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The Hiv Care Continuum And Barriers To Viral Suppression Among Men Who Have Sex With Men In Greater Kuala Lumpur, Malaysia.

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Abstract

Background: Men who have sex with men (MSM) now account for nearly half of all new HIV cases in Malaysia. There has been little research, however, characterizing the HIV care continuum among MSM living with HIV in Malaysia. This study describes the HIV care continuum and examines factors associated with HIV viral non-suppression among newly diagnosed MSM living with HIV in Kuala Lumpur, Malaysia.

Methods: We enrolled 163 MSM living with HIV who were in care at a major university hospital in Kuala Lumpur, Malaysia. Participants completed a self-administered questionnaire. Electronic medical chart review also provided data on engagement in the care continuum, including CD4 counts and HIV viral loads. Bivariate and multivariable logistic regression was used to identify correlates of HIV viral non-suppression.

Results: 94.4% of this sample is currently on ART while 79.7% self-reported 100% adherence to medication. Nearly 80% of this population were optimally virally suppressed at <20 copies/mL. In the multivariable model, not having a full-time job (aOR = 6.25; 95% CI = 1.53 – 25.49; p = 0.011) and being single (aOR = 9.15; CI = 1.07 – 78.21; p = 0.043) were associated with viral non-suppression (viral load of 200 copies/mL or more). 9.8% of all participants reported active (last 30 days) chemsex participation while nearly 40% indicated severe depression symptoms.

Conclusions: This is the first study to describe the HIV care continuum on MSM from Malaysia. Though many MSM in this sample were able to achieve viral suppression, others continue to face socioeconomic barriers to treatment and retention in care. Future studies should recruit from a wider range of venues and include those disengaged from care.

Acknowledgments

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Background

HIV in men who have sex with men

Globally, men who have sex with men (MSM) have been disproportionately affected by HIV.[1] Although AIDS-related mortality has gradually declined over the last decade,[2] many countries are experiencing re-emergent epidemics driven by sexual transmission, particularly among MSM.[3] In several high-income Western European countries, Australia and the United States, HIV infection rates in the general population decreased, but not in MSM.[4] In some low- and middle-income settings like Ghana and Peru, MSM were the predominant contributor to HIV.[5] In the Asia-Pacific region, over 75% of new HIV infections in 2018 were among key populations and their sexual partners, especially young gay men (age 15 to 24) and other young MSM.[2]

HIV in Malaysia

Malaysia still has one of the highest burdens of HIV in its region.[2] Since the first case of HIV was detected in the country in 1986, the total number of HIV diagnoses in Malaysia is estimated to be 118,883 with a national adult prevalence of 0.4%.[6] By the end of 2018, there were 87,041 living with HIV in Malaysia.[6] The Malaysian epidemic is characterized by significant regional variations in severity: three states – Selangor, Kuala Lumpur and Putra Jaya, and Johor – accounted for approximately half of PWH in Malaysia.[6]

Historically, Malaysia's HIV epidemic was primarily driven by people who inject drugs (PWID), which accounted for 83% of reported cases in 1996.[6] In stark contrast, new HIV infections by sexual transmission among MSM in 1996 was 2%.[6] This trend has reversed in recent years, with sexual transmission among MSM leading 56% of new HIV infections in 2018, while new infections among PWID declined to 3%.[6]

MSM and HIV in Malaysia

Malaysia has the second highest HIV prevalence among gay men and other MSM in the Asia-Pacific region after Indonesia.[2] As of 2017, 21.6% of MSM in Malaysia were estimated to be HIV-infected, more than doubling from 8.9% three years prior.[7] This trend was also seen in Kuala Lumpur, Malaysia's largest and most urbanized city, where prevalence increased twofold, from 22% in 2014 to 43.3% in 2017.[7] By the end of 2017, more than half (56.7%) of MSM were unaware of their HIV status.[8]

This growing epidemic among MSM has been associated with several high-risk behaviors. HIV-positive MSM in Malaysia showed higher rates of unprotected anal intercourse,[9,10] multiple sex partners, and group sex.[10,11] Up to 13%[12] of Malaysian MSM have engaged in 'chemsex' at least once in their lifetime,[13] which is the use of psychoactive drugs, particularly stimulants, to enhance sexual pleasure,[13] which are significantly associated with HIV infection.[14] Additionally, those who engaged in chemsex were more likely to have multiple sex partners, engage in group sex, show inconsistent condom use, and to have previously acquired sexually transmitted infections (STIs).[12,15] MSM have also reported high use of geosocial sexual networking phone applications to find sex partners, which has been associated with increased engagement in chemsex,[15] reduced condom use[16,17] and increased STIs.[17]

These findings are of concern for HIV prevention as substance abuse is likely to be part of the overlapping health problems ('syndemics') that put Malaysian MSM at high risk for HIV/STI infection and transmission.[14,18-21] There are also implications for HIV treatment as alcohol and drug use was independently associated with antiretroviral therapy (ART) treatment non-adherence.[22,23] Amphetamine-type stimulants (ATS) use, particularly methamphetamine, was more strongly linked to engagement in condomless sex than were other drugs.[22] Previous

research has shown that alcohol and substance use by MSM as means to cope with HIV-related stress can lead to more depressive symptoms and even cognitive impairment.[23]

