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Severe menopausal symptoms associated with reduced adherence to antiretroviral therapy among perimenopausal and menopausal women living with HIV in Metro Vancouver

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Abstract

Objectives—Although more women living with HIV (WLWH) are entering midlife, the experiences of peri-menopausal and menopausal WLWH, including the effects of menopausal symptoms severity, remain understudied. This study longitudinally investigated the correlates of antiretroviral therapy (ART) adherence among peri-menopausal and menopausal WLWH from Metro Vancouver.

Methods—Analyses drew on longitudinal data (2014–2017) from Sexual health and HIV/AIDS: Women's Longitudinal Needs Assessment, an ongoing community-based cohort of Women Living With HIV (WLWH), aged 14+, from Metro-Vancouver, Canada. At baseline and biannually, participants completed an interviewer-administered questionnaire. Bivariate and multivariable logistic regression with Generalized Estimating Equations (GEE) were used to identify the correlates of self-reported <95% ART adherence.

Results—The sample included 109 peri-menopausal and menopausal WLWH (233 observations), with a median age of 49 years (IQR 44–53). While most (68.8%) participants experienced menopausal symptoms, only 17% had received treatment (e.g., anti-depressants, hormone therapy) at baseline. In multivariable analysis, severe menopausal symptoms Adjusted

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Odds Ratio (AOR=1.03; 95%CI 1.00–1.06), injection drug use (AOR= 2.86; 95%CI 1.44–5.55) and physical/sexual violence (AOR=2.33; 95%CI 1.02–5.26) independently and positively correlated with <95% adherence.

Conclusions—These findings suggest that menopausal symptoms may undermine ART adherence, with overlapping vulnerabilities such as injection drug use and sexual/physical violence further exacerbating poor ART adherence. Women-centred, trauma-informed care approaches to detect menopause and treat menopausal symptoms are urgently needed. Such approaches should holistically address the intersecting barriers to adherence and link WLWH to peripheral health and social services, including trauma counseling and evidence-based harm reduction services.

Keywords

menopause; adherence; antiretroviral therapy; HIV; women; ageing

INTRODUCTION

Globally, approximately 17.8 million women are living with HIV, comprising 51% of adults living with HIV.¹ In Canada, women constitute approximately a quarter of people living with HIV PLWH². Echoing global trends, the survival of Canadian women living with HIV (WLWH) has improved significantly following the expansion of antiretroviral therapy (ART),³ with more WLWH now entering the age of peri-menopause and menopause (between 45–56 years of age).⁴ Moreover, adult women constitute the majority of new infections among Canadian women, with 64% of new HIV infections being amongst women aged 30+, according to 2014 estimates.² With a growing number of WLWH entering their mid-life, there is a need to better understand the challenges related to menopause among WLWH, including the impact of menopause on the clinical management of HIV.

Given that until recently WLWH did not live long enough to experience menopause, this is a relatively new phenomenon and remains a neglected area of study.⁵ However, emergent research suggests there may be key differences in the experiences of peri-menopause and menopause based on HIV status.^{5–7} Though data are conflicting,⁴ and the age range of reaching menopause is broad in general, some evidence suggests that WLWH are reaching menopause at earlier ages (ranging from 47.5–50 years versus an average of 51 (40–58) among Canadian women not living with HIV),^{5, 6, 8–10} with smoking, substance use and co-infection with Hepatitis C, CD4 count <50 cells/mm³ associated with earlier menopause.^{9, 11, 12} Other studies suggest that menopausal symptoms may be more prevalent and severe among WLWH, though again, data are mixed.^{10, 13, 14} Among the menopausal symptoms that women experience, vasomotor symptoms (i.e., night sweats, hot flashes, and flushes), have been the most researched, and linked to increased levels of depression.¹⁰ The role of urogenital (e.g., sexual complaints, vaginal dryness, urinary complaints) or psychological symptoms (e.g., irritability, anxiety, feelings of sadness, fatigue) in the context of HIV are less well-known, including how menopausal symptoms may collectively affect HIV clinical outcomes or disease progression among WLWH. Additionally, the structural challenges and barriers to the clinical management of HIV among peri-menopausal and menopausal women are not well-known, with existing studies rarely disaggregating peri-menopausal and

menopausal WLWH from other WLWH. It is likely that menopausal WLWH experience unique barriers to their health and well-being which may exacerbate challenges experienced in the menopausal transition.

