

Experiences of chronic stress and mental health concerns among urban Indigenous women

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Abstract We measured stress, depression and post-traumatic stress disorder (PTSD) levels of urban Indigenous women living with and without HIV in Ontario, Canada, and identified correlates of depression. We recruited 30 Indigenous women living with HIV and 60 without HIV aged 18 years or older who completed socio-demographic and health questionnaires and validated scales assessing stress, depression and PTSD. Descriptive statistics were conducted to summarize variables and linear regression to identify correlates of depression. 85.6 % of Indigenous women self-identified as First Nation. Co-morbidities other than HIV were self-reported by 82.2 % ($n=74$) of the sample. High levels of perceived stress were reported by 57.8 % ($n=52$) of the sample and 84.2 % ($n=75$) had moderate to high levels of urban stress. High median levels of race-related (51/88, IQR 42–68.5) and parental-related stress (40.5/90, IQR 35–49) scores were reported. 82.2 % ($n=74$) reported severe depressive symptoms and 83.2 % ($n=74$) severe PTSD. High levels of perceived stress was correlated with high depressive

symptoms (estimate 1.28 (95 % CI 0.97–1.58), $p<0.001$). Indigenous women living with and without HIV reported elevated levels of stress and physical and mental health concerns. Interventions cutting across diverse health care settings are required for improving and preventing adverse health outcomes.

Keywords Indigenous women · Stress · Depression · Post-traumatic stress disorder · HIV

Introduction

There is a paucity of information assessing and quantifying stress for Indigenous women in Canada who self-identify as First Nation, Métis or Inuit. Using quantitative tools to identify stressors can contribute to locating the historical and present-day grief and trauma of Indigenous women that

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continues to be perpetuated through forced acculturation and adaptation or adjustment (Bartlett 2003; Poonwassie 2006).

Stress has been characterized as a normal biological and emotional response to life events associated with biochemical, physiological and behavioural changes (Baum 1990). It can be acute, suddenly emerging through an unpredictable threat, or it can be chronic, resulting from repeated exposure to life events or persistent responses from past events (Baum 1990). Acute stress may have adverse consequences on health; however, it is chronic stress which entails continued activation of bodily systems which influences the pathophysiology of diseases (Anderson 1998; Baum 1990; Baum and Posluszny 1999). Chronic stress has been attributed to the development and/or progression of mental health concerns (e.g. substance use, anxiety, depression and schizophrenia), a diversity of physical health concerns (e.g. insomnia, muscle pain, arthritis, headaches and high blood pressure) including major illnesses (e.g. heart disease, HIV and obesity) (Anderson 1998; Baum 1990; Baum and Posluszny 1999; Leserman 2003, 2008). We are interested in chronic stress because of its attribution to the development and/or progression of mental and physical health concerns.

Stressful events particularly chronic experiences are a pervasive concern for Indigenous women (Bartlett 2003). These stressful events are largely attributed to the historical and ongoing impact of colonialism felt across generations from forced assimilation through residential schools and separation from family, violence and abuse and loss of culture and traditions for example (Kirmayer et al. 2014). However, few studies quantify the current stress landscape of Indigenous women in Canada. Stressors that have been widely documented include socio-economic worries (Hawkins et al. 2009; Iwasaki et al. 2004; Lee 2000), adverse home, work and social environments (Bartlett 2003; Hawkins et al. 2009), lack of self-determination in their own health and health care choices (Browne and Fiske 2001; Hawkins et al. 2009; Iwasaki et al. 2004) and inequitable health status and access to health care and support (Browne and Fiske 2001; Hawkins et al. 2009; Hole et al. 2015; Smith et al. 2005). Other key stressors that impact the lives of Indigenous women include the manifestation of trauma and violence (Hawkins et al. 2009; Iwasaki et al. 2004; Mill 1997) including cultural, historical and political systems shaping discrimination and other prejudiced attitudes and beliefs linked to women's Indigenous identity (Hawkins et al. 2009; Iwasaki et al. 2004) that, for example, call into their ability to parent (Smith et al. 2005). Furthermore, any or all of these stressful events exist for Indigenous women living with HIV. Indigenous persons living with HIV have reported health-related concerns (i.e. discrimination in the health care setting and managing HIV symptoms) including competing daily stressors (e.g. housing, food, income and support insecurity) (Cain et al. 2013; McCall et al. 2009; Mill 1997). Specific concerns described by Indigenous

women living with HIV have included childhood trauma and violence (e.g. sexual, physical, mental and emotional), adverse parental outcomes (e.g. neglect, substance use and the foster care system), socio-economic insecurities, a lack of supportive outlets and gender inequities (Hawkins et al. 2009). In this study, we are particularly interested in examining the association between chronic stress, HIV and mental health.

Mental health is understood as a state of physical, mental and social wellbeing and includes both the absence and presence of serious mental illness which is affected by daily stressors (CMHA 2015a; WHO 2015). Indigenous people further view mental health as a state of mental wellness in which there is a balance between social, physical, spiritual and emotional life within the person, family, community and the larger environment (FNHA 2015; Wilson 2007). The co-occurrence of chronic stress and mental health issues among Indigenous women has previously been described (Caron and Liu 2010; Kirmayer et al. 2000; Wingert 2011). Indigenous persons are two to five times more likely to experience mental health concerns including depression compared to other ethnicities (Caron and Liu 2010). Furthermore, the intergenerational impact of colonialism has promoted the development of post-traumatic stress disorder, which has been frequently described, but rarely quantified in studies of Indigenous persons (Brasfield 2001; Brave Heart 1993, 1999; Corrado and Cohen 2003; Duran 2006; Gone 2014; Kirmayer et al. 2014; Mitchell and Maracle 2005; Van Ameringen et al. 2008).