In addition, Malaysian MSM face long-standing religious, cultural, and legal prohibitions of drug use and homosexuality, which exacerbate the dual burden of social stigma and discrimination and limit their access to successful and equitable delivery of existing HIV prevention efforts, further escalating the HIV epidemic.[24,25] Same-sex sexual acts are punishable by imprisonment of 14 years to life[2], institutionalizing and criminalizing homophobia at the national level. Muslim and all ethnic Malay MSM face further stigma[26] internally and externally from their families and religious communities as homosexuality is a punishable sin under Sharia law,[9] compounding their psychosocial struggles with conflicting identities.[27]

HIV treatment in Malaysia

In Malaysia, HIV care is primarily delivered through the public Ministry of Health system which provides no-cost care and no-cost first-line ART.[28] First-line ART in Malaysia –primarily comprised of Efavirenz, Emtricitabine, Tenofovir disoproxil – is fully covered by the government while second-line therapy is partially subsidized.[28]

The HIV care continuum framework is a widely utilized model to describe and evaluate the progress of PWH along the spectrum of engagement in HIV care.[29] Steps in the care continuum include diagnosis, linkage and retention in HIV care, initiation of ART, adherence to ART, and viral suppression.[30] Minimizing the gaps between these steps is essential for successful test-and-treat[29] and treatment as prevention (TasP) strategies,[31] as well as for reducing HIV-related morality. Optimizing engagement and retention in the continuum is also necessary for patients to achieve and maintain viral suppression.[32,33]

This framework was also recognized and adopted in the Joint United Nations Programme on HIV/AIDS' (UNAIDS) 90-90-90 target for the year 2020: 90% of all PWH know their HIV status, 90% of those who know their status receive sustained ART, and 90% of those receiving ART be virally suppressed.[34]

While Malaysia has made progress in the scale-up of HIV testing and universal access to no-cost ART for all Malaysian PWH,[6] several areas of the care continuum remain suboptimal. As of 2019, the Ministry of Health estimated that 86% of PWH were aware of their status, while 48% of PWH were receiving ART.[2] The latest survey on ART initiation among Malaysian MSM indicated that 13.5% were currently on treatment.[7] Moreover, there is no data on the proportion of PWH achieving HIV viral suppression for 2019 (UNAIDS reported 42% in 2018).[8] It is difficult to assess at which of these points MSM PWH are falling off because the Malaysian Ministry of Health does not aggregate HIV care continuum results by key populations.

Linkage to HIV care, initiation and retention on ART and HIV viral suppression are key to reducing mortality among PWH and preventing onward transmission of HIV. Given the suboptimal outcomes for PWH in Malaysia, particularly among MSM, the present study will evaluate the barriers and facilitators of linkage to HIV care, initiation and retention on ART, and achievement of HIV viral suppression among a sample of newly diagnosed HIV+ MSM in Greater Kuala Lumpur. Specifically, the study will examine the proportion of participants who achieve each of these three steps in the HIV continuum of care.

Methods

Participants

Participants (n = 163) were recruited using venue-based convenience sampling at the University Malaya Medical Centre's (UMMC) HIV clinic in Kuala Lumpur. One of the largest HIV clinics in Malaysia, UMMC provides ongoing HIV care to approximately 1700 PWH, with an average of 100 to 120 PWH encounters each week. Inclusion criteria were: 1) cisgender male; 2) ≥ 18 years of age; 3) screened positive for HIV in the last 6 to 60 months; 4) identify as man who has sex with other men; 5) able to speak Bahasa Malaysia, Mandarin, or English; 6) able to provide informed consent; and 7) willing to consent to provide a release of medical information authorization for health records associated with their HIV care and treatment at UMMC.

Patients with appointments were pre-screened for eligibility based on their electronic medical records and recruited during their waiting time. Walk-in patients were also reviewed for eligibility during their visit. Study flyers were posted on the wall of exam rooms and physicians were given study leaflets share with potentially eligible patients. Inpatient wards were also regularly checked for study candidates.

Procedures

Following informed consent, participants were self-administered a questionnaire using a tablet or laptop in a designated private area of the clinic. The questionnaire was programmed and administered using Qualtrics (Qualtrics, Inc., Provo, Utah, USA) online survey software. All study materials were translated into in English, Mandarin, and Bahasa Malaysia. All participants were offered the opportunity to enter a drawing for a free tablet computer for their participation in the study.

Measures

Structured Questionnaire

Questionnaire measures included sociodemographic factors, including age, ethnicity, primary language, religion, country of birth, highest level of education achieved, employment status, relationship status, monthly income, and housing status.

Lifetime and recent (last 30 days) alcohol and drug use were also measured, including alcohol, amphetamine-type stimulants (ATS), primarily methamphetamine; ecstasy / MDMA (3,4-Methylenedioxymethamphetamine); heroin or other opioids, including prescription narcotics; cocaine; foxy,[35] a synthetic tryptamine (5-methoxy-N, N-diisopropyltryptamine;[35] GHB/GBL (Gamma-Hydroxybutyrate); marijuana; ketamine; benzodiazepines; and LSD (lysergic acid diethylamide). Lifetime and recent (last 30 days) engagement in chemsex, defined as any use of ATS, ecstasy / MDMA, or GHB / GBL, prior to or during sexual activity.

Participants were also asked to answer questions on their sexually transmitted infection (STI) and HIV history, such as self-reported date of diagnosis, visit history, CD4 and HIV viral load test information, as well as their antiretroviral therapy (ART) regimen and adherence. Other questions were on barriers to getting HIV care such as financial cost, lack of transportation, wait time, and employer leave policy.