Despite the importance of menopause for the health and quality of life for women, there remains a dearth of studies examining how menopause, particularly the severity of menopausal symptoms, impacts the HIV cascade of care among women.⁵ While some studies have hypothesized the link between the prevalence of menopausal symptoms and reduced ART adherence,^{10, 15} our literature review located only one study examining this association.¹⁶ This study, by Maki and colleagues, focused on depressive symptoms among menopausal WLWH and found elevated depressive symptoms to reduce ART adherence.¹⁶ To our knowledge, there are no studies examining how the severity of menopausal symptoms collectively affect ART adherence.

Given the growing number of WLWH entering the age of menopause, and the knowledge gap surrounding the impact of menopause and related symptoms on the HIV treatment adherence, this study sought to examine the correlates of suboptimal ART adherence (defined as <95% adherence) among menopausal WLWH in Metro Vancouver, including the impact of menopausal symptom severity, using the standardized and validated menopausal-rating scale (MRS). We hypothesize that illicit drug use and increased menopausal symptom severity will be associated with sub-optimal ART adherence.

METHODS

Study Design and sampling

Our analysis drew on data from an ongoing community-based, longitudinal study known as *Sexual Health and HIV/AIDS: Women's Longitudinal Needs Assessment* (SHAWNA) (2014-present). SHAWNA is a partnership of more than 20 women's HIV and community service providers, guided by a Community Stakeholder Advisory Board that meets semi-annually, and a Positive Women's Advisory Board of WLWH from Metro-Vancouver, that meets every 2–3 months. The SHAWNA study was developed based on over six months of community-consultations with WLWH, HIV care providers and policy experts, with the aim to longitudinally assess the needs and priorities identified women living with and accessing care in HIV (WLWH) in Metro Vancouver.

Study eligibility includes being a WLWH (trans inclusive), aged 14 and older, who lives in and/or accesses HIV/AIDS services in Metro Vancouver. Participants are recruited via various community-based outreach methods including: self-referrals and referrals from HIV care providers, peer navigators, HIV/AIDS organizations and clinical outreach, including British Columbia's primary referral centre for WLWH (Oak Tree Clinic, BC Women's Hospital). At enrolment and biannually, WLWH who have provided informed consent complete a questionnaire administered by our trained PRAs/interview team, on a wide range of topics such as individual, biological and behavioural variables (e.g., age, sexual orientation, ethnicity). Study participants are interviewed at one of two community research offices, or a safe and discreet location of their choice. Some of the social and structural data collected include: experiences of gender-based violence (e.g., intimate partner violence),

experiences navigating sexual and reproductive health (SRH) services and housing status. Following the questionnaire, participants are seen by a project sexual health nurse, who administers a health-related questionnaire which captures various aspects of sexual and reproductive health access and outcomes. This includes detailed questions around menopause, such as age of menopause (either by physician diagnosis or perceived menopause), treatment for menopause/menopausal symptoms (e.g., hormone therapy (HT)) and date of the participant's last period. To measure the severity of menopausal symptoms, interviewers administer the Menopause Rating Scale (MRS),¹⁷ which has been used among several populations, including WLWH.^{10, 18}

Participants also receive voluntary viral load/CD4 measurements and STI/HCV serology by one of the project's sexual health nurse. If needed, project nurses offer onsite treatment for symptomatic STI infections and Papanicolaou testing (regardless of enrollment in the study), and facilitate education support and referrals. At each visit, participants receive \$50 CAD remuneration for their time, expertise and travel. The study holds ethical approval through Providence Health Care/University of British Columbia Research Ethics Board and BC Women's Hospital.