Depression has been one of the most frequently reported mental health concerns for Indigenous persons in Canada (FNRHS 2007; Khan 2008). Symptoms of depression are characterized as severe despondency over a long period of time resulting in adverse changes to a person's thoughts, behaviours, feelings and sense of wellbeing (Salmans 1995). Depressive symptoms include restlessness, sadness, loss, guilt, worthlessness, impatience, irritability or short temper, loss of interest or pleasure in usually enjoyed activities, withdrawal from family and friends and suicide ideation (NIMH 2011; Salmans 1995; Simon et al. 1999). Recent major life events and a personal and positive family history of depression are three of the most important predictors of depression (Monroe et al. 2014). The Canadian Community Health Survey (2000–2003) showed that 7.1 % of the general Canadian population had major depressive disorder in the previous 12 months compared to 13.2 % of the Indigenous population living off-First Nations communities (StatsCan 2006). A 1997 survey administered on First Nations communities showed that 16 % of First Nations adults had depression compared to 8 % of the general Canadian population (Khan 2008). In 2005, the First Nation Regional Health Survey reported that 34.5 % of First Nations women have felt sad, blue or depressed for two or more weeks (FNRHS 2007). Limited data is currently available for Indigenous persons living with HIV,

however, in previous studies, Indigenous persons living with HIV described depressive symptoms prior to their HIV diagnosis and their understanding of depression in terms of their relationships with community, culture and people (Cain et al. 2011, 2013). Major life events such as interpersonal stress (e.g. disruption in early attachment relationships such as child removal, neglect, violence or abuse during childhood) and social rejection (e.g. discrimination) are all major risk factors for depression (Slavich and Irwin 2014) and have been described by Indigenous women with and without HIV (Bartlett 2003; Cain et al. 2013; Fleming et al. 2006; Hawkins et al. 2009; McCall et al. 2009). Thus, more recent comprehensive data on depression levels of Indigenous women living with and without HIV are needed. Over the last 15 years, insufficient resources have been dedicated to examining coping strategies that might help mitigate depression including recognition of Indigenous approaches.

The pervasiveness of stressful life events and adverse mental health outcomes has led to a wider interest in exploring Indigenous culture-based strategies for improving health and wellness. Initiatives founded on an Indigenous culture for improved health and wellness have been shown to successfully rebuild individual and communal cultural identity, thus, contributing to sustaining health and wellness and promoting healthy life choices (DeGagne 2007; Gone 2013; Iwasaki et al. 2005). Although psychotropic medications and psychotherapies remain the standard treatment approaches for addressing mental health difficulties in the general population (Hollander 2013; Watts et al. 2013), these forms of mental health care do not seem to be sufficient or as effective for Indigenous people. Thus, greater consideration as to why mental health outcomes among Indigenous persons are not improving is needed and possible contributing factors such as inequitable access to mental health care, different understandings of mental health and wellness and how mental health care and support are desired by Indigenous persons need to be examined. In fact, post-traumatic stress disorder (PTSD) is one such example of a mental health issues for which Indigenous persons have a different understanding (Brasfield 2001; Brave Heart 1993; Corrado and Cohen 2003; Gone 2014; Kirmayer et al. 2014).

Given the known high number of stressful life events which many Indigenous women experience, there exists a dearth of information examining the rates of PTSD among Indigenous women. PTSD is characterized as a trauma or stress-related disorder resulting from traumatic event(s) consisting of the following: re-experiencing the traumatic event, avoidance, negative cognitions and mood and arousal (APA 2013; CMHA 2015b). However, important discussions on historical trauma, postcolonial distress, the residential school syndrome and soul wound for Indigenous people have taken place. Historical trauma signifies mounting emotional and psychological wounding over the lifespan and across

generations stemming from experiences of collective trauma (Brave Heart 1993, 1999; Gone 2014; Kirmayer et al. 2014). Postcolonial distress is understood as modern and historical pain and suffering as opposed to trauma and is characterized by a collective experience of colonial injury with cumulative effects and cross-generational impacts (Kirmayer et al. 2014). The residential school syndrome (RSS) similar to PTSD not only includes recurrent intrusive memories, avoidance, diminished interest and participation and arousal but also adverse parenting models and initiation of substance use at a young age (Brasfield 2001; Corrado and Cohen 2003). The soul wound defined by the Iroquois people eloquently signifies the embedding of historical trauma into the cultural memory of a people which is passed on similar to culture (Duran 2006). Efforts have been made to understand the experience and manifestation of the intergenerational impact of colonization albeit from a qualitative perspective. More comprehensive data is now required particularly since a single study in British Columbia among 127 residential school survivors indicated that approximately 64 % were living with PTSD (Corrado and Cohen 2003; Mitchell and Maracle 2005). In contrast, a national study in the general Canadian population indicated much lower levels of PTSD including a lifetime PTSD of 12.8 and 5.3 % for women and men, respectively, and current experiences of PTSD were 3.3 % for women and 1.3 % for men (Van Ameringen et al. 2008). In Ontario, another study indicated that lifetime prevalence of PTSD among women was 10.7 % (Frise et al. 2002). There exists very little quantitative research examining prevalence rates of PTSD among Indigenous women living in Ontario. Such data could be used to inform the allocation of resources that would be needed to effectively implement intervention strategies aimed at addressing PTSD from an Indigenous perspective.