Depression was assessed using the Center for Epidemiologic Studies Short Depression Scale (CESD-10)[36]. The scale had a possible range of 0 to 30, and a previously validated[37] cutoff score of 10 or higher was used to classify those with severe depressive symptoms. On average, it took participants 15 to 20 minutes to complete the survey.

Electronic Medical Chart Review

Data collected during the chart review include: all UMMC HIV care visit encounter dates, all CD4 count and HIV Viral Load (VL) test dates and laboratory results, date of HIV diagnosis, date of antiretroviral treatment (ART) initiation, interruptions or changes in ART regimen, current diagnoses, current non-ART medications, and any notable background information of the participant recorded by the doctor.

HIV-related Measures

Several important HIV-related measures collected from the questionnaire and/or medical chart review will be used to describe the HIV care continuum of participants. Questionnaire measures include self-reported STI and HIV testing and diagnosis history, HIV-care visit history, CD4 and HIV viral load laboratory test results as, and ART adherence as best as they can recall. Participants were also asked to report social barriers to HIV care such as financial costs, wait time, ability to leave school or work, and access to transportation.

Table 1 describes measures of the HIV care continuum extracted using responses to the questionnaire and data from medical chart review.

Ethics and Human Subjects Protection

All participants were asked to provide consent for Release of Information (ROI) of their health records and medical information related to their care at UMMC. This authorization was required for participation in the study.

This study was approved by the Institutional Review Boards for Yale University and the University of Malaya Medical Centre (UMMC).

Statistical Analysis

Frequencies and descriptive statistics were used to characterize the participants. We used bivariate logistic regression to examine possible sociodemographic and HIV care-related predictors of viral non-suppression (defined as detectable load > 200 copies/mL). We ran a multivariable logistic regression analysis using independent variables with statistical significance at the $p \leq 0.10$ level. Odds ratios with 95% confidence intervals were reported. All analyses were conducted in IBM SPSS Statistics 26 (Chicago, IL).

Results

Description of sample

The mean age was 35.4 years (SD = 8.4). (Table 2). Over half (54.6%) were Chinese, followed by Malay (35.0%). Buddhism (35.6%) and Islam (35.6%) were the two most popular religions. Majority were highly educated (66.3%), with a bachelor's degree or beyond. 80.4% had a full-time job and the mean monthly income of the whole sample was USD 1,466.32 (SD = 1,418.93). A little over half (54.6%) were single, divorced, or separated from their spouse. The majority (92.7%) of this population had stable housing.

Lifetime and active substance use history are illustrated in Figure 1. Alcohol (66.3%), ATS (33.1%), ecstasy (27.0%), and GHB (20.9%) were the most used drugs across the lifetime. Similarly, alcohol (39.3%), ATS (11.7%), GHB (6.1%), and ecstasy (3.7%) were the most used drugs during the previous 30 days. Opioids were among the least used drugs across the lifetime (1.2%) and last 30 days (0.6%). Chemsex across the lifetime was reported by 39.9% of participants, with 9.8% having engaged in chemsex in the last 30 days. Lifetime drug injection behavior was reported by 9.2% of participants and 1.8% had injected drugs in the last 30 days.

Lifetime STI testing and diagnosis history is depicted in Figure 2. Over half of participants (50.9%) reported being previously diagnosed with Syphilis, with lower proportions having been ever diagnosed with gonorrhea (13.5%), hepatitis B (11.0%), chlamydia (7.4%), and hepatitis c (4.9%).

Of all the participants, 39.9% reported a CESD score above 10, which indicates higher levels of depression symptoms in this group.

HIV Care Continuum

Figure 3 illustrates the proportion of study participants' successes along the cascade of HIV care. The majority (54.6%, Figure 4) were diagnosed in a private hospital or clinic and on average, lived with HIV for 2.36 years (SD = 1.34). Mean time from HIV diagnosis to linkage to HIV care among this sample was 4.14 months (SD = 8.42). In correspondence with the eligibility criteria, 100% of this study sample has been positively diagnosed for HIV and have made at least one HIV care visit in the last 12 months. At baseline, 11% had a viral load higher than one million copies/mL and 30.1% had a CD4 count of less than 100. Nearly all (99.4%) self-reported that they are on ART. On average, time from HIV diagnosis to ART initiation was 2.20 months (SD = 3.39). Self-reports of adherence during the past 30 days were high, with levels of 94.4%, 93.8%, and 75.3% for adherence levels of 80% or more, 90% or more, and 100%, respectively. At the <200 copies/mL cut-off level, 151 (92.6%) achieved viral suppression, while 130 (79.7%) achieved optimal suppression at a more conservative cut-off of <20 copies/mL. A majority (69.3%) of the sample was both virally suppressed and 100% adherent to ART the past 30 days.