Primary outcome

The primary outcome, self-reported sub-optimal ART adherence, was based on participants' estimates of their adherence to ART being <95% versus ≥95% in the last 3–4 weeks and is a time-updated measure. Sub-optimal ART adherence, defined as <95% self-reported adherence in the last 3–4 weeks was employed as it has been found to be an accurate measure of adherence (highly correlated to pill count and HIV viral load),¹⁹ and has been used in previous studies among WLWH in Canada.²⁰

Explanatory variables were selected based on their *a priori* known relationship with ART adherence, particularly among older WLWH. Sociodemographic variables examined were: age (measured continuously, in years); sexual orientation (i.e., identifying as gay, lesbian, bisexual, asexual or two-spirit versus straight, at baseline); ethnicity (defined as Indigenous (First Nations, Métis or Inuit) vs. White vs. African/Caribbean/Black) and education (defined as high-school graduate vs. less than high school). All the sociodemographic variables listed above were considered time-independent variables. The remaining individual, social and structural variables were considered time-dependent and updated to refer to occurrences in the previous six months. Individual variables considered included injection and non-injection drug use. Having had a mental health diagnosis (lifetime, time-updated for at least one of many mental health conditions: e.g., depression, anxiety, post-traumatic stress disorder, schizophrenia, attention deficit disorder, borderline personality disorder bipolar disorder), and duration of HIV infection (continuous, in years) and MRS were time-updated measures asked by the research nurse to support education, referral and support. The MRS was used to capture the severity of menopausal symptoms, and refer to symptoms experienced at the time of the interview. The MRS consists of 11 items and includes three symptom domains: somatic symptoms (e.g., sweating/hot flushes, cardiac complaints, sleeping disorders, joint and muscle complaints), urogenital symptoms (e.g., vaginal dryness, sexual problems, urinary complaints) and psychological symptoms (e.g.,

depressive mood, anxiety, irritability and exhaustion). Participants rated the severity of symptoms on a five-point scale, from none (scored as 0), to extremely severe (4). A total score was calculated by summing the ratings for each symptom with possible scores ranging from asymptomatic (for a score of 0) to the highest degree of symptom complaints (score of 44). The MRS scale has a high internal consistency with a Cronbach's alpha of 0.90 for the full scale.²¹ The following time-updated interpersonal and structural variables were also examined: experienced gender-based physical and/or sexual violence homelessness, sex work and being incarcerated (jail or prison overnight or longer).

Statistical Analyses

Our sample was restricted to cis-gender women, 30 years of age or older, who had ever been diagnosed by a health care provider as peri-menopausal or menopausal or self-reported that they were experiencing peri-menopause or menopause. While menopause among the general population is often defined as amenorrhea for >12 months, we did not use this definition, as menstrual irregularity, anovulation and amenorrhea are common among WLWH, and can confound the ability to accurately assess menopause.^{6, 22} Menopause/perimenopause diagnosis by a physician was based on a 'yes' response to the question: "Have you ever been told by a doctor that you have menopause or peri-menopause"? Self-defined menopause was defined as an answer of "Yes" to the question "Do you feel that you may be experiencing menopause or perimenopause?". When administering this question, interviewers described peri-menopause/menopause and asked follow-up questions about symptoms including: the absence of a period for over a year, hot flashes, fatigue, chills, night sweats. Women who have had a hysterectomy were also excluded, as amenorrhea resulting from this procedure may also be mistakenly interpreted as menopause in self-report.

Descriptive statistics calculated included frequencies and proportions for categorical variables, and measures of central tendencies (i.e., mean, medians and interquartile ranges (IQR)) for continuous data. Bivariate logistic regression with generalized estimating equations (GEE) and an exchangeable correlation structure and logit link was first conducted to screen for independent associations of individual, social and structural factors with adherence among peri-menopausal and menopausal women. Pearson's chi-squared tests (or Fisher's exact test for small cell counts) were used for categorical variables and Wilcoxon rank-sum test for continuous variables. GEE methods were employed to account for the time-varying variables in our analysis and adjusts the standard error to account for correlations arising from repeated measurements on the same participants over time. All 233 interviews were analyzed together using generalized estimating questions to account for multiple observations on the same participant. To measure the strength of association between categorical variables Odds Ratios (ORs) with 95% Confidence Intervals (CIs) were calculated.