In this literature review, we have found that research on the severity and prevalence rates of stress, depressive symptoms and PTSD using validated scales is lacking for Indigenous women living with and without HIV. The primary objective of our study was to determine the prevalence and severity of stress levels among Indigenous women living with and without HIV in Ontario, Canada. The secondary objectives involved measuring depressive symptoms and PTSD and identifying correlates of depression.

Materials and methods

Study design

The Indigenous Women's Stress Study (IWSS) aimed to identify and understand stressors in the lives of Indigenous women as well as learn how they desire to manage, currently manage, adapt to and modify these stressors. Two phases have currently been executed following principles of community-based

research (CBR) and Indigenous methodology. CBR was executed in our study through the involvement of community partners in the design and implementation of the study (Israel et al. 1998). Indigenous methodologies were implemented in consultation with local Indigenous knowledge holders; a spiritual leader conducted ceremony and together with community partners advised on the elements required for creating a safe space and for collecting information from study participants through sharing circles and one-on-one discussions (Kovach 2010). During phase 1, socio-demographic factors, wellbeing, social support, HIV knowledge, stress, depression, post-traumatic stress disorder and stress management were characterized using a peer-administered questionnaire through peer-led interviews and sharing circles. Briefly, a sharing circle is a discussion group including Indigenous protocols where the outcomes of a focus group can be obtained (Lavallee 2009). During phase 2, we conducted a sharing circle which served as a validity check ‘focus group’ to verify phase 1 findings. Culturally based stress-reducing interventions informed by phase 1 study participants were also implemented during phase 2. The interventions were overseen by an Indigenous spiritual leader trusted by the study participants who guided ceremony, informed the inclusion of Indigenous culture in the stress-reducing practices and facilitated stress-reduction practices. In this paper, we will report phase 1 quantitative findings and focus on socio-demographic and health information and measures of stress, depression and PTSD.

Study population

Study participants were recruited from Toronto, Ontario between June 1 and December 31, 2012 and August 1 to December 31, 2013 in Thunder Bay, Ontario. A total of 90 Indigenous women were recruited of which 30 were living with HIV and 60 without HIV. Participants were recruited through peer outreach and regional Indigenous service providers and agencies. Eligible study participants met the following criteria: (1) self-identified as a woman, including transwoman; (2) self-identified as First Nation, Métis or Inuit; (3) being 18 years or older and (4) able to read and write French or English with exceptions. Women with visual and hearing impairments were not excluded ($n < 6$) because assistance in completing the questionnaire was accepted and funds were available for interpreters. The study was reviewed by the Women’s College Research Institute Ethics Review Board and all study participants provided both verbal and written informed consent. Study participants received an honorarium and public transportation costs were covered.

Questionnaire variables

The questionnaire required between 30 and 60 min to complete and the following variables were characterized.

Socio-demographic, psychosocial and health variables

Socio-demographic information collected from the study participants included age, ethnicity, sexual orientation, education, employment, income and living, relationship, and parenting status. Psychosocial and health-related information collected included smoking, drug use, alcohol use, other self-reported illnesses including hepatitis C, depression, anxiety and exercise or stress management activities. Psychosocial variables such as stress, depression and PTSD were measured as described below.

Stress variables

We measured stress using several scales; the Perceived Stress Scale, the Index of Race-Related Stress, the Urban Life Stress Scale, and the Parental Stress Scale. The 10-item Perceived Stress Scale measures feelings and thoughts during the last month prior to completing the scale (Cohen et al. 1983; 1988). It evaluates how unpredictable, uncontrollable and overloaded respondents find their lives using a scale ranging from a score of 0 for ‘Never’ to a score of 4 for ‘very often’. The total score ranged between 0 and 40 where the levels of perceived stress were categorized as follows: less than 13 (not clinically significant), 13–20 (high) and greater than 20 (very high) (Cohen et al. 1983; 1988). The latter category is indicative of chronic stress. It is one of the most widely used psychological instruments to assess life stressors and the effectiveness of stress-reducing interventions (Cohen et al. 1983; 1988). It is also a predictor for biological markers of stress and increased risk of disease in individuals with high scores (Cohen et al. 1983; 1988). It has adequate validity and reliability (Cohen et al. 1983; 1988). The validity of the scale and its internal reliability (0.78) has been established (Cohen et al. 1983; 1988). The scale has also been used in persons living with HIV (Koopman et al. 2000; Massad et al. 2011). The Perceived Stress Scale yielded a satisfactory degree of internal consistency with a coefficient alpha of 0.82 in our study.

Stress deriving from a person’s urban environment and associated life burden was assessed using the Urban Life Stress Scale (ULSS), a measure of chronic stress related to poverty, employment, housing, education and crime to name a few (Jipguep et al. 2004; Sanders-Phillips 1996). The 22-item scale measures stress using a 5-point rating system where ‘No stress’ equals 1 and ‘Extreme stress’ equals 5 and the score ranges between 22 and 110 with elevated scores indicative of a higher degree of stress (Sanders-Phillips 1996). The scale has been used in women living with HIV (Jipguep et al. 2004) and its reliability (greater than 0.84) and validity have been established (Jaffee et al. 2005; Sanders-Phillips 1996). In our study, the ULSS yielded a high degree of internal consistency with a coefficient alpha of 0.89.