Correlates of HIV viral non-suppression

Of all the participants, only those who had at least one viral load test in the last 18 months (N = 160) were included in the final bivariate and multivariate logistic regression models. At the bivariate level, participants who were ethnic Malay (OR = 2.83; 95% CI = 0.85 – 9.37; p = 0.089), employed less than full-time (OR = 6.89; 95% CI = 2.02 – 23.46; p = 0.002), single (OR = 10.14; 95% CI = 1.28 – 80.6; p = 0.028), had a baseline CD4 count ≤ 100 cells/mm^3 (OR = 3.65; 95% CI = 1.10 – 12.15; p = 0.035), or were initially diagnosed in a government clinic or hospital (OR = 5.59; 95% CI = 1.59 – 19.60; p = 0.007) were significantly more likely to have a detectable HIV viral load in the previous 18 months. Participants who were initially diagnosed in a private clinic, however, were significant less likely to have a detectable HIV viral load in the last 18 months (OR = 0.25; 95% CI = 0.06 – 0.95; p = 0.042). In the multivariable model, not having a full-time job and being single were associated with viral non-suppression (viral load of 200 copies/mL or more). Those who did not have a full-time job had 6-fold higher odds of having a detectable viral load (aOR = 6.25; 95% CI = 1.53 – 25.49; p = 0.011) compared to those who did. Participants who reported that they were single were 9 (aOR = 9.15; CI = 1.07 – 78.21; p = 0.043) times more likely to have a detectable viral load compared to non-single participants.

Discussion

To our knowledge, this is the first study to describe the HIV care continuum among MSM living with HIV in Malaysia. Results showed nearly all participants were on ART (99.4%) and the majority had achieved viral suppression (79.7% virally suppressed at <20 copies/mL) and adherence (75.3% adherent to ART = 100%). In this sample, opportunities remain for minimizing time between steps in the cascade. On average, there was a 4-month delay in linkage to care and 2-month period before ART initiation. The overall level of success was likely

possible due to UMMC's unique position as a quasi-public institution with more independence. These findings may not be generalizable to all HIV-positive MSM in Malaysia, as this sample was recruited from a clinic and already engaged in care. Future studies should sample from a wider range of venues and include those disengaged from care.

In this study, HIV viral non-suppression was associated with unstable employment. Individuals with employment less than full-time were more likely to have a detectable viral load than those with full-time employment. This finding can allude to financial limitations experienced by individuals with less than full-time employment. Previous studies have demonstrated associations between lower socioeconomic status (SES) and worse adherence and overall treatment outcomes[38-40]. Among this sample, 25.8%, 30.1%, and 14.1% said financial costs prevented them from receiving a CD4 test, HIV viral load test, and ART, respectively. Financial constraints could also explain why three participants did not have a viral load test within the last 18 months. For some patients at UMMC, even subsidized viral load test costs can be burdensome.

Being single (including divorced and separated) was also independently associated with viral non-suppression. Compared to those in relationship, single people had ten times the odds of viral non-suppression. This aligns with other findings that social support in the form relationships has been associated with better ART adherence[41,42] and lower viral loads among MSM.[43,44] These results suggest that interventions promoting relationship and social support can benefit treatment outcomes in HIV-positive MSM.

Additional factors associated with viral non-suppression were the location of HIV diagnosis, CD4 count at baseline, and Malay ethnicity. These results follow that of prior studies which found an association between lower baseline CD4 cell count and greater risk of viral

rebound.[45,46] Baseline CD4 count has also been shown to be a better predictor of viral suppression that baseline viral load.[47] Overall, 11% and 30.1% of this group had baseline viral loads higher than one million copies/mL and baseline CD4 counts less than 100, respectively, indicating that many patients do not find out they are HIV-positive for a long time. The significance of location of HIV diagnosis may be explained by participants' financial abilities. Private health care recipients may not experience financial barriers to seeking care compared to their counterparts. Among our participants, 54.6% were diagnosed in a private hospital or clinic (Figure 4).

Though not found to be statistically significant factors in viral suppression, lifetime alcohol and substance use among this sample were fairly high (Figure 1). In particular, lifetime alcohol use was highest at 66.3% followed by poppers (44.8%), ATS (33.1%) and ecstasy (27.0%). These percentages drastically reduced for active use. One explanation may be that recently diagnosed PWH engage in less transmission risk behaviors immediately after their diagnosis.[48] Social desirability bias may also be at play, with participants choosing responses that are more socially acceptable in Malaysia.[49] Future studies should test for longer windows of "active use," from 90 days up to a year.

Despite our results, alcohol and drug use among PWH should continue to be studied for its impact on other aspects of HIV care. This study observed higher levels of lifetime (39.9%) and active (9.8%) chemsex participation than seen in unpublished data (lifetime = 21.8%, active = 6.2%) from a study of HIV-Syphilis co-infection among MSM in Malaysia.[50] PWH who use alcohol and drugs to cope with HIV-related stress are less likely to be adherent to ART.[41,51,52] Furthermore, nearly half (39.9%) of this sample reported high levels of depression symptoms, which has also been associated with nonadherence to ART.[52,53]

In the multivariable analysis, two covariates remained significant. Not having full-time employment was associated with 6.25 times the odds of non-viral suppression compared with those who did. Individuals who were single were 9.15 times more likely to be virally non-suppressed than those in a relationship. All significant covariates in this multivariate model were social measures, suggesting that socioeconomic statuses of HIV-positive MSM are important parts of successful care and treatment. Clinicians should ask more non-clinical questions and document these aspects of their patients. Future studies should incorporate social measures beyond those included here.

There were several limitations in this study. First, these results may not be generalizable to those who are not engaged in care or those who progressed to death without being linked to care, as this population was recruited from a clinic. We also lacked medical chart data for participants who may have previously received HIV care outside of UMMC. In general, quality of the data captured through UMMC's electronic medical records (EMR) was varied and dependent on the physician in charge. Aside from laboratory test results, all EMR were in text form and not standardized across patients. Critical information for some, such as HIV diagnoses and ART initiation dates, did not match self-reported dates. Access to EMR in general was restrictive with clinicians themselves only being able to view patient data up to 24 hours within a care visit. Clinicians also had no access to important patient information outside of their department, such as psychiatric comorbidities or prescriptions for other illnesses.

