Driving factors of retention in care among HIV-positive MSM and transwomen in Indonesia: A cross-sectional study

Adi Nugroho¹,²,³*, Vicki Erasmus¹, Robert W. S. Coulter⁴,⁵, Sushil Koirala⁶, Oranuch Nampaisan⁶, Wirstra Pamungkas³, Jan Hendrik Richardus¹

¹ Department of Public Health, Erasmus MC, University Medical Center Rotterdam, Rotterdam, The Netherlands, ² School of Public Health, Medical Faculty, Lambung Mangkurat University, Banjarbaru, Indonesia, ³ GWL-INA Network, Jakarta, Indonesia, ⁴ Department of Behavioral and Community Health Sciences, Graduate School of Public Health, University of Pittsburgh, Pittsburgh, Pennsylvania, United States of America, ⁵ Center for LGBT Health Research, Graduate School of Public Health, University of Pittsburgh, Pittsburgh, Pennsylvania, United States of America, ⁶ Asia Pacific Network of People Living with HIV/AIDS, Bangkok, Thailand

* a.nugroho@erasmusmc.nl

Abstract

Little is known about the prevalence of and factors that influence retention in HIV-related care among Indonesian men who have sex with men (MSM) and transgender women (transwomen, or waria in Indonesian term). Therefore, we explored the driving factors of retention in care among HIV-positive MSM and waria in Indonesia. This cross-sectional study involved 298 self-reported HIV-positive MSM (n = 165) and waria (n = 133). Participants were recruited using targeted sampling and interviewed using a structured questionnaire. We applied a four-step model building process using multivariable logistic regression to examine how sociodemographic, predisposing, enabling, and reinforcing factors were associated with adequate retention in care. Overall, 78.5% of participants were linked to HIV care within 3 months after diagnosis or earlier, and 66.4% were adequately retained in care (at least one health care visit every three months once a person is diagnosed with HIV). Being on antiretroviral therapy (adjusted odds ratio [AOR] = 6.00; 95% confidence interval [CI]: 2.93–12.3), using the Internet to find HIV-related information (AOR = 2.15; 95% CI: 1.00–4.59), and having medical insurance (AOR = 2.84; 95% CI: 1.27–6.34) were associated with adequate retention in care. Involvement with an HIV-related organization was associated negatively with retention in care (AOR = 0.47; 95% CI: 0.24–0.95). Future interventions should increase health insurance coverage and utilize the Internet to help MSM and waria to remain in HIV-related care, thereby assisting them in achieving viral suppression.

Introduction

Men who have sex with men (MSM) and transgender women (transwomen) are disproportionately burdened by HIV infection worldwide. Compared to the general adult population,
MSM and transgender people have 19- and 34-fold greater odds, respectively, of getting infected with HIV [1]. In Indonesia, HIV prevalence among MSM and “waria” (an Indonesian term for transwomen) is substantial: HIV prevalence rose from 5% in 2007 to 12% in 2011 among MSM, and was even higher among waria at 24% in 2007 and 23% in 2011 [2].

Given the high prevalence of HIV among MSM and waria, the Indonesia government currently supports a “Test and Treat” strategy. Such a strategy aims to initiate antiretroviral therapy (ART) for HIV-positive individuals who have a high chance of transmitting the virus to their sex partners (due to their high-risk behavior) regardless of their CD4 count [3], including MSM and waria. The success of this strategy is evaluated through the HIV treatment cascade, a system that monitors the number of individuals living with HIV who are linked to care, receive medical care, remain engaged in care; and are able to suppress the virus through treatment [4–6]. Immediate linkage to care after an HIV-positive diagnosis allows HIV-patients to receive appropriate counseling and treatment, which can prevent further HIV sequelae and transmission [7]. Both patients who are on antiretroviral therapy (ART) and those who are not should remain retained in care [8]. For those who are on ART, retention in care is necessary to ensure adherence, manage toxicities, and address treatment failure [8, 9]. For those not on ART, regular engagement in care allows doctors to monitor patients and provide prophylactic medication and ART initiation once indicated [10, 11]. These common clinical practices help patients attain and maintain viral suppression, which is the ultimate indicator for successful management of HIV infection [12] and can prevent sexual transmission of HIV infection [13–15].

Among HIV-positive Indonesians, generally, the proportion of HIV-positive individuals alive and receiving ART after one year of initiating treatment was less than 70% in 2011, with loss to follow-up from treatment at 19% [16]. In 2013, HIV treatment retention for 12, 24, and 60 months was 66%, 62%, and 44%, respectively [17]. These drop-out levels are comparable to the treatment retention of HIV-positive MSM and transwomen populations in other countries [18, 19]. However, specific data about how HIV-positive MSM and waria in Indonesia are linked to and retained in care is scarce. Because anti-gay and anti-trans stigma in Indonesia are high [20], linking and retaining these stigmatized groups to care is likely worse than that of HIV-positive individuals in general. Understanding the prevalence of retention in care among MSM and waria is therefore warranted.

Furthermore, studies examining factors that facilitate and create barriers to proper retention in HIV care for Indonesian MSM and waria can help inform future interventions that aim to increase retention in care. Prior studies in other countries indicate the following common barriers to engagement in HIV care among MSM: psychological burden of committing to HIV care; accessibility of HIV treatment; privacy and treatment concerns; perceived discrimination from healthcare workers; and lack of guidance and follow-up [21–24]. Barriers to ART access among transgender women primarily consist of fear of their HIV-positive status being revealed to others; HIV stigma within transgender communities themselves; rejection by family; social isolation, loss of subsistence income; and maltreatment within the healthcare system [25–27]. Having culturally appropriate and transgender-sensitive healthcare was a strong facilitator to engagement and retention in care [28].

