling and viral examination load HIV.

The characteristics of the respondents, such as age, initial HIV diagnosis, and viral load examination, have an influence on adherence to ARV treatment, with a medium category (0.476) path coefficient analyzed with the IMB model.

Disclosures

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