Conclusions

Despite these limitations, this study is the first to evaluate the HIV care continuum in MSM from Kuala Lumpur. While these results indicate that many Malaysian HIV-positive MSM linked to care are able to achieve viral suppression, it also highlights potential socioeconomic barriers

faced by this population. Future efforts should focus on evaluating other social barriers faced by individuals linked to care.

Appendix

Table 1. Measurement of the HIV care continuum

Variable	Source	Measurement	Definition
Linkage to HIV care	Self-reported HIV diagnosis on questionnaire; HIV care visit dates from chart review	Binary (0,1)	Completion of at least one HIV care clinic visit within 12 months of diagnosis
Time to linkage to HIV care	Self-reported HIV diagnosis on questionnaire; HIV care visit dates from chart review	Continuous (months)	Time (months) between the date of self-reported HIV diagnosis and the completion of the first HIV care clinic visit
Initiation of ART	Self-reported date of initiation of ART and recorded initiation date on chart review	Binary (0,1)	Initiation of ART, defined as the patient having started taking ART
Time to initiation of ART	Self-reported date of HIV diagnosis on questionnaire; self-reported date of initiation of ART and recorded initiation date on chart review	Continuous (months)	Time (months) between the date of first HIV care clinic visit and self-reported date of ART initiation
Adherence to ART	Self-reported percent of doses completed in last 30 days on questionnaire	Self-reported percent of doses completed in last 30 days	Self-reported adherence during the past 30 days using visual analog scale
Achievement of HIV viral suppression	Viral load test results on chart review	Continuous (copies/mL) and binary (0,1)	Most recent HIV-RNA test ($\leq$ 18 months) = < 200 copies/mL

Table 2. Characteristics of study population (n = 163)

Characteristic	n (%)*
Age (years), mean ± SD	35.4 years ± 8.4
Ethnicity	
Malay	57 (35.0)
Chinese	89 (54.6)
Indian	9 (5.5)
Other	8 (4.9)
Religion	
Buddhism	58 (35.6)
Christianity	23 (14.1)
Hinduism	5 (3.1)
Islam	58 (35.6)
None/Atheist/Agnostic	18 (11.0)
Other	1 (0.6)
Education	
Less than high school	3 (1.8)
High school	52 (31.9)
Bachelor's degree or beyond	108 (66.3)
Employment	
Full Time	131 (80.4)
Part Time	13 (8.0)
Unemployed	17 (10.4)
Student	2 (1.2)
Relationship status	
Single	85 (52.1)
Boyfriend/Partner	68 (41.7)
Married	6 (3.7)
Divorced or separated from spouse	4 (2.5)
Housing	
House/apartment alone	72 (44.2)
House/apartment with others	79 (48.5)
Hotel/motel/guesthouse	1 (0.6)
Other	6 (3.7)
Monthly Income (MYR), mean ± SD	6,389.63 ± 6183.11

* Percentages may not sum to 100% due to rounding.

† Housing question has missing data (n = 158) since it was a newly added question.

Table 3. Unadjusted and adjusted associations between study variables and viral non-suppression (n = 160*)

Characteristic	n (%)†	Unadjusted OR (95% CI)	p	Adjusted OR (95% CI)	p
Demographics					
Age (years): 18 – 24	10 (6.2)	1.38 (0.16, 11.94)	0.768		
Age (years): 25 – 34	77 (47.2)	0.76 (0.23, 2.49)	0.643		
Age (years): 35+	74 (45.4)	1.21 (0.37, 3.94)	0.749		
Ethnicity: Malay	57 (35.0)	2.83 (0.85, 9.37)	0.089	2.94 (0.73, 11.84)	0.130
Ethnicity: Chinese	89 (54.6)	0.58 (0.17, 1.90)	0.363		
Education: Less than college	55 (33.7)	2.08 (0.64, 6.80)	0.224		
Employment: Not full time	32 (19.6)	6.89 (2.02, 23.46)	0.002	6.25 (1.53, 25.49)	0.011
Income (MYR): Low income, <100	15 (9.2)	2.08 (0.41, 10.51)	0.377		
Relationship Status: Single	89 (54.6)	10.14 (1.28, 80.6)	0.028	9.15 (1.07, 78.21)	0.043
Housing: Unstable	7 (4.3)	2.08 (0.23, 18.82)	0.516		
HIV Care-related					
CD4 count at baseline: 100 cells/mm^3 or less	50 (30.7)	3.65 (1.10, 12.16)	0.035	1.82 (0.45, 7.29)	0.400
VL at baseline: 1 million copies/mL or more	18 (11.0)	2.93 (0.72, 12.03)	0.135		
VL at baseline: 2 million copies/mL or more	8 (4.9)	0.0 (0.0, 0.0)	0.999		
Switch in ART regimen: At least once	40 (24.5)	0.67 (0.14, 3.23)	0.614		
HIV-related hospitalization: At least once	4 (2.5)	0.0 (0.0, 0.0)	0.999		
Location of HIV diagnosis: gov't	49 (30.1)	5.59 (1.59, 19.60)	0.007		
Location of HIV diagnosis: private	89 (54.6)	0.25 (0.06, 0.95)	0.042	0.40 (0.09, 1.76)	0.226
Location of first care since diagnosis: gov't	48 (29.4)	1.05 (0.25, 4.38)	0.951		
Location of first care since diagnosis: private	31 (19.0)	2.02 (0.47, 8.59)	0.342		
Vitamin training: never received	10 (6.1)	3.50 (0.65, 18.72)	0.143		
Substance Use					
Lifetime: Chemsex	65 (39.9)	0.71 (0.21, 2.47)	0.594		
Lifetime: Alcohol	108 (66.3)	1.02 (0.29, 3.55)	0.975		
Lifetime: Marijuana	33 (20.2)	0.33 (0.04, 2.65)	0.297		
Lifetime: ATS	54 (33.1)	0.98 (0.28, 3.41)	0.975		
Lifetime: Ecstasy (E, MDMA)	44 (27.0)	0.52 (0.11, 2.49)	0.414		
Lifetime: "Club" drugs ‡	68 (41.7)	0.68 (0.20, 2.34)	0.535		