Understanding how vulnerable populations are linked to and retained in HIV care is critical to achieve optimal clinical outcomes. However, factors that enable or inhibit retention in care among Indonesian MSM and waria have yet to be examined. To address these gaps in knowledge, this study aimed to describe retention in HIV care among HIV-positive MSM and waria in Indonesia. This study also investigated the driving factors of retention in care among the populations. We examined predisposing, enabling, and reinforcing factors, which are based on the PRECEDE-PROCEED Model [29], a theoretical model for evaluating psycho-sociological health behavior.
Methods

Study design and population

We analyzed cross-sectional baseline data from a study conducted by the Asia Pacific AIDS Positive Network (APN+), a regional network of people living with HIV from 11 countries in Asia and the Pacific. Data were collected by trained interviewers from 1,655 Indonesian people living with HIV from December 2012 to February 2013. In this paper we focus on the MSM and waria subsample (n = 298; 165 MSM and 133 waria). Participants were administered a validated questionnaire developed by the APN+. The original questionnaire was in English, and translated to Bahasa Indonesia. The questionnaire was then back-translated into English to ensure consistency and quality.

Participants were recruited using a targeted sampling method [30], a technique that has been widely used for sampling hard-to-reach groups. First, at least one person from each high-risk group with HIV (including MSM and waria) was selected to be a seed at each study site. These people were identified either through the contact of a local support group for people living with HIV or through a local community-based organization. Each seed was surveyed and then asked to recruit another participant to the study. Then this participant was surveyed and asked to recruit another participant to the study. This process was repeated until the desired sample size at each study site was reached.

Inclusion of the participants was based on the following criteria: 1) an HIV-positive individual residing in the study sites; 2) aged between 18–50 years; and 3) self-reported diagnosed with HIV infection at least three months prior to the date of interview. Participants were informed about the study objectives and the procedures prior to being surveyed. Those who voluntarily signed the informed consent form were then given the interviewer-administered survey. Study procedures were approved by the Research Ethics Board of Atma Jaya University Indonesia, Jakarta.

Measures

The primary outcome measure in our analysis was retention in HIV care, which was measured using the following question: “After being HIV-positive, how frequently did you visit your doctor/nurse/health worker?” Response options included: once a week; once a month; once every 2–3 months; once every 4–6 months; only every 7–12 months; or only when I am sick). We dichotomized participants into having adequate and inadequate retention in care. We defined adequate retention as at least one health care visit every three months once a person is diagnosed with HIV. This definition is in accordance with guidelines and prior studies [8, 10, 31]. As additional information, we also measured linkage to care using the following question: “After diagnosis, how long did it take you to meet the doctor/nurse/health worker?” Response options consisted of: right after diagnosis, same day; number of years/months/days after diagnosis; or not visited yet.

To explore the determinants of retention in HIV care, we analyzed the impacts of three groups of influencing factors: predisposing, enabling, and reinforcing factors based on the PRECEDE-PROCEED model [29]. Predisposing factors included HIV treatment literacy, which was defined as the level of understanding on all aspects of ART, including types of ART drugs, ART side effects, treatment adherence, HIV drug resistance and other related topics. To measure this, an overall literacy score was applied using 25 “True” or “False” questions (Cronbach’s alpha = 0.90; higher scores indicate greater knowledge). The remaining predisposing factors were: disease history (e.g., in the past 6 months, did you suffer from any disease/health problem? yes versus no); ever diagnosed with TB (have you ever been diagnosed with TB after
you were HIV+? yes versus no); alcohol drinking (do you currently drink alcohol? yes versus no); illicit drug use (have you ever used any illicit drugs? Yes versus no); smoking (do you smoke? yes versus no); and unsafe sex in the past 6 months (in the past 6 months, have you had sex with your spouse/someone other than your spouse? yes versus no); how frequently did you use a condom when you had sex with him/her?).

**Enabling factors** included having medical insurance (are you enrolled in any kind of health insurance program? yes versus no); and being a member of/affiliated to an HIV-related organization (are you a member of/affiliated to any HIV-related organization? yes versus no); internet use for HIV information (have you ever used internet to find HIV-related information? yes versus no), and amount of internet use (in the past 7 days, how many hours did you spend on the internet?).

**Reinforcing factors** included ART status (are you taking ART/HIV medicines now? yes versus no); disclosure to steady partner (have you ever disclosed your HIV+ status to your spouse? yes versus no); disclosure to individuals beyond family & steady partner (have you ever disclosed your HIV+ status to anyone except your spouse, a close family member, and your doctor? yes versus no); stigma & discrimination experience (in the last 12 months, how often have you been excluded from social events or activities; or been verbally insulted, harassed and/or threatened; or been physically assaulted; or been denied health services because of your HIV status?); and social support, which was measured using a validated 12 items scale [32]. These items addressed instrumental and emotional social support from family, friends, and significant other (e.g. “my family really tries to help me”; “I can count on my friends when things go wrong”; and “there is a special person with whom I can share my joys and sorrows”). Responses ranged from “strongly disagree” to “strongly agree” on a five-point scale (Cronbach’s alpha = 0.90; higher scores indicate greater social support). Sociodemographic characteristics were also measured. This included risk group (MSM or waria), age, education, income, and place of residence.

**Analyses**

We analyzed data in Stata version 14.0 (StataCorp, College Station, Texas). We first examined differences between MSM and waria in sociodemographic characteristics, linkage to care, and retention in care, as well as predisposing, enabling, reinforcing factors using chi-square tests for categorical variables and independent t-test or Mann-Whitney U tests (when data were not normally distributed) for continuous variables. We then examined the associations of sociodemographic characteristics as well as predisposing, enabling, reinforcing factors with our primary outcome, retention in HIV care using univariate logistic regression models. When univariate p-values were less than 0.20, we included these factors in multivariable models. We fit multivariable logistic regression models to identify factors associated with retention in care. We used a four-step model building process, based on the PRECEDE-PROCEED Model [29]. We added factors cumulatively: first, we added sociodemographic characteristics (Model 1), followed by predisposing factors (Model 2), enabling factors (Model 3), and reinforcing factors (Model 4). Assumptions for logistic regression were met (i.e., non-collinearity, linearity in the logit, no outliers, independence of observations).

**Results**

**Sociodemographic characteristics**

Table 1 describes the sociodemographic characteristics of the sample. Compared to waria participants, MSM participants were significantly younger, were better educated, had a higher monthly income, and were less likely to have ever engaged in sex work.
Retention in care of HIV-positive MSM and waria in Indonesia

Linkage to and retention in HIV care

Table 2 indicates that the majority of respondents (78.5%) were linked to HIV care within 3 months after receiving their HIV diagnosis, and this did not differ between MSM and waria. Almost two-thirds (66.4%) of respondents had adequate retention in health care (i.e., they visited a healthcare facility at least once every three months since being diagnosed with HIV). Retention in HIV care was higher among MSM than waria participants (72.7% vs 58.7%, respectively, p < 0.05).