Racism-related stress was measured using the Index of Race-Related Stress (IRRS)–brief version (B) (IRRS-B) (Utsey and Ponterotto 1996, 1999, Utsey 1999). The IRRS-B is a 22-item multidimensional scale that includes four subscales: cultural (10 items), institutional/collective (4/2 items), individual (6 items) and a global racism measure (all items). The IRRS-B can be adapted to multiple ethnic minorities to evaluate their encounters with racism where each item is rated on a 4-point rating system (0–4) ranging from ‘This has never happened to me’ equaling 0 and ‘This happened and I was extremely upset’ equaling 4 (Bastos et al. 2010; Utsey and Ponterotto 1996, 1999, Utsey 1999). The score ranges between 0 and 88 where high scores indicate greater experiences of racism. IRRS-B has demonstrated adequate validity and reliability (Utsey and Ponterotto 1996, 1999, Utsey 1999). The Cronbach's alpha were 0.78 (cultural subscale), 0.78 (individual) and 0.69 (institutional/collective) (Utsey 1999). Moderate IRRS-B subscale intercorrelations were measured and high correlations between the IRRS-B subscales and the total scale (global racism scale) indicating that the scale measures were related, but distinct (Utsey 1999). Validity and reliability were established (Bastos et al. 2010; Utsey 1999). In our study, the IRSS yielded a high degree of internal consistency with a coefficient alpha of 0.90 for the total scale and 0.83 (cultural), 0.82 (individual) and 0.69 (institutional/collective) for the subscales.

Pleasurable and negative aspects of parenting were measured using the Parental Stress Scale (Berry and Jones 1995). The scale consists of 18 items where parents are asked to agree or disagree with items in terms of their typical relationship with their child/children. The score ranges from 19 to 90 with a point scale between 1, ‘Strongly disagree’, and 5, ‘Strongly agrees’ where higher scores indicate a greater degree of stress. The scale has demonstrated adequate levels of reliability and validity (Berry et al. 1995). The scale demonstrated satisfactory levels of internal reliability (0.83), test-retest reliability (0.81) and validity (Berry et al. 1995). In our study, the Parental Stress Scale yielded a high degree of internal consistency with a coefficient alpha of 0.84.

Depression and post-traumatic stress disorder variables

Depressive symptoms were screened for using the Center for Epidemiologic Studies Depression Scale (CES-D) (Radloff 1977). The scale consists of 20 items describing how a respondent might have felt or behaved during the last 7 days leading up to and including the day the scale is completed. The total score ranged between 0 to 60 with a response option ranging from 0 to 3 where 0 represents ‘Rarely or none of the time (less than 1 day)’ and 3 ‘Most or all of the time (5–7 days)’

(Balfour et al. 2006; Radloff 1977; Schroevers et al. 2000). A clinical cut-off score of 16 was used as the threshold suggestive of depressive symptoms (Radloff 1977). Scores between 16 and 21 were suggestive of significant or mild depressive symptoms and scores greater than 21 as moderate to severe depressive symptoms (Radloff 1977). The CES-D has been used in evaluating mood in persons living with HIV (Balfour et al. 2006; Knowlton et al. 2001). The scale yielded internal coefficients of 0.92 and 0.94 in studies including persons living with HIV (Balfour et al. 2006; Hand et al. 2006; Massad et al. 2011). In our study, this scale yielded a high degree of internal consistency with a coefficient alpha of 0.89.

Problems and/or complaints in response to traumatic and stressful life experiences were assessed using the Post-Traumatic Stress Disorder (PTSD) Checklist–Civilian Version (PCL-C) (Martin and Kagee 2011). The scale consists of 17 items rating the impact of traumatic and stressful life experiences within the last month on a 5-point scale where 1 refers to ‘Not at all’ and 5 to ‘Extremely’. The score ranges from 17 to 85 points where scores greater than 30 are indicative of significant levels of symptom severity and a greater impact of stressful events on life (Blanchard et al. 1996; Martin et al. 2011). Test-retest reliability (0.96), internal consistency (0.97) and validity were established (Weathers et al. 1993). The scale has been used in women living with HIV (Martin et al. 2011; Smith et al. 2002). The coefficient alpha for the PTSD scale in our study was 0.93.

Statistical analysis

Socio-demographic, psychosocial and health-related variables were presented as frequencies and proportions for categorical variables and compared using the Fischer's exact test. Medians and interquartile ranges (IQR) (25th and 75th percentile) were used to describe continuous variables and compared using the Wilcoxon rank test. For all scales, items were summed and presented as continuous variables and categorical values where appropriate with *p* values calculated.

Simple and multiple linear regression models were used to measure the estimate and 95 % confidence interval (CI) of covariates associated with depression as a continuous variable. Participants answering 14 or more CES-D questions were included into the analysis. Missing values for individual CES-D items were imputed with the mean value of non-missing answers for that participant. Significant covariates ($p < 0.10$) and a priori variables of interest: age at interview, income, HIV status, co-morbidities and having children, were candidates for inclusion in the adjusted model. All analyses were performed using SAS software version 9.4 (SAS Institute, Cary, NC, USA).

Results

Study participant characteristics

Table 1 summarizes socio-demographic and health-related variables for all women. A separate analysis was not conducted for transwomen due to small sample numbers ($n < 6$). First Nation identity was reported for 85.6 % ($n = 77$) of the women. Socio-economically, only 22.2 % ($n = 20$) of the women were employed, 19.5 % ($n = 17$) had an income greater than \$20,000 and 39.3 % ($n = 35$) had at least a high school education. Practices for improved health and wellness including stress management were reported among 97.8 % ($n = 88$) of the women.