Active: Chemsex	16 (9.8)	0.81 (0.10, 6.69)	0.842		
Active (last 30 days): Alcohol	64 (39.3)	0.50 (0.13, 1.94)	0.317		
Active (last 30 days): Marijuana	5 (3.1)	0.0 (0.0, 0.0)	0.999		
Active (last 30 days): ATS	19 (11.7)	0.66 (0.08, 5.39)	0.695		
Active (last 30 days): Ecstasy (E, MDMA)	6 (3.7)	0.0 (0.0, 0.0)	0.999		
Active (last 30 days): "Club" drugs	20 (12.3)	0.66 (0.08, 5.39)	0.695		
Depression (CES-D score above 10)	65 (39.9)	1.11 (0.34, 3.66)	0.866		

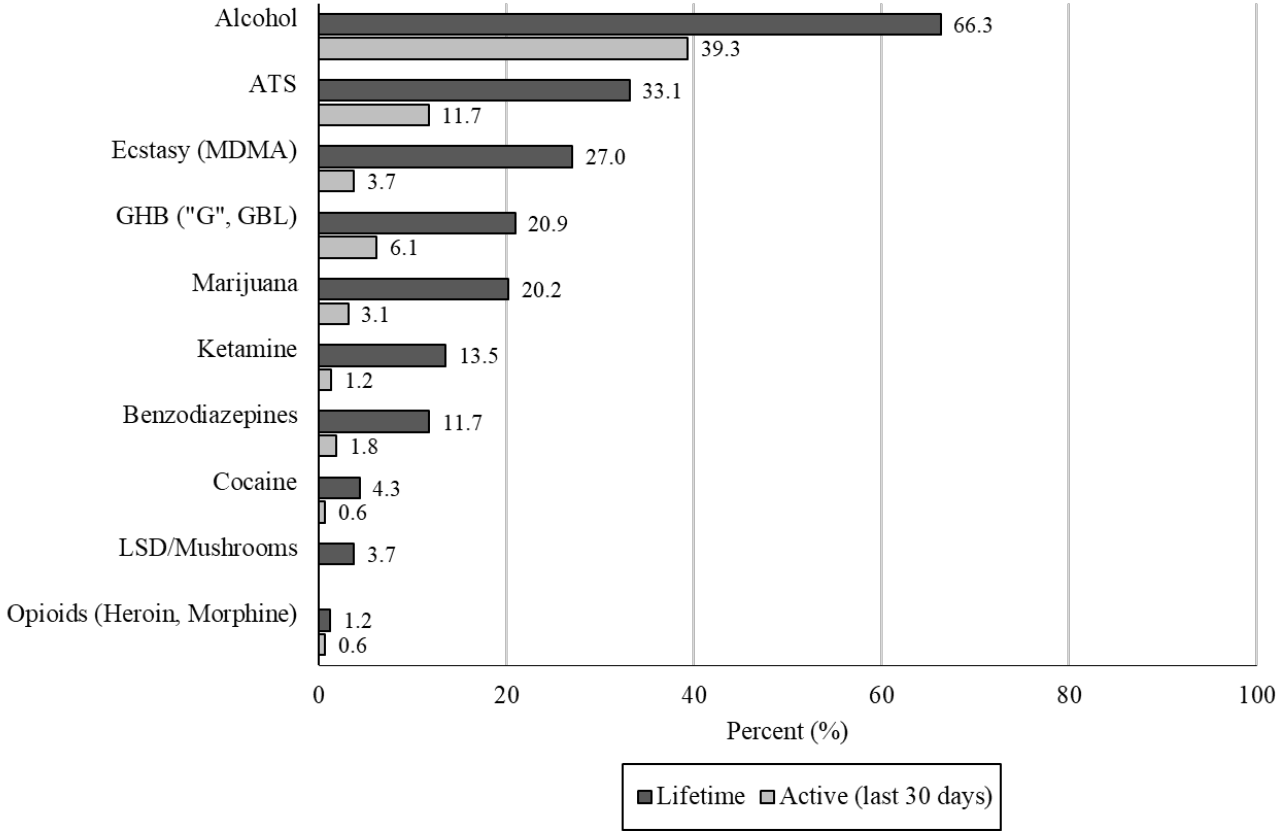
*Key: OR = odds ratio; aOR = adjusted odds ratio; ATS = Amphetamine-type stimulants; E = Ecstasy; MDMA = 3,4-Methylenedioxy methamphetamine; CES-D = Center for Epidemiological Studies Depression Scale.