Predisposing, enabling, and reinforcing factors

Table 2 also shows the prevalence of predisposing, enabling, and reinforcing factors, as well as differences in these factors between MSM and waria. Regarding predisposing factors, 67.8% of participants were diagnosed with HIV more than 12 months prior to the survey, 6.4% reported having health problems in the past six months, 23.2% had unprotected sex in the past six months. Compared to waria, MSM were less likely to use alcohol, use illicit drugs, smoke, and ever have TB. MSM had a higher HIV-treatment literacy than waria.
Table 2. Linkage to and retention in HIV care, and determinant factors on health care uptake among respondents, and by risk group.

| Variable                                      | Total | MSM | Waria | Risk group | p-value |
|-----------------------------------------------|-------|-----|-------|------------|---------|
|                                               | N     | %   | n     | %         | n       | %     |
| Total                                         | 298   | 100 | 165   | 55.4      | 133     | 44.6  |
| **Linkage to HIV care**                       |       |     |       |           |         |       |
| ≤ 3 months after diagnosis                    | 234   | 78.5| 132   | 80.0      | 102     | 76.7  |
| 4–6 months after diagnosis                    | 7     | 2.3 | 1     | 0.6       | 6       | 4.5   |
| > 6 months after diagnosis                    | 30    | 10.1| 18    | 10.9      | 12      | 9.0   |
| Had not yet visited                           | 27    | 9.1 | 14    | 8.5       | 13      | 9.8   |
| **Retention in HIV care**                     |       |     |       |           |         |       |
| Adequate                                      | 198   | 66.4| 120   | 72.7      | 78      | 58.7  |
| Inadequate                                    | 100   | 33.6| 45    | 27.3      | 55      | 41.3  |
| **Predisposing factors**                      |       |     |       |           |         |       |
| Time of diagnosis                             |       |     |       |           |         |       |
| ≤ 12 months prior                             | 96    | 32.2| 63    | 38.2      | 33      | 24.8  |
| > 12 months prior                             | 202   | 67.8| 102   | 61.8      | 100     | 75.2  |
| Had any health problem³                       | 19    | 6.4 | 11    | 6.7       | 8       | 6.0   |
| Ever diagnosed with TB                        | 97    | 32.6| 31    | 18.8      | 66      | 49.6  |
| Alcohol drinking⁵                              | 70    | 23.5| 15    | 9.1       | 78      | 58.7  |
| Illicit drug use⁴                              | 54    | 18.1| 20    | 12.1      | 34      | 25.6  |
| Smoking⁵                                      | 147   | 49.3| 55    | 33.3      | 92      | 69.2  |
| Had unprotected sex⁵                          | 69    | 23.2| 34    | 20.6      | 35      | 26.3  |
| HIV-treatment literacy, mean (SD)             | 18.1  | (5.29)| 19.25 | (4.45)    | 16.74   | (5.90) |
| **Enabling factors**                          |       |     |       |           |         |       |
| Having medical insurance                      | 74    | 24.8| 31    | 18.8      | 43      | 32.3  |
| Connected with HIV-related organization⁶       | 120   | 40.3| 56    | 33.9      | 64      | 48.1  |
| Mobile-phone use                              | 286   | 96  | 164   | 99.4      | 122     | 91.7  |
| SMS use                                       | 283   | 99  | 162   | 98.8      | 121     | 99.2  |
| Searched HIV information on internet          | 168   | 56.4| 134   | 81.2      | 34      | 25.6  |
| Internet use (hours)⁷, median                 | 4     | 1   | 11    | -         | 0       | -     |
| **Reinforcing factors**                       |       |     |       |           |         |       |
| Has been on ART                               | 168   | 56.4| 84    | 50.9      | 84      | 63.2  |
| Having a partner who knows their HIV status   | 29    | 9.7 | 19    | 11.5      | 10      | 7.5   |
| Disclosed HIV status externally               | 137   | 46  | 65    | 39.4      | 72      | 54.1  |
| Experienced stigma & discrimination⁶          | 60    | 20.1| 16    | 9.7       | 44      | 33.1  |
| Social support, mean (SD)                     | 3.41  | (0.67)| 3.22  | (0.77)    | 3.64   | (0.42) |

Note: P-values were derived from Chi-Square test for categorical variables, and independent t-tests or Mann-Whitney U test for continuous variables; SD = standard deviation; TB: tuberculosis; ART: antiretroviral therapy; Waria = Indonesian term for transwomen;³ In the past six months;⁴ At present;⁵ In lifetime;⁶ Member of/affiliated with;⁷ In the past week;⁸ In the past year.

https://doi.org/10.1371/journal.pone.0191255.t002
Regarding enabling factors, only 24.8% had medical insurance. Compared to waria, MSM were less likely to have medical insurance, to be a member of or affiliated with an HIV-related organization, more likely to use mobile phones, more likely to search for HIV information on the internet, and had higher internet usage.

Regarding reinforcing factors, more than half of all respondents were already on ART (56.4%), with MSM less likely than waria to have been on ART. Compared to waria, MSM were less likely to disclose their HIV status beyond family and partners, were less likely to experience stigma and discrimination, and had lower social support.

**Univariate differences for retention in care**

Retention in care was associated with several of the sociodemographic, predisposing, enabling, and reinforcing factors that were considered (Table 3). As noted in Table 2, MSM were more likely to have adequate retention (73%) than waria (59%). Compared to those who had inadequate retention in care, participants with adequate retention had a significantly higher monthly income, and were less likely to have engaged in sex work throughout their lifetime.

Compared to those who had inadequate retention in care, participants with adequate retention were less likely to drink alcohol, smoke, and have unprotected sex. They also had higher HIV-treatment literacy. Such participants were also more likely to have medical insurance, more likely to search for HIV information on the internet and more likely to have been on ART. Further they were less likely to experience stigma and discrimination but they also reported having less social support.