Socio-demographic and health-related variables were compared between women living with and without HIV and few differences were found (Table 1). As the primary outcome of our study is depression, descriptive statistics was also conducted to examine socio-demographic and health-related variables for women with CES-D scores less than 16 and greater or equal to 16 (table not shown). Among the total sample of 90 Indigenous women, 82.2 % ($n = 74$) scored above the CES-D clinical cut-off score of ≥ 16 suggestive of significant depressive symptoms (data not shown). A higher proportion of women with symptoms suggestive of depression (≥ 16) reported living with a co-morbidity (excluding HIV) compared to women with scores < 16 (86.5 %, $n = 64$ versus 62.5 %, $n = 10$, $p = 0.03$) (data not shown).

Stress severity

Median scores for stress scales and subscales and stress severity are reported in Table 2. The median perceived stress score was 21.0 (IQR 19.0–26.0), which reflects high perceived stress (scores > 20). Less than six women reported average stress (scores < 13), as such we are reporting average to moderate stress and high stress for women, 42.2 % ($n = 38$) versus 57.8 % ($n = 52$), respectively. The median score for urban life stress was 57.0 (IQR 48.0–69.0) reflecting moderate stress. More women reported moderate (49.4 %, $n = 44$) to high (34.8 %, $n = 31$) urban life stress than average urban life stress 15.7 % ($n = 14$). The median parental stress score was 40.5 (35.0–49.0) and the median race-related stress score was 51.0 (IQR 42.0–68.5).

We conducted analyses to determine differences in the stress levels between women living with and without HIV, but statistically significant differences were not found with the exception of cultural racism, a subscale of the Index of Race-Related Stress. We reported for Indigenous women living with HIV a median score of 22.0 (IQR 19.0–27.0) compared to 28.5 (IQR 21.0–34.0) among those not living with an HIV diagnosis ($p = 0.003$) (Table 2). Questions within the cultural racism subscale were on the negative portrayal of

Indigenous people by the media (e.g. movies, newspapers, radio, television), books and the general population as well as sensationalization of committed crimes that are similar to their Caucasian peers which lead to the embedding of negative Indigenous stereotypes in mainstream society. Other questions within the subscale cover the topic of racism from the police, public officials, Caucasian people in general and internalized racism as well as crimes falsely being attributed to Indigenous people.

Depression

The median score and severity levels for depression, the primary outcome, are reported in Table 2. Among the 30 women living with HIV completing the CES-D, only one woman missed answering a question and completed 19 out of the 20 questions. Among 60 women not living with an HIV diagnosis, 53 women completed all 20 questions, five women completed 19 questions, one woman completed 16 questions and one woman completed 14 questions. The median CES-D score was 26.5 (18.0–34.0), suggestive of severe depressive symptoms. Overall, 62.2 % ($n = 56$) of women experienced severe depressive symptoms, 20.0 % ($n = 18$) reported significant symptoms and 17.8 % ($n = 16$) reported no depressive symptoms. We did not find any differences in median depression scores or severity levels between women living with and without HIV.

Post-traumatic stress disorder

The median post-traumatic stress disorder score was 46.0 (IQR 34.5–60.5) (Table 2). The majority of the women had significant PTSD symptoms (83.2 %, $n = 74$), and 15 (16.8 %) women had no PTSD symptoms. No statistically significant differences in the median PTSD score ($p = 0.94$) and severity levels ($p = 0.97$) were found between Indigenous women living with and without HIV.

Linear regression analysis

Covariates associated with depression are presented in Table 3. A priori variables were not associated with depression scores. In the unadjusted model, for every unit increase in perceived stress (1.15, 95 % CI 0.86, 1.45) an increase in the depression scores was measured. In the multiple regression model, for every unit increase in perceived stress (1.28, 95 % CI 0.97, 1.58) an increase in the depression scores is predicted.

Table 1 Study population socio-demographic, psychosocial and health-related characteristics ($n=90$)