Based on existing studies,^{23, 24} a *p*-value-cutoff of <0.10 was used to consider *a priori* hypothesized confounders for inclusion in the multivariable model. A backward stepwise approach was then used to construct the final multivariable model, beginning with a full model, followed by the removal of variables starting with the highest *p*-value and an assessment of the quasi-likelihood under the independence model criterion (QIC) after the

removal of each subsequent variable. The QIC value provides an indication of the combination of variables that best explain the variability in our outcome, adherence. The final model presented is the one exhibiting the lowest QIC value. The final model was tested for multicollinearity. All p -values are two-sided, and SAS software version 9.4 was used for all statistical analyses (SAS Institute Inc., Cary, North Carolina, USA).

RESULTS

In total, longitudinal data for 109 peri-menopausal and menopausal WLWH were included in this sample, for a total of 233 observations. The median number of interviews completed in this open cohort was two (IQR 1–3), with 70 participants completing more than one interview. Among the 70 participants who completed more than one interview, the median follow-up time was 12.4 months (IQR 6.5–17.3 months). The median age of our sample was 49 years (44–53), with the median age of perimenopause/menopause being approximately 44.5 (IQR = 40.5–49.0), based on the year that participants first experienced symptoms. The majority (56.0%) of our sample were Indigenous, with 36.7% white and 7.3% African/Caribbean/Black (ACB). At baseline, 13/109 (11.9%) participants indicated they had been offered treatment for menopause or peri-menopausal symptoms.

The mean score for the full MRS was 10.90, with a median of 11 (IQR:0–19). Of the full sample, 71.6% had experienced any menopausal symptoms over the course of the study. Somatic symptoms were most common, experienced by 70.6% of participants, followed by psychological symptoms (65.1%) and urogenital symptoms (57.8%). In terms of severity, psychological symptoms were among the most severe, particularly physical and mental exhaustion and irritability; forty percent and 37.6% respectively rated these symptoms as moderately to extremely severe. Hot flashes were the most severely experienced somatic symptom, with 40.4% rating their hot flash symptoms as moderately to extremely severe. The median and Interquartile Range (IQR) and GEE bivariate associations of each domain of the MRS with ART adherence are presented in Table 3.

Over the two-year study period, 70.6% reported <95% ART adherence, with injection drug use (Odds Ratio (OR)=3.04; 95% Confidence Interval (CI) 1.62–6.00), gender-based physical/sexual violence (OR=2.72; 95%CI 1.23 – 6.00), Indigeneity (OR=2.22; 95%CI 1.03 – 4.77) and more severe menopausal symptoms (OR= 1.03; 95%CI 1.00 – 1.05) significantly inversely associated with < 95% adherence at $p<0.05$ in bivariate GEE analysis. Age was found to decrease the odds of < 95% adherence by 5% with every year increase (OR=0.95; 95%CI 0.91 – 1.00). (See Table 1)

In our final multivariable GEE model, severe menopausal symptoms (measured continuously, using the MRS scale) (Adjusted Odds Ratio (AOR)=1.03; 95%CI 1.00 –1.06) injection drug use (AOR= 2.86; 95%CI 1.44–5.55) and physical/sexual gender based violence (GBV) (AOR=2.33; 95%CI 1.02–5.26) were inversely associated with < 95% versus 95% adherence in our final model (at $p<0.05$) (See Table 2).

DISCUSSION

The marginal association between MRS and adherence in our data suggest that severe menopausal symptoms may be negatively associated with ART adherence. Sub-optimal adherence to ART among peri- and menopausal WLWH may be exacerbated by intersecting vulnerabilities, including physical/sexual violence and injection drug use. These data highlight the critical need to properly assess peri-menopause and menopausal symptoms among WLWH and offer treatment for these symptoms to improve WLWHs' quality of life and support optimal treatment adherence and outcomes. At present, properly identifying menopause can be challenging, with many physicians unaware that WLWH may experience early menopause and therefore not test follicle stimulating hormone (FSH) levels in younger WLWH to confirm menopause.