**Multivariable associations of retention in care**

Model 1 (Table 4) indicates that none of the sociodemographic variables were significantly associated with retention in care. Model 2 shows that after adjusting for sociodemographics, having any health problems (adjusted odds ratio [AOR] = 4.45; 95% confidence interval [CI]: 1.05–18.5) and higher HIV-treatment literacy (AOR = 1.12; 95% CI: 1.10–17.9) were significantly associated with higher odds of adequate retention in care. These two factors remained statistically significant when enabling factors were included in Model 3. Controlling for sociodemographic, predisposing, and enabling factors, being a member of or affiliated with an HIV-related organization was associated with lower odds of retention in care (AOR = 0.50; 95% CI: 0.27–0.91).

In Model 4, which added reinforcing factors, having been on ART (AOR = 6.00; 95% CI: 2.93–12.3) was associated with higher odds of adequate retention in care. Respondents who searched for HIV-information on the Internet (AOR = 2.15; 95% CI: 1.00–4.59) and had medical insurance (AOR = 2.84; 95% CI: 1.27–6.34) were also associated with higher odds of retention in care. Being a member of or affiliated with an HIV-related organization remained associated with lower odds of adequate retention in care (AOR = 0.47; 95% CI: 0.24–0.95), whereas having any health problems or higher HIV treatment literacy were no longer associated with retention in care in Model 4.

**Discussion**

This study demonstrated high rates of early linkage to care and a moderate rate of adequate retention in HIV care among HIV-positive MSM and waria in Indonesia. Our analysis showed that two predisposing factors, i.e. having other health problems and higher literacy of HIV treatment seem to facilitate to the higher odds of adequate retention in care among our study participants when accounting for sociodemographic characteristics and enabling factors. For the enabling factors, using the internet for HIV information and having medical insurance
Table 3. Sociodemographic, predisposing, enabling, and reinforcing factors by retention in care.

| Variable | Total | Adequate | Inadequate | p-value |
|----------|-------|----------|------------|---------|
|          | N %   | n %      | n %        |         |
| Total    | 298 100 | 198 66.4  | 100 33.6   | 0.411   |
| Age, mean (SD) | 32.1 (0.43) | 32.4 (0.52) | 31.7 (0.74) | 0.411 |
| Highest education level | | | | |
| Primary school or lower | 14 4.7 | 10 5.1 | 4 4.0 | 0.305 |
| Secondary school | 63 21.1 | 36 18.2 | 27 27.0 |
| Higher secondary school | 173 58.1 | 121 61.1 | 52 52.0 |
| College degree or above | 48 16.1 | 31 15.7 | 17 17.0 |
| Monthly income (in US dollars), median | 109.1 - | 136.4 - | 90.9 - | 0.003 |
| Relationship status | | | | |
| Single | 231 77.5 | 156 78.8 | 75 75.0 | 0.449 |
| Has an HIV-negative partner | 28 9.4 | 20 10.1 | 8 8.0 |
| Has an HIV-positive partner | 16 5.4 | 10 5.1 | 6 6.0 |
| Has a partner with unknown HIV status | 23 7.7 | 12 6.1 | 11 11.0 |
| Area of residence | | | | |
| Rural area/small town | 61 20.5 | 38 19.2 | 23 23.0 | 0.442 |
| Large town/city | 237 79.5 | 160 80.8 | 77 77.0 |
| Recruitment site | | | | |
| Jakarta and surroundings | 76 25.5 | 54 27.3 | 22 22.0 | 0.651 |
| Bandung and surroundings | 148 49.7 | 94 47.5 | 54 54.0 |
| Yogyakarta & Central Java | 46 15.4 | 30 15.2 | 16 16.0 |
| City outside of Java Island | 28 9.4 | 20 10.1 | 8 8.0 |
| Sex work in lifetime | | | | |
| Injection drug use in lifetime | 4 1.3 | 2 1.0 | 2 2.0 | 0.483 |
| Predisposing factors | | | | |
| Time of diagnosis | | | | |
| ≤ 12 months prior | 96 32.2 | 63 31.8 | 33 33.0 | 0.837 |
| > 12 months prior | 202 67.8 | 135 68.2 | 67 67.0 |
| Had any health problem* | 19 6.4 | 16 8.1 | 3 3.0 | 0.090 |
| Ever diagnosed with TB | 97 32.6 | 65 32.8 | 32 32.0 | 0.885 |
| Alcohol drinking* | 70 23.5 | 37 18.7 | 33 33.0 | 0.006 |
| Illicit drugs use* | 54 18.1 | 35 17.7 | 19 19.0 | 0.079 |
| Smoking* | 147 49.3 | 83 41.9 | 64 64.0 | <0.001 |
| Had unprotected sex* | 69 23.2 | 35 17.7 | 34 34.0 | 0.002 |
| HIV-treatment literacy, mean (SD) | 18.1 (0.31) | 19.3 (0.32) | 15.7 (0.59) | <0.001 |
| Enabling factors | | | | |
| Having medical insurance | 74 24.8 | 57 28.8 | 17 17.0 | 0.026 |
| Connected with HIV-related organization* | 120 40.3 | 74 37.4 | 46 46.0 | 0.152 |
| Searched HIV information on internet | 168 56.4 | 120 60.6 | 48 48.0 | 0.038 |
| Internet use (hours)*, median | 4 - | 5 - | 3 - | 0.532 |
| Reinforcing factors | | | | |
| Has been on ART | 168 56.4 | 135 68.2 | 33 33.0 | <0.001 |
| Having partner who knows their HIV status | 29 9.7 | 16 8.1 | 13 13.0 | 0.176 |
| Disclosed HIV status externally | 137 46.0 | 88 44.4 | 49 49.0 | 0.456 |
| Experienced stigma & discrimination* | 60 20.1 | 27 13.6 | 33 33.0 | <0.001 |

(Continued)
facilitated adequate retention in care once we controlled for reinforcing factors. Being on ART was the reinforcing factor that could facilitate adequate retention in care. Whereas involvement with HIV-related organizations seemed to inhibit retention in care among our study participants.

The relatively high rates of linkage to care among our study participants is comparable to that among general HIV-positive patients in Indonesia [33], suggesting that there might not be disparities in linkage to care between MSM and waria populations compared to other groups in Indonesia. Also, the prevalence of MSM and waria in our study that have adequate retention in HIV care is similar to the prevalence of retention in care of all HIV-positive individuals in Indonesia taken together [17]. Our results show a higher proportion of adequate retention in care in our sample than HIV-positive MSM and transgender women in other global locations [5, 31, 34, 35].