†Three cases whose most recent viral load test was $\geq$ 18 months were removed.

‡ Number of cases for each variable may not sum to total number of participants due to missing values.

§ "Club" drugs include methamphetamine, Ecstasy (E, MDMA), GHB, Ketamine.

Figure 1. Lifetime and active substance abuse history (n = 163)



ATS = amphetamine-type stimulants; GHB = gamma hydroxybutyrate; LSD = lysergic acid diethylamide

Figure 2. STI testing and diagnosis history (n = 163)

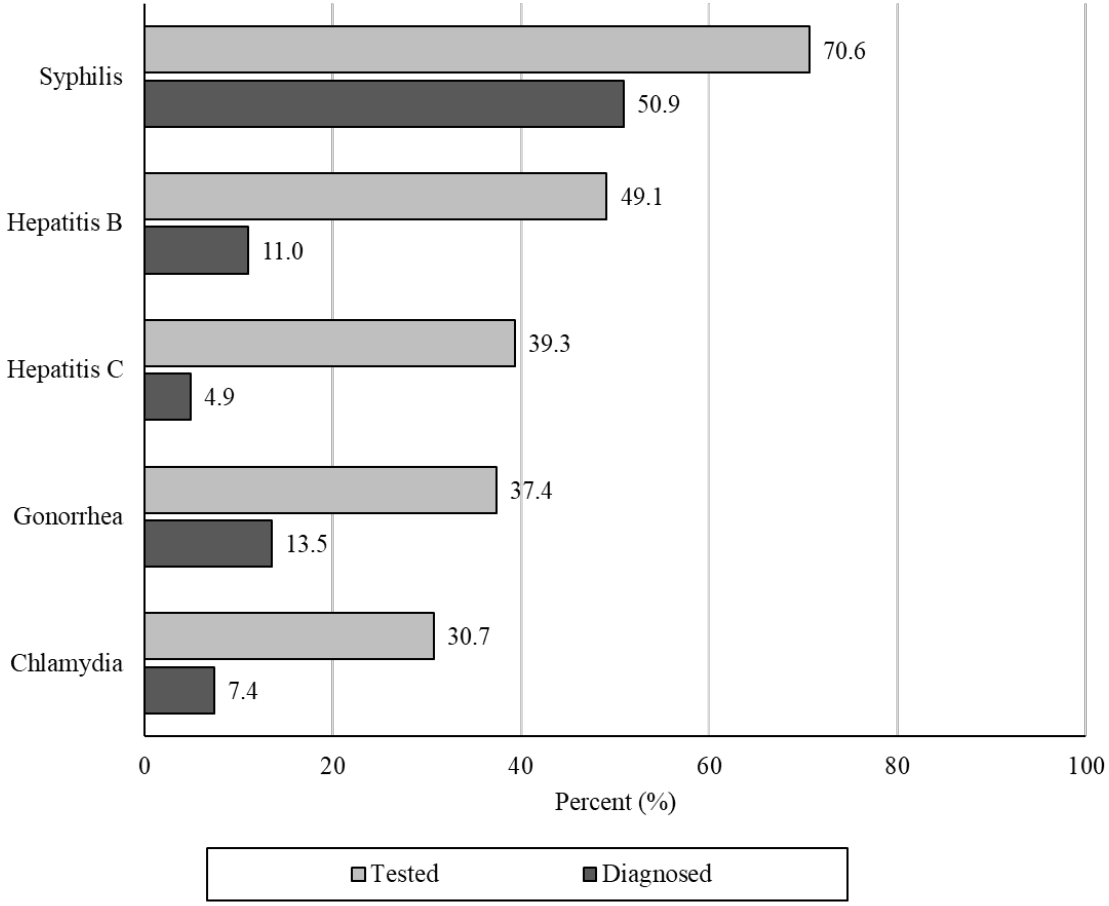


Figure 3. The HIV care continuum among recently diagnosed HIV-positive men who have sex with men in Kuala Lumpur, Malaysia (n = 163)