Our findings build on the limited information on the impact of menopause on the HIV cascade of care, and extend research that has hypothesized a link between menopause symptom severity and ART adherence.¹⁰ Specifically, Looby and colleagues documented that WLWH with severe hot flash symptoms (measured using the MRS) had more challenges with daily activities and a reduced quality of life and postulated that this destabilization of well-being could be negatively associated with ART adherence.¹⁰ Maki and colleagues have found adherence to be a predictor of depressive symptoms among menopausal WLWH.¹⁶ Others have hypothesized that the potential negative impact of depressive symptoms on ART adherence may place WLWH at increased risk of AIDS defining illnesses.¹⁵ Adding to previous research, our findings suggest that the combination of menopausal symptoms, rather than specific symptoms, that may be negatively associated with WLWHs' ability to adhere to ART. Aligned with previous research, it is possible that the challenges of managing menopausal symptoms and subsequent negative impact on WLWHs' wellbeing may make adherence challenging.^{10, 15, 16} Alternatively, WLWH may mistake menopausal symptoms for ART side-effects,⁸ and it is possible that they may temporarily abandon treatment to alleviate their symptoms, though further investigation into this potential mechanism is warranted. There is a need to provide WLWH with education (by health providers and peer support groups/navigators) around aging with HIV and menopausal symptoms, both to prepare women and alleviate the stigma and fear around aging with HIV.

Among our sample, psychological and somatic symptoms were more common compared to urogenital complaints, with psychological symptoms (e.g., irritability, mental and physical exhaustion) being among the most severe symptoms experienced. It is important to mention, however, the high level of mental health co-morbidities in our sample (i.e., anxiety and depression) may contribute to the level of menopause-related psychological symptoms reported. The severity of symptoms in our sample were slightly lower compared to other cohorts of WLWH and women in the general population that have also used MRS. For example, the mean score for the full MRS scale in our sample was 10.9 (median=11; IQR 0–19), compared to 15 among WLWH in the US.¹⁰ Similarly, among midlife American women enrolled in methadone maintenance therapy, the mean MRS score for the sample was 17.04 (SD=9.18).²⁵ These data suggest that the menopausal symptoms of WLWH in our sample may be lower compared to women in the general population, contradicting some existing

literature that menopausal symptoms are more frequent and severe in WLWH.^{10, 13, 14} The high level of engagement in care among our sample (e.g., free ART, high levels of adherence, and greater access to support services and mental health treatment) compared to WLWH in other settings may contribute to the reduced severity of symptoms documented in our study. While it is possible that WLWH in our sample do not experience more severe menopause, alternative explanations for this difference could include the earlier age of menopause among our sample, the older median age of our sample (49 years), combined with the fact that menopausal symptoms are often heightened in the early stages of perimenopause. Furthermore, previous research suggests menopausal symptoms are often underreported by WLWH, as they may attribute their symptoms to ART side-effects or other illnesses.⁸ This may be particularly true of our sample of marginalized WLWH, who often contend with numerous overlapping vulnerabilities (e.g., homelessness, violence and trauma, illicit drug use, mental health issues) and co-morbidities (e.g., Hepatitis C, sexually transmitted infections). While our sample reported less severe symptoms compared to other cohorts/populations, the marginally significant association between increased symptoms severity and reduced ART adherence may be important.

The role of injection drug use, and to a lesser extent, physical and sexual violence, have been linked to reduced ART adherence and viral suppression among WLWH in various settings.^{26–30} Unfortunately, our findings suggest that these barriers persist among mid-life WLWH and continue to undermine ART adherence. Given the complex interactions between HIV, ageing and these social and structural factors, it is imperative that health care providers adopt a women-centred, trauma-informed approach to care, which acknowledges and addresses the broader social and structural factors (e.g., violence, trauma, addictions) that interact to disrupt WLWHs' ART adherence. This needs to be coupled with an expansion of and increased referrals/access to evidence-based addictions treatment.