This is to the best of our knowledge the first study in Indonesia documenting retention in care of HIV-positive MSM and waria and its social aspects. A sizeable number of people from these difficult to reach groups were interviewed, allowing to capture an overall view of retention in care among these groups. Nevertheless, this study also has several limitations. Firstly, the survey used a non-random sampling approach in urban settings, so findings may not be representative of the entire population of MSM and waria groups in Indonesia. The use of targeted sampling which is similar to snowball sampling may also have limited our study participants to certain social network. Secondly, MSM and waria were pooled in the analysis, while descriptive analysis showed that these groups differed on several aspects. The sample sizes, however, were too small to perform subgroup analysis with adequate power. For the same reason we could not stratify participants by time of diagnosis, which might be important because standards of clinical care for people newly diagnosed with HIV may be different from those given to people who have been living with HIV longer [5]. Lastly, this study is subject to social desirability due the nature of self-reported data collection, although all precautions were taken during data collected to reduce this bias to a minimum.

Participants who had higher HIV-treatment literacy and who had other health problems were more likely to be retained in care, but these associations lost significance when taking ART status into account. It is common that HIV patients seek care only when they experience symptoms of disease [36], and our results appear to confirm this tendency that participants who are in good health do not seek health care regularly. Our finding also supports the notion that sufficient literacy or knowledge about the benefits of HIV treatment could increase

| Variable                        | Total  | Adequate | Inadequate | p-value |
|---------------------------------|--------|----------|------------|---------|
| Social support, mean (SD)       | 3.41 (0.04) | 3.35 (0.05) | 3.54 (0.06) | 0.018   |

Note: P-values were derived from Chi-Square test for categorical variables, and independent t-tests or Mann-Whitney U test for continuous variables; SD = standard deviation; TB: tuberculosis; ART: antiretroviral therapy; 
*In the past six months*; 
*At present;* 
*In lifetime;* 
*Member of/affiliated with;* 
*In the past week;* 
*In the past year.*

https://doi.org/10.1371/journal.pone.0191255.t003
motivation to seek and remain in treatment. To our knowledge, prior studies have not examined the association between knowledge and retention in care, although some studies have shown that a lack of knowledge about HIV treatment is a barrier to HIV testing [37] and ART use [38].

Knowledge about HIV care and treatment may be obtained by searching HIV-related materials through any source of information, including the internet. Our results show a positive
association between using the internet to look for HIV information and adequate retention in care. This finding supports prior studies that identified the strong potential of internet use for HIV-positive individuals in the HIV care continuum [39–42]. Our study further revealed that medical insurance predicted greater odds of retention in HIV care. This implies that financial reasons may prevent people with HIV in Indonesia from routinely accessing HIV care. In lower-middle income countries, a fee-for-service program was associated with a lower probability that people with HIV will continue treatment after ART initiation [43]. Likewise, a systematic review showed that having private insurance was associated with higher utilization rates of health services among people with HIV, even in high income countries [44].

A surprising finding in our study is that participants who are attached to an HIV-related organization are less likely to be retained in care. We assumed such attachment could bring support for people with HIV, in turn enabling them to be retained in care. HIV-related organizations usually have solid networking with local HIV care and treatment services [45, 46], and thus would encourage people with HIV to be adequately retained in care [5]. Nevertheless, our findings indicate that having such support may possibly keep them away from health care. Maintaining a healthy status to keep the doctor away is a basic health concept among Indonesian people for financial reasons. It is possible that participants with support from HIV-related organizations perceive themselves as being in good health and find it unnecessary to visit HIV care too often [47]. More insight into this phenomenon is needed in order to improve retention to care among these individuals.

As expected, we found that ART status had a positive association with retention in care. This aligns with other studies indicating a positive association between ART initiation with retention in care [48], and with a higher utilization of health services [44, 49]. Our analysis further showed that once HIV-positive MSM and waria are on ART, predisposing factors are no longer influential towards retention in care. In Indonesia, people on ART are required to visit an HIV care facility every month for a one-month supply of ART pills. A buffer stock will only be given if they have an acceptable reason e.g., going out of town. This strategy may encourage people with HIV to visit HIV care regularly.

Our findings suggest that it is important to ensure that adequate information on HIV care is available online [39, 42]. We identified a large proportion of internet users among our participants, particularly among MSM. Internet should thus be considered as one alternative medium to improve adherence. In view of the high rate of mobile phone use, future research on the efficacy of mobile phone based interventions [50], either through text messaging [51–54] or smart-phone applications [55] is worth considering. It is also important to guarantee that HIV care is affordable for people with HIV. It is crucial to lower the cost of HIV care or to give people with HIV access to a health insurance program. Being on ART gives a greater likelihood that people with HIV remain in HIV care, therefore a strategy seems appropriate that puts newly diagnosed MSM and waria on ART immediately [56, 57]. Lastly, more knowledge is needed to comprehend how organizational support influences retention in care of people with HIV in Indonesia.

Conclusions

Our results fill gaps on data about two crucial stages in the HIV treatment cascade, i.e., linkage to and retention in care, specifically for HIV-positive MSM and transgender women in Indonesia. This study describes how sociodemographic characteristics and social determinants influence retention in care. As highlighted in our study, future interventions should carefully consider socioeconomic and cultural barriers and use internet-based technology to improve retention in care, and ultimately viral load suppression in these two vulnerable populations.
Acknowledgments

We highly appreciate the considerable work done by all interviewers and all the team members of GWL-INA Network on the whole research process in Indonesia. Last but not least, we would like to sincerely thank all of the participants who took part in this study.

Author Contributions

Conceptualization: Adi Nugroho, Vicki Erasmus, Sushil Koirala, Jan Hendrik Richardus.

Data curation: Adi Nugroho, Wirastra Pamungkas.

Formal analysis: Adi Nugroho, Vicki Erasmus, Robert W. S. Coulter, Jan Hendrik Richardus.

Funding acquisition: Sushil Koirala, Oranuch Nampaisan.

Investigation: Sushil Koirala, Oranuch Nampaisan, Wirastra Pamungkas.