Characteristic	All	Living with HIV ($n=30$)	Living without HIV ($n=60$)	p
Age at interview (median, IQR)	42 (30–47)	42 (38–49)	40 (29–46)	0.03*
Indigenous grouping				
First Nations	77 (85.6 %)	22 (73.0 %)	55 (92.0 %)	0.02*
Métis or Inuit	13 (14.4 %)	8 (27.0 %)	5 (8.0 %)	
Education (>high school)	35 (39.3 %)	8 (26.7 %)	27 (45.8 %)	0.13
Employed (yes)	20 (22.2 %)	4 (13.3 %)	16 (26.7 %)	0.15
Annual gross income (>\$20,000)	17 (19.5 %)	5 (17.2 %)	12 (20.7 %)	0.70
Living status (permanent residence)	74 (82.2 %)	28 (93.3 %)	46 (76.7 %)	0.07
Relationship (yes)	42 (47.2 %)	12 (40.0 %)	30 (50.0 %)	0.33
Sexual orientation				
Heterosexual	68 (76.4 %)	22 (73.3 %)	46 (78.0 %)	0.63
Bisexual or 2-spirit	21 (23.6 %)	8 (26.7 %)	13 (22.0 %)	
Cigarette use				
Never	12 (13.5 %)	4 (13.3 %)	8 (13.5 %)	0.92
≤ 10 /day	38 (42.7 %)	12 (40.0 %)	26 (44.1 %)	
≥ 11 /day	39 (43.8 %)	14 (46.7 %)	25 (42.4 %)	
Marijuana use				
Never	39 (43.8 %)	11 (36.7 %)	28 (47.5)	0.33
Ever (current)	50 (56.2 %)	19 (63.3 %)	31 (52.5 %)	
Last time injected drug use				
Never	41 (47.7 %)	7 (25.0 %)	34 (58.6 %)	0.01*
≤ 1 month ago	16 (18.6 %)	7 (25.0 %)	9 (15.5 %)	
≥ 1 year ago	29 (33.7 %)	14 (50.0 %)	15 (25.9 %)	
Smoke, oral or inhale drugs				
Never	21 (33.3 %)	7 (33.3 %)	14 (33.3 %)	0.91
≤ 1 month ago	22 (34.9 %)	8 (38.1 %)	14 (33.3 %)	
≥ 1 year ago	20 (31.8 %)	6 (28.6 %)	14 (33.3 %)	
Illicit drug use				
Never	15 (16.9 %)	5 (16.7 %)	10 (17.0 %)	0.97
Ever	74 (83.1 %)	25 (83.3 %)	49 (83.0 %)	
Alcohol use in last 30 days				
Never	28 (31.5 %)	9 (30.0 %)	19 (32.2 %)	0.66
1–7 times a week	25 (28.1 %)	7 (23.3 %)	18 (30.5 %)	
1–3 times a month	36 (40.4 %)	14 (46.7 %)	22 (37.3 %)	
Usual alcohol consumed (>3 drinks)	43 (71.7 %)	12 (54.5 %)	31 (81.6 %)	0.02*
Stress management (yes)	88 (97.8 %)	30 (100 %)	58 (96.7 %)	0.31
Cultural/spiritual practices (yes)	53 (60.2 %)	19 (63.3 %)	34 (58.6 %)	0.67
Co-morbidities (not HIV) (yes)	74 (82.2 %)	23 (76.7 %)	51 (85.0)	0.33
Co-morbidities (self-reported)				
Hepatitis C	21 (21.4 %)	12 (52.2 %)	9 (17.6 %)	0.002*
Depression	52 (32.7 %)	16 (69.6 %)	36 (70.6 %)	0.93
Anxiety	52 (32.7 %)	16 (69.6 %)	36 (70.6 %)	0.93
Other	34 (13.2 %)	8 (34.8 %)	26 (51.1 %)	0.20
Have child (<18 years) (yes)	37 (58.7 %)	9 (34.6 %)	28 (60.9 %)	0.18
Live with child (<18 years) (yes)	16 (27.1 %)	4 (20.0 %)	12 (30.8 %)	0.35

Column percent are presented

Permanent residence living alone, with a roommate, partner, children or family; *no permanent residence* supportive housing, family, partner, friend, roommate, alone or shelter; *other co-morbidities* bipolar, asthma, cancer, diabetes, hypertension and post-traumatic stress disorder; *illicit drug use* smoke, oral, inhale or inject drug use and marijuana use; *stress management* recreational exercises, cultural or spiritual practices, yoga, reading; *relationship status yes* married, civil union and common law; *relationship status no* single, separated, divorced, widow

*Indicates p values with statistical significance

Table 2 Scores and severity levels of stress, depression and post-traumatic stress disorder

	All	Living with HIV	Living without HIV	<i>p</i>
Perceived stress	21.0 (19.0–26.0)	20.5 (19.0–24.2)	22.0 (17.2–26.0)	0.98
Perceived stress				
≤20 (average–moderate)	38 (42.2 %)	15 (50.0 %)	23 (38.3 %)	0.07
>20 (high)	52 (57.8 %)	15 (50.0 %)	37 (61.7 %)	
Urban life stress	57.0 (48.0–69.0)	54.8 (46.2–69.0)	58.0 (49.0–70.0)	0.38
Urban life stress				
<43 (average)	14 (15.7 %)	6 (20.0 %)	8 (13.6 %)	0.66
43–63 (moderate)	44 (49.4 %)	15 (50.0 %)	29 (49.1 %)	
>63 (high)	31 (34.8 %)	9 (30.0 %)	22 (37.3 %)	
Index of race-related stress	51.0 (42.0–68.5)	50.0 (41.0–56.0)	55.5 (43.0–71.0)	0.08
Individual racism	15.0 (10.0–20.0)	14.5 (9.0–20.0)	15.0 (10.0–20.0)	0.53
Collective/institutional racism	13.0 (9.0–20.0)	14.0 (9.0–22.0)	13.0 (9.0–19.0)	0.38
Cultural racism	26.8 (20.0–33.0)	22.0 (19.0–22.0)	28.5 (21.0–34.0)	0.003*
Parental stress	40.5 (35.0–49.0)	41.5 (35.0–46.5)	40.5 (35.0–50.0)	0.98
Depression (primary outcome)	26.5 (18.0–34.0)	30.5 (20.0–34.0)	25.1 (17.5–34.5)	0.45
Depression				
<16 (none)	16 (17.8 %)	4 (13.3 %)	12 (20.0)	0.72
16–21 (significant–mild)	18 (20.0 %)	6 (20.0 %)	12 (20.0 %)	
>21 (moderate–severe)	56 (62.2 %)	20 (66.7 %)	36 (60.0 %)	
PTSD	46.0 (34.5–60.5)	49.0 (39.0–57.0)	43.0 (33.0–62.0)	0.94
PTSD				
≤30 (none)	15 (16.8 %)	5 (16.7 %)	10 (17.0 %)	0.97
>30 (significant)	74 (83.2 %)	25 (83.3 %)	49 (83.0 %)	

Column percent are shown. Median (interquartile range) and frequency and proportion of psychosocial variables scores are shown
PTSD post-traumatic stress disorder

Discussion

Similar concerning levels of stress were measured among urban Indigenous women living with and without HIV from Thunder Bay and Toronto, Ontario. In evaluating the severity of perceived, urban, race and parental-related stress, scores suggest moderate to high levels for each of the stressors for the majority of the women. Furthermore, significant to severe depressive symptoms and significant PTSD symptoms were respectively experienced by more than 80 % of the women with no differences between women living with and without HIV. As expected, increasing perceived stress was identified as a correlate of depressive symptoms.