Additionally, our findings highlight an urgent need to better assess for menopausal symptoms and offer treatment for menopausal symptoms among WLWH as a way to improve the quality of life of peri- and menopausal WLWH as well as bolster ART adherence. Our data indicate that very few (11.9%) peri- and menopausal WLWH in our sample were offered treatment for their menopausal symptoms, with only 6 (5.5%) women reporting being on HT at baseline. This low use of HT echoes trends elsewhere,⁵ and are comparable to estimates among menopausal women in the general Canadian population (4.9%)³¹. There remains a general lack of data on effective strategies to manage menopause among WLWH, including the safety and efficacy of HT among WLWH, such as potential interactions with ART.⁵ Further research are needed to better understand the risk and benefits of various management strategies for peri- and menopausal WLWH.

This study has a number of limitations. Firstly, the association between the MRS score and adherence includes 1, indicating only marginal significance. Secondly, our sample was restricted to peri- and menopausal women, based on a physician's diagnosis or self-report. Since it is unclear how peri- and menopause was diagnosed (e.g., FSH tests versus assessment of amenorrhea >12 months, or other symptoms), it is possible that our sample may also include premenopausal women- which could potentially underestimate the age of menopause and severity of menopausal symptoms. A study from Cejtin and colleagues

suggests that many WLWH with prolonged amenorrhea were not menopausal when diagnosed using FSH blood tests.²² However, given the older median age of our sample, we suspect this limitation to be minimal. Third, WLWH may mistakenly attribute their menopausal symptoms to ART side-effects or other health ailments which would result in an underreporting of menopausal symptoms. Fourth, while more than of our sample were Indigenous, and were less likely to be adherent compared to other backgrounds, we did not examine differences in the severity of menopausal symptoms by background. Future analyses into the differences in age of menopause and severity of symptoms by ethnicity are warranted. Fifth, given the small sample size and the relatively large number of variables examined, it is possible that significant associations detected were due to these multiple comparisons. Additionally, this study's small sample size may lack the power to detect associations, thus missing potential risk factors for ART adherence. However, the multiple observations for each participant in this cohort study increases the total number of observations, tempering these biases. Finally, our outcome (95% adherence) may be susceptible to social desirability bias, resulting in an over-reporting of adherence. However, we have no reason to believe that women experiencing more severe menopausal symptoms would differentially report adherence levels. The community-based nature of this study, which uses highly-trained peer-research associates (including women living with HIV) who have a strong rapport with the community of WLWH, likely tempers the impact of social desirability bias on our adherence measure.

CONCLUSION

In summary, our findings suggest that increased severity of menopausal symptoms may be associated with lower ART adherence among peri-menopausal and menopausal WLWH, and this may be exacerbated by intersecting vulnerabilities, including injection drug use and recent sexual/physical violence. With WLWH aging, there is a higher need to more accurately identify and treat menopausal symptoms, in the context of women-centred and trauma-informed care. Care needs to address the numerous and overlapping social and structural barriers to adherence (e.g., violence-related trauma, addictions and depression) and provides active referrals to complementing/supporting health and social services, including trauma counseling and evidence based harm reduction services. Further research is needed to identify effective strategies for managing menopause and related symptoms among WLWH, to improve adherence and their quality of life.

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TABLE 1

Baseline characteristics of the 109 peri-menopausal and menopausal women living with HIV in SHAWNA Project in Metro Vancouver, Canada (2014–2017), stratified by adherence to ART (<95% versus ≥95%).