Methodology: Adi Nugroho, Vicki Erasmus, Robert W. S. Coulter, Jan Hendrik Richardus.

Project administration: Sushil Koirala, Oranuch Nampaisan, Wirastra Pamungkas.

Resources: Sushil Koirala, Oranuch Nampaisan.

Supervision: Sushil Koirala, Oranuch Nampaisan.

Visualization: Adi Nugroho, Vicki Erasmus, Robert W. S. Coulter, Jan Hendrik Richardus.

Writing – original draft: Adi Nugroho, Vicki Erasmus, Jan Hendrik Richardus.

Writing – review & editing: Adi Nugroho, Vicki Erasmus, Robert W. S. Coulter, Sushil Koirala, Jan Hendrik Richardus.

References

1. Beyrer C, Baral SD, van Griensven F, Goodreau SM, Charualertaks S, Wirtz AL, et al. Global epidemiology of HIV infection in men who have sex with men. Lancet. 2012; 380(9839):367–77. Epub 2012/07/24. https://doi.org/10.1016/S0140-6736(12)60821-6 PMID: 22819660;

2. Ministry of Health Republic of Indonesia. IBBS 2011: Integrated Biological and Behavioural Survey Jakarta: Directorate General of Disease Control and Environmental Health Ministry of Health Republic Indonesia; 2011 [cited 2015 March 8]. http://www.aidsdatahub.org/dmdocuments/IBBS_2011_Report_Indonesia.pdf.

3. Mugavero MJ, Amico KR, Westfall AO, Crane HM, Zinski A, Willig JH, et al. Early Retention in HIV Care and Viral Load Suppression: Implications for a Test and Treat Approach to HIV Prevention. Journal of acquired immune deficiency syndromes (1999). 2012; 59(1):86–93. PMID: 21937921;

4. Gardner EM, McLees MP, Steiner JF, Del Rio C, Burman WJ. The spectrum of engagement in HIV care and its relevance to test-and-treat strategies for prevention of HIV infection. Clinical infectious diseases: an official publication of the Infectious Diseases Society of America. 2011; 52(6):793–800. Epub 2011/03/04. https://doi.org/10.1093/cid/ciq243 PMID: 21367734;

5. Ayala G, Makofane K, Santos G-M, Arreola S, Hebert P, et al. HIV Treatment Cascade that Leak: Correlates of Drop-off from the HIV Care Continuum among Men who have Sex with Men Worldwide. J AIDS Clin Res 2014; 5(8):8.

6. Hallett TB, Eaton JW. A side door into care cascade for HIV-infected patients? Journal of acquired immune deficiency syndromes (1999). 2013; 63 Suppl 2:S228–32. Epub 2013/06/21. https://doi.org/10.1097/QAI.0b013e318298721b PMID: 23764640.

7. Christopoulos KA, Das M, Coffax GN. Linkage and retention in HIV care among men who have sex with men in the United States. Clinical infectious diseases: an official publication of the Infectious Diseases Society of America. 2011; 52 Suppl 2:S214–22. https://doi.org/10.1093/cid/ciq045 PMID: 21342910.

8. Stricker SM, Fox KA, Baggaley R, Negussie E, de Pee S, Grede N, et al. Retention in care and adherence to ART are critical elements of HIV care interventions. AIDS Behav. 2014; 18 Suppl 5:S465–75. https://doi.org/10.1007/s10461-013-0598-6 PMID: 24292251.
8. WHO. Antiretroviral therapy for HIV infection in adults and adolescents: recommendations for a public health approach—2010 rev: World Health Organization; 2010 [cited 2015 August 18]. http://apps.who.int/iris/bitstream/10665/44379/1/9789241599764_eng.pdf.

9. Lessells RJ, Mutvedzi PC, Cooke GS, Newell ML. Retention in HIV care for individuals not yet eligible for antiretroviral therapy: rural KwaZulu-Natal, South Africa. Journal of acquired immune deficiency syndromes (1999). 2011; 56(3):e79–86. https://doi.org/10.1097/QAI.0b013e3182075ae2 PMID: 21157360.

10. Rosen S, Fox MP. Retention in HIV care between testing and treatment in sub-Saharan Africa: a systematic review. PLoS Med. 2011; 8(7):e1001056. https://doi.org/10.1371/journal.pmed.1001056 PMID: 2181403.

11. WHO. Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection: World Health Organization; 2013 [cited 2015 August 18]. http://www.who.int/hiv/pub/guidelines/an2013/download/en/

12. Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, Kumarasamy N, et al. Prevention of HIV-1 infection with early antiretroviral therapy. N Engl J Med. 2011; 365(6):493–505. Epub 2011/07/20. https://doi.org/10.1056/NEJMoa1105243 PMID: 21767103.

13. Quinn TC, Wawer MJ, Sewankambo N, Serwadda D, Li C, Wabwire-Mangen F, et al. Viral load and heterosexual transmission of human immunodeficiency virus type 1. Rakai Project Study Group. N Engl J Med. 2000; 342(13):921–9. PMID: 10738050.

14. Lessells RJ, Mutevedzi PC, Cooke GS, Newell ML. Retention in HIV care for individuals not yet eligible for antiretroviral therapy: rural KwaZulu-Natal, South Africa. Journal of acquired immune deficiency syndromes (1999). 2011; 56(3):e79–86. https://doi.org/10.1097/QAI.0b013e3182075ae2 PMID: 21157360.

15. Rosen S, Fox MP. Retention in HIV care between testing and treatment in sub-Saharan Africa: a systematic review. PLoS Med. 2011; 8(7):e1001056. https://doi.org/10.1371/journal.pmed.1001056 PMID: 2181403.

16. National AIDS Commission of Indonesia. Republic of Indonesia Country Report on the follow-up to the Declaration of Commitment On HIV/AIDS: UNAIDS; 2012 [cited 2015 March 8]. http://www.unaids.org/en/dataanalysis/knowyourresponse/countryprogressreports/2012countries/ce_ID_Narrative_Report.pdf.

17. National AIDS Commission of Indonesia. Global AIDS Response Progress Reporting—Indonesia Country Progress Report 2014—Reporting Period 2012–2013. 2014.