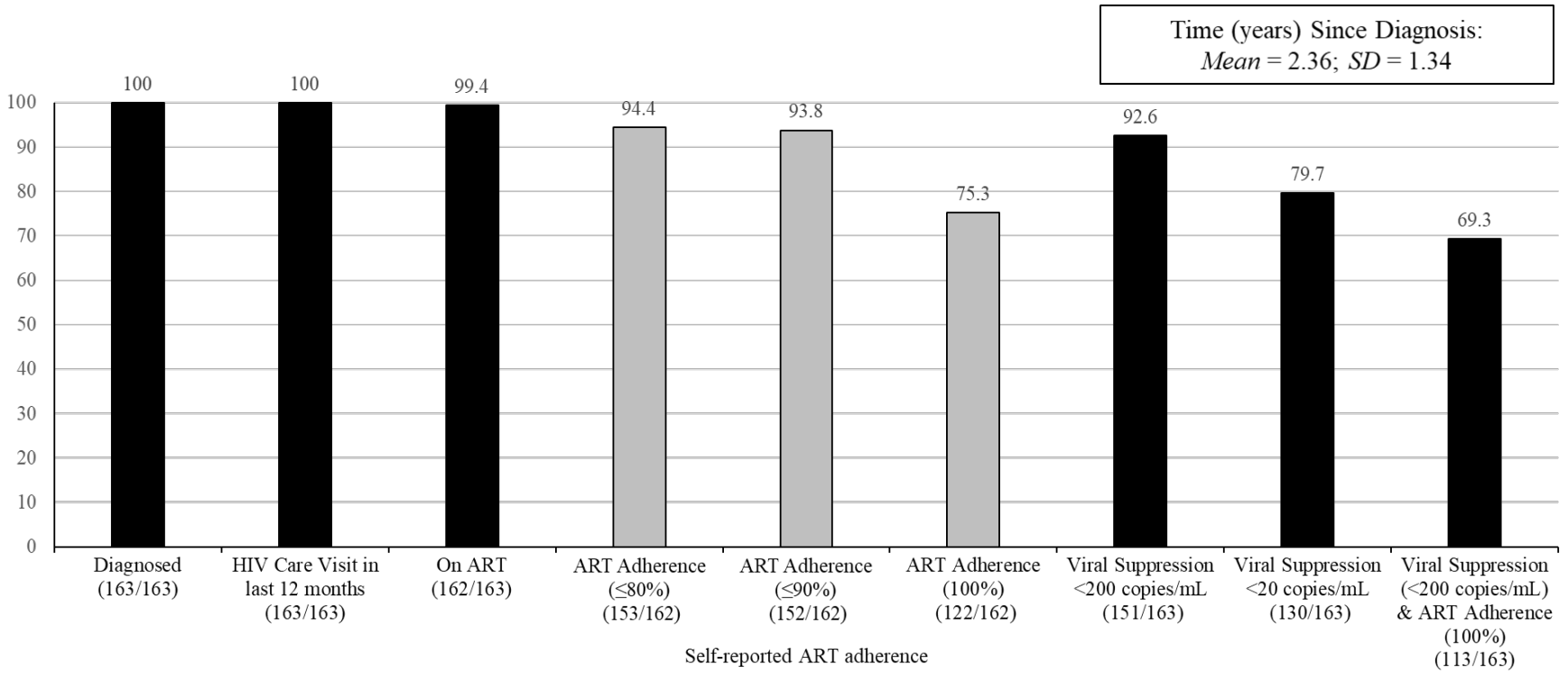
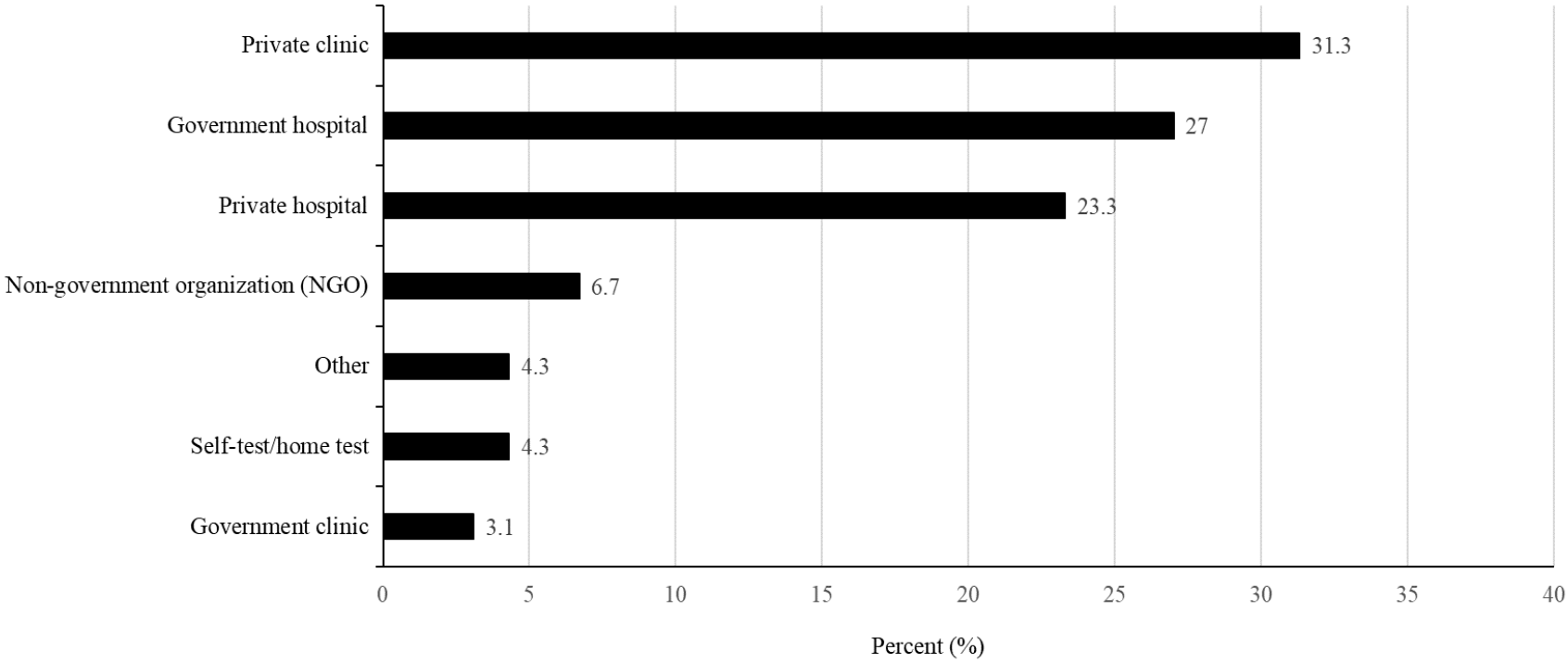


Figure 4. Location of HIV diagnosis (n = 163)



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