Characteristic	Total (%) (n = 109)	95% ART adherence*	
		Yes (70.6%) n=77	No (29.4%) n = 32
Age (med, IQR)	49.0 (44.0–53.0)	50.0 (45.0–54.0)	46.0 (40.5–52.5)
Age diagnosed with peri-menopause/menopause (med, IQR)	44.0 (40.5–49.0)	-	-
Full menopause rating scale (MRS)* (med, IQR)	11.0 (0.0–19.0)	8.0 (0.0–15.0)	17.0 (0.0–22.0)
<i>Sexual orientation</i>			
LBQ2S (Lesbian, gay, bisexual, queer, two-spirit)	37 (33.9)	28 (36.4)	9 (28.1)
<i>Ethnicity</i> [†]			
Indigenous [‡]	61 (56.0)	36 (46.8)	25 (78.1)
African/Black/Caribbean	8 (7.3)	7 (9.1)	1 (3.1)
White	40 (36.7)	34 (44.2)	6 (18.8)
High school graduate	99 (90.8)	68 (88.3)	31 (96.9)
Homeless*	14 (12.8)	9 (11.7)	5 (15.6)
Sex work ^{*†}	27 (24.8)	17 (22.1)	10 (31.3)
Gender-based physical/sexual violence ^{*†}	16 (14.7)	7 (9.1)	9 (28.1)
Injection drug use ^{*†}	46 (42.2)	25 (32.5)	21 (65.6)
Non-injection drug use ^{*†}	54 (49.5)	35 (45.5)	19 (59.4)
Mental health diagnoses, lifetime	79 (72.5)	56 (72.7)	23 (71.9)

* Last 6 months

[†] Variable has missing responses at baseline. Sample size will not add up to 109. Proportions are calculated to include missing variables.

[‡] Indigenous peoples of Canada: First Nations, Métis and Inuit peoples. The Indigenous peoples of Canada represent diverse cultures and languages however, for the purposes of this analysis Indigenous was used to refer to these groups collectively

TABLE 2

Bivariate and multivariable GEE correlates of < 95% ART adherence among 109 (233 observations) perimenopausal and menopausal women living with HIV in Metro Vancouver (2014–2017).

Characteristic	Correlates of < 95% ART adherence	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Full menopause rating scale	1.03 (1.00 – 1.05) *	1.03 (1.00–1.06)
Age	0.95 (0.91 – 1.00) *	–
<i>Sexual orientation</i>		
LGBQ2S (Lesbian, gay, bisexual, queer, two-spirit)	1.18 (0.59 – 2.34)	–
<i>Ethnicity</i> [‡]		–
Indigenous [‡]	2.22 (1.03 – 4.77) *	–
African/Black/Caribbean	2.06 (0.42 – 9.96)	–
White	REF	
High school graduate	3.70 (0.46 – 29.9)	–
Homeless [‡]	1.28 (0.59 – 2.81)	–
Sex work [‡]	1.41 (0.73 – 2.72)	–
Gender-based physical and/or sexual violence [‡]	2.72 (1.23 – 6.00) *	2.33 (1.02 – 5.26) *
Injection drug use [‡]	3.04 (1.62 – 5.73) *	2.86 (1.45 – 5.56) *
Non-injection drug use [‡]	1.68 (0.90 – 3.13)	–
Mental health diagnosis	0.89 (0.44 – 1.81)	–

* Statistically significant at p<0.05

[‡] Last 6 months

[‡] Indigenous peoples of Canada: First Nations, Métis and Inuit peoples. The Indigenous peoples of Canada represent diverse cultures and languages however, for the purposes of this analysis Indigenous was used to refer to these groups collectively

Table 3

Median, Interquartile Ranges (IQR) and GEE bivariate associations with <95% ART adherence for each domain of the Menopause Rating Scale (MRS)

MRS Domain	Median and IQR	OR (95%CI)	p-value
<i>Psychological symptoms sub-scale</i>	1 (0–4)	1.04 (0.98 – 1.10)	0.16
• Dryness of the vagina			
• Bladder problems			
• Sexual problems			
<i>Somato vegetative symptoms sub-scale</i>	4 (0–7)	1.05 (0.98 – 1.12)	0.16
• Joint and muscular discomfort			
• Heart discomfort			
• Sleep problems			
• Hot flushes, sweating			
<i>Urogenital symptoms sub-scale</i>	4 (0–8)	1.09 (0.99 – 1.22)	0.09
• Physical and mental exhaustion			
• Anxiety			
• Irritability			
• Depressive mood			
<i>Full menopause rating scale</i>	11.0 (0.0–19.0)	1.03 (1.00 – 1.05) [*]	0.04

* Statistically significant at p<0.05

[†] Includes all three domains/subscales of the menopause rating scale