18. Wong NS, Mao J, Cheng W, Tang W, Cohen MS, Tucker JD, et al. HIV Linkage to Care and Retention in Care Rate Among MSM in Guangzhou, China. AIDS and Behavior. 2017. https://doi.org/10.1007/s10461-017-1893-4 PMID: 28849284.

19. Chow JY, Konda KA, Borquez A, Caballero P, Silva-Santisteban A, Klauser JD, et al. Peru’s HIV care continuum among men who have sex with men and transgender women: opportunities to optimize treatment and prevention. International Journal of STD & AIDS. 2016; 27(12):1039–48. https://doi.org/10.1177/0956462416645727 PMID: 27099168.

20. Kohut A, Wike R, Bell J, Horowitz JM, Simmons K, Stokes B, et al. The Global Divide on Homosexuality. Pew Research Center, June; 2013.

21. Hussen SA, Harper GW, Bauermeister JA, Hightow-Weidman LB. Psychosocial influences on engagement in care among HIV-positive young black gay/bisexual and other men who have sex with men. AIDS Patient Care STDS. 2015; 29(2):77–85. Epub 2015/02/17. https://doi.org/10.1089/apc.2014.0117 PMID: 25682888.

22. Wei C, Yan H, Yang C, Raymond HF, Li J, Yang H, et al. Accessing HIV testing and treatment among men who have sex with men in China: a qualitative study. AIDS Care. 2014; 26(3):372–8. Epub 2013/08/06. https://doi.org/10.1080/09540121.2013.824536 PMID: 23908807.

23. Aylward JG, Price JS, Bieler GS, McAuley J, Qiu Y, Rong R. Psychosocial determinants of HIV risk behaviors among young Chinese men who have sex with men. AIDS Patient Care STDS. 2015; 29(2):77–85. Epub 2015/02/17. https://doi.org/10.1080/09540121.2013.824536 PMID: 23908807.

24. Harper GW, Fernandez IM, Bruce D, Hosek SG, Jacobs RJ. The role of multiple identities in adherence to medical appointments among gay/bisexual male adolescents living with HIV. AIDS Behav. 2014; 18(1):213–23. Epub 2011/11/02. https://doi.org/10.1007/s10461-011-0071-3 PMID: 22041930.

25. Sevelius JM, Patoahs E, Keatley JG, Johnson MO. Barriers and facilitators to engagement and retention in care among transgender women living with human immunodeficiency virus. Annals of behavioral medicine: a publication of the Society of Behavioral Medicine. 2014; 47(1):5–16. Epub 2013/12/10. https://doi.org/10.1007/s12160-013-9565-8 PMID: 24317955.

26. Sevelius JM, Saberi P, Johnson MO. Correlates of antiretroviral adherence and viral load among transgender women living with HIV. AIDS Care. 2014; 26(8):976–82. Epub 2014/03/22. https://doi.org/10.1080/09540121.2014.896451 PMID: 24646419.

27. Chakrapani V, Newman PA, Shunmugam M, Dubrow R. Barriers to free antiretroviral treatment access among kothi-identified men who have sex with men and aravanis (transgender women) in Chennai,
28. Sevelius JM, Patouhas E, Keatley JG, Johnson MO. Barriers and Facilitators to Engagement and Retention in Care among Transgender Women Living with Human Immunodeficiency Virus. Annals of Behavioral Medicine. 2014; 47(1):5–16. https://doi.org/10.1007/s12106-013-9565-8 PMID: 24317955

29. Glanz K, Rimer B. Theory at a Glance: A Guide to Health Promotion Practice Bethesda MD: National Cancer Institute; NIH Publ. 05–3896; 1995.

30. Watters JK, Biernacki P. Targeted Sampling: Options for the Study of Hidden Populations. Social Problems. 1989; 36(4):416–30. https://doi.org/10.2307/800824

31. Wohl AR, Galvan FH, Myers HF, Garland W, George S, Witt M, et al. Do social support, stress, disclosure and stigma influence retention in HIV care for Latino and African American men who have sex with men and women? AIDS Behav. 2011; 15(6):1098–110. https://doi.org/10.1007/s10461-010-9833-6 PMID: 20963630.

32. Zimet GD, Powell SS, Farley GK, Werkman S, Berkoff KA. Psychometric characteristics of the Multidimensional Scale of Perceived Social Support. J Pers Assess. 1990; 55(3–4):610–7. https://doi.org/10.1080/00223891.1990.9674095 PMID: 2280326.

33. AIDS Data Hub. Country Profiles—Indonesia: HIV and AIDS Data Hub for Asia Pacific; 2014 [cited 2016 July 7]. http://www.aidsdatahub.org/Country-Profiles/Indonesia.

34. Santos GM, Wilson EC, Rapues J, Macias O, Packer T, Raymond HF. HIV treatment cascade among transgender women in a San Francisco respondent driven sampling study. Sex Transm Infect. 2014; 90(5):430–3. Epub 2014/04/10. https://doi.org/10.1136/sextrans-2013-051342 PMID: 24714446.

35. Yehia BR, Fleishman JA, Moore RD, Gebo KA. Retention in care and health outcomes of transgender persons living with HIV, Clinical infectious diseases: an official publication of the Infectious Diseases Society of America. 2013; 57(5):774–6. https://doi.org/10.1093/cid/cit363 PMID: 23723022.

36. Parchure R, Kulkarni V, Kulkarni S, Gangakhedkar R. Pattern of linkage and retention in HIV care continuum among patients attending referral HIV care clinic in private sector in India. AIDS Care. 2015; 27(6):716–22. https://doi.org/10.1080/09540121.2014.96518 PMID: 2559639.

37. Schwartz S, Richards TA, Frank H, Wenzel C, Hsu LC, Chin CS, et al. Identifying barriers to HIV testing: personal and contextual factors associated with late HIV testing. AIDS Care. 2011; 23(7):892–900. https://doi.org/10.1080/09540121.2010.534436 PMID: 21424942.

38. Chakrapani V, Velayudham J, Shunmugam M, Newman PA, Dubrow R. Barriers to antiretroviral treatment access for injecting drug users living with HIV in Chennai, South India. AIDS Care. 2014; 26(7):835–41. https://doi.org/10.1080/09540121.2013.861573 PMID: 24283220.