A number of stress scales were used to assess the diversity and severity of stress experienced by Indigenous women in order to situate and quantify the experience of stress compared to other populations. In our study, perceived stress for Indigenous women was higher than that reported for women from the general population in the USA (Cohen and Janicki-Deverts 2012) and mean scores previously described for women living with and without HIV who were largely African-American and had low income (Massad et al. 2011). While the perceived stress scale assesses chronic stress and

how unpredictable, uncontrollable and overloaded women felt their lives, the urban life stress scale assesses the stress derived from their urban environment (e.g. poverty, employment, housing, education, violence and crime). Our scores for stress related to living in an urban environment were considerably higher than mean scores measured for African-American mothers living with HIV where higher levels of stress were associated with increased HIV risk behaviours (Jipguep et al. 2004). Such stress has previously been linked to disadvantaged situations for Indigenous women (Mill 1997). The urban life stress scale is a very succinct scale where each item of the scale is a stressful life event (e.g. money or finances; job satisfaction; housing or living situation; death, injury or illness of someone close; family problems; crime and violence; communication or cultural conflicts; relations with police and other racial groups; racism and discrimination) that has previously been linked back to the intergenerational impact of colonization.

Another impact of colonization reflects the concerning trend of the apprehension of children from Indigenous women particularly those considered marginalized due to experiences in sex work or substance use (Duff et al. 2014). We utilized the parental stress scale to assess stress levels of the mothers in

Table 3 Regression analysis with depression as the primary outcome

Variable	Estimate (95 % CI) unadjusted	<i>p</i>	Estimate (95 % CI) adjusted	<i>p</i>
HIV				
Positive	Ref		Ref	
Negative	-1.90 (-6.87, 3.06)	0.49	-1.87 (-6.09, 2.36)	0.38
Age at interview	0.06 (-0.17, 0.30)	0.49	0.10 (-0.10, 0.30)	0.32
Annual gross income				
≤\$20,000	Ref		Ref	
>\$20,000	1.87 (-4.18, 7.93)	0.54	2.63 (-2.12, 7.38)	0.27
Relationship				
Single, separated, divorced, widow	Ref		Ref	
Married, civil union, common law	-2.26 (-7.00, 2.47)	0.34	-1.42 (-5.24, 2.40)	0.46
Have child				
Yes	Ref		Ref	
No	1.40 (-4.27, 7.07)	0.62	2.32 (-2.23, 6.87)	0.31
Cigarette use				
Yes	Ref		Ref	
No	-0.83 (-7.74, 6.08)	0.81	0.78 (-4.62, 6.19)	0.77
Illicit drug use				
Yes	Ref		Ref	
No	2.78 (-3.53, 9.10)	0.38	-2.98 (-8.56, 2.62)	0.29
Alcohol use in the last 30 days				
Yes	Ref		Ref	
No	1.38 (-3.72, 6.49)	0.59	-0.01 (-4.36, 4.33)	0.99
Co-morbidities (not HIV)				
Yes	Ref		Ref	
No	-5.09 (-11.14, 0.96)	0.10	-4.58 (-10.78, 1.63)	0.15
Perceived stress scale	1.15 (0.86, 1.45)	<0.0001	1.28 (0.97, 1.58)	<0.0001

our study; although it does not capture specific events such as child apprehension, it does capture the desire and intentions of being the ideal mother. Women from our study exhibited similar parental stress scores as mean scores measured for mothers caring for children with disabilities and mothers with behavioural problems (Berry et al. 1995). This is despite the fact that one third of the women in our study had children under 18 and less than half of those women were living with their children. Many questions in the parental stress scale could still be answered to reflect less than optimal relationships with their child or children and their discontent with their current parental status.

Finally, we assessed stress related to racism, which was also captured in the urban life stress scale with a single item. The race-related stress scale captures experiences and observations of racism. In our study, the race-related stress score was higher than the mean scores measured for African-American men and women (Utsey 1999). The scale assesses different adverse life circumstances for Indigenous women, which have been previously described as a manifestation of colonialism and ensuing acculturation (Bartlett 2003). Changes resulting from

acculturation occur on seven levels: 'physical (e.g. place to live, housing, increasing population density), biological (e.g. new nutrition, new diseases), political (e.g. self-determination), economic (e.g. move away from traditional pursuits to new forms of employment), cultural (e.g. loss of original linguistic, religious, educational and technical institutions), social relationships (e.g. alterations in intergroup and interpersonal) and psychological (e.g. values, attitudes, abilities and motives)' (Bartlett 2003). Many of these changes are contemporary *and* historical concerns that impact the health and wellbeing of Indigenous women, particularly women living with HIV that are in part reflected in the stress measures.