39. Kalichman SC, Benotsch EG, Weinhardt LS, Austin J, Luke W. Internet use among people living with HIV/AIDS: association of health information, health behaviors, and health status. AIDS Educ Prev. 2002; 14(1):51–61. PMID: 11900110.

40. Kalichman SC, Weinhardt L, Benotsch E, DiFonzo K, Luke W, Austin J. Internet access and Internet use for health information among people living with HIV-AIDS. Patient Educ Couns. 2002; 46(2):109–16. PMID: 11867240.

41. Horvath KJ, Danilenko GP, Williams ML, Simoni J, Amico KR, Oakes JM, et al. Technology use and reasons to participate in social networking health websites among people living with HIV in the US. AIDS Behav. 2012; 16(4):900–10. https://doi.org/10.1007/s10461-012-0164-7 PMID: 22350832.

42. Horvath KJ, Courtenay-Quirk C, Harwood E, Fisher H, Kachur R, McFarlane M, et al. Using the Internet to provide care for persons living with HIV. AIDS Patient Care STDS. 2009; 23(12):1033–41. https://doi.org/10.1089/apc.2009.0163 PMID: 20025513.

43. Brinkhof MW, Dabis F, Myer L, Bangsberg DR, Boule A, Nash D, et al. Early loss of HIV-infected patients on potent antiretroviral therapy programmes in lower-income countries. Bull World Health Organ. 2008; 86(7):559–67. https://doi.org/10.2471/BLT.07.044248 PMID: 18670668.

44. Brennan A, Morley D, O’Leary AC, Bergin CJ, Horgan M. Determinants of HIV Outpatient Service Utilization: A Systematic Review. AIDS Behav. 2015; 19(1):104–19. https://doi.org/10.1007/s10461-014-0814-z PMID: 24907780.

45. amfAR The Foundation for AIDS Research. Ensuring Universal Access to Comprehensive HIV Services for MSM in Asia and the Pacific: AIDS Projects Management Group; 2009 [cited 2015 August 18]. http://www.aidsprojects.com/wp-content/uploads/2012/05/Ensuring-Universal-Access-for-MSM.pdf.

46. Alliance China. Community Response to HIV among Men who have Sex with Men in China—Review and documentation of International HIV/AIDS Alliance China MSM projects 2012. http://www.allianceindia.org/wp-content/uploads/2012/10/msme7a4bee58cbeae889bee6bb8beb79785e5ba94e5af9e88bb1e69687e78988-1.pdf.
47. Udeagu CC, Webster TR, Bocour A, Michel P, Shepard CW. Lost or just not following up: public health effort to re-engage HIV-infected persons lost to follow-up into HIV medical care. Aids. 2013; 27(14):2271–9. PMID: 23669157.

48. Yang GL, Yan J, Liu Y, Huang ZL, Long S. Retention in care and factors affecting it among people living with HIV/AIDS in Changsha City, China. Asia Pac J Public Health. 2015; 27(2 Suppl):86S–92S. https://doi.org/10.1177/1010539514548758 PMID: 25204803.

49. Tominari S, Nakakura T, Yasuo T, Yamanaka K, Takahashi Y, Shirasaka T, et al. Implementation of mental health service has an impact on retention in HIV care: a nested case-control study in a Japanese HIV care facility. PLoS One. 2013; 8(7):e69603. https://doi.org/10.1371/journal.pone.0069603 PMID: 23922753.

50. Belzer ME, Naar-King S, Olson J, Sarr M, Thornton S, Kahana SY, et al. The use of cell phone support for non-adherent HIV-infected youth and young adults: an initial randomized and controlled intervention trial. AIDS Behav. 2014; 18(4):686–96. Epub 2013/11/26. https://doi.org/10.1007/s10461-013-0661-3 PMID: 24271347;

51. Mbuagbaw L, Mursleen S, Lytvyn L, Smieja M, Dolovich L, Thabane L. Mobile phone text messaging interventions for HIV and other chronic diseases: an overview of systematic reviews and framework for evidence transfer. BMC Health Serv Res. 2015; 15(1):33. https://doi.org/10.1186/s12913-014-0654-6 PMID: 25609559.

52. Christopoulos KA, Riley ED, Tulsky J, Carrico AW, Moskowitz JT, Wilson L, et al. A text messaging intervention to improve retention in care and virologic suppression in a U.S. urban safety-net HIV clinic: study protocol for the Connect4Care (C4C) randomized controlled trial. BMC Infect Dis. 2014; 14(1):3849. Epub 2015/01/01. https://doi.org/10.1186/s12879-014-0718-6 PMID: 25551175;

53. van der Kop ML, Ojakaa DI, Patel A, Thabane L, Kinagwi K, Ekstrom AM, et al. The effect of weekly short message service communication on patient retention in care in the first year after HIV diagnosis: study protocol for a randomised controlled trial (WelTel Retain). BMJ Open. 2013; 3(6). Epub 2013/06/26. https://doi.org/10.1136/bmjopen-2013-003155 PMID: 23794578;

54. Gurol-Urganci I, de Jongh T, Vodopivec-Jamsek V, Atun R, Car J. Mobile phone messaging reminders for attendance at healthcare appointments. Cochrane Database Syst Rev. 2013; 12:Cd007458. Epub 2013/12/07. https://doi.org/10.1002/14651858.CD007458.pub3 PMID: 24310741.

55. Perera AI, Thomas MG, Moore JO, Faasse K, Petrie KJ. Effect of a smartphone application incorporating personalized health-related imagery on adherence to antiretroviral therapy: a randomized clinical trial. AIDS Patient Care STDs. 2014; 28(11):579–86. Epub 2014/10/08. https://doi.org/10.1089/apc.2014.0156 PMID: 25290556;

56. Maek-a-nantawat W, Phanuphak N, Teeratakulpisarn N, Pakam C, Kanteeranon T, Chaiva O, et al. Attitudes toward, and interest in, the test-and-treat strategy for HIV prevention among Thai men who have sex with men. AIDS Care. 2014; 26(10):1298–302. Epub 2014/04/29. https://doi.org/10.1080/09540121.2014.911810 PMID: 24766659.

57. Dabis F. Test and treat all as soon as possible. Lancet Glob Health. 2014; 2(1):e2–3. Epub 2014/08/12. https://doi.org/10.1016/S2214-109X(13)70178-5 PMID: 25104628.