Chronic stress has previously been associated with depression (Gotlib and Joormann 2010; Slavich et al. 2014). In our study, the median CES-D score for depressive symptoms was higher than that previously reported for persons living with HIV (Balfour et al. 2010; Braitstein et al. 2005; Kowal et al. 2008) and individuals co-infected with HIV and hepatitis C (Braitstein et al. 2005). Our scores were similar to the mean scores measured for African-American women living with HIV (Lichtenstein et al. 2002). African-American women described

experiences of economic worries and single parenting as well as having been incarcerated, homeless and were on average younger and had low educational attainment (Lichtenstein et al. 2002). Another study also reported that depressive symptoms were greater for Indigenous women from a Western Canadian inner city compared to non-Indigenous women (Bowen and Muhajarine 2006). Depression was associated with a history of depression, mood swings, increased stressors, current smoking and lack of social support (Bowen et al. 2006). A qualitative study conducted with Indigenous persons living with HIV across Canada, described depression even prior to the HIV diagnosis (Cain et al. 2013). Historical trauma during childhood ranging from inadequate parenting, being raised in foster care or adoptive homes to a history of childhood abuse was described. These early experiences of abuse and neglect were suggested to have led to feelings of depression and substance use (Cain et al. 2013). Previous studies have shown that individuals living with depression experiencing stressful situations will more frequently use strategies based on avoidance and denial and had more difficulties in finding positive aspects to stressful events (Orzechowska et al. 2013). Identifying the severity and prevalence of depression among Indigenous women is important to raise awareness on the necessity of allocating resources and identifying the appropriate strategies for managing depression. We identified perceived stress, a measure of chronic stress, as an important correlate of depressive symptoms. Due to collinearity, PTSD and urban and race-related stress measures were not included in the regression model. Moreover, the literature does show an association between traumatic events and PTSD with other mental health illnesses (Catz et al. 2000; Delahanty et al. 2004; Perkonig et al. 2000).

In our study, Indigenous women had a median PTSD score suggestive of significant PTSD symptoms. The cut-off score suggestive of PTSD with the PCL-C is between 30 and 35 for the general population and civilians accessing primary care (Norris and Hamblen 2003; USDVA 2014). In contrast, a cut-off score of 36 to 44 has been recommended for persons accessing specialized medical clinics (e.g. pain, traumatic brain injury) and veteran affairs primary care and 45 to 50 for veteran affairs or civilian specialty mental health clinics (Blanchard et al. 1996; USDVA 2014). The lower the expected prevalence of PTSD in a population, the lower the optimal cut-off point, and in settings where high rates are expected, a higher cut-off point is recommended (USDVA 2014). A meta-analysis study has estimated the rate of PTSD among women living with HIV to be over five times the rate found in the general population using a cut-off of 50 (Machtinger et al. 2012). Therefore, it may be more reasonable to have used a higher cut-off score of 50 as previously used for women living with HIV with persistent pain where 53.2 % ($n=31/58$) had PTSD and in another study where 20 % ($n=20/102$) and 15 % ($n=15/102$) had symptoms suggestive and indicative of PTSD, respectively (Katz and Nevid 2005; Smith et al.

2002). Few studies have assessed the prevalence of PTSD among Indigenous persons living in Canada. In a national Canadian study measuring PTSD, information on Indigenous ethnicity was captured, but analysis for ethnicity as a correlate for PTSD included only the categories White and other (e.g. Indigenous, Black, Latin American, Asian and other) (Van Ameringen et al. 2008). Separate PTSD studies in Ontario and Manitoba, Canada, did not assess the prevalence of PTSD by Indigenous ethnicity (Frise et al. 2002; Stein et al. 1997). An American study did demonstrate higher prevalence of PTSD among non-White individuals (Roberts et al. 2011), but prevalence levels did not reach those previously measured in Indigenous residential school survivors (64.2 %) (Corrado 2003; Robertson 2006). PTSD levels among persons self-identifying as Black was 8.7 %, for Hispanic 7.4 %, White 7.0 % and for Asians 4.0 % (Roberts et al. 2011). Differences in PTSD levels between genders have also been shown (Frise et al. 2002; Stein et al. 1997). In women with co-morbidities living in Ontario, Canada, the prevalence of PTSD was 10.7 % (Frise et al. 2002). Although a lower prevalence of PTSD was measured among men (1.2 %) and women (2.7 %) in Manitoba, Canada, levels were similarly higher for women (Stein et al. 1997).

The types of traumatic events have been shown to differ markedly between different races and ethnicities (Roberts et al. 2011). White persons have more frequently reported trauma due to the death or trauma of someone close when compared to Black and Hispanic persons (Roberts et al. 2011). In contrast, the traumatic events for Black and Hispanic individuals were child maltreatment, domestic violence and war-related events (Roberts et al. 2011). The described traumatic events differ significantly from events related to colonialism described by Indigenous people. Gender differences in experienced traumatic events have also been described. The most common traumatic events reported by women were sexual assaults and for men witnessing serious or severe injuries or death (Stein et al. 1997; Van Ameringen et al. 2008). For Indigenous men and women in the residential school system, sexual abuse may be an important traumatic event to consider. It is estimated that between 48 and 70 % of children attending residential schools were sexually abused, and in some schools, those estimates were closer to 100 % (Chrisjohn 1991; Feldthusen 2007). Furthermore, among the previously reported residential school survivors suffering from PTSD (64.2 %), 70 % were male and all reported sexual abuse (Corrado 2003; Robertson 2006).

Gender and ethnicity considerations must be made when measuring and determining how to manage PTSD since women are twice as likely to develop PTSD and different ethnicities report substantially different traumatic events. It has also been hypothesized that Indigenous people may be more frequently exposed to traumatic events (Breslau 2001; Breslau et al. 1998; Creamer et al. 2001; Kessler et al. 1995; Norris

1992; Perkonig et al. 2000; Roberts et al. 2011; Schnurr et al. 2002; Stein et al. 1997, 2000) possibly leading to increased PTSD risk.

For Indigenous persons, an important consideration not investigated in our study is the impact of historical trauma during childhood on adulthood—although the PCL-C could broadly capture such experiences. There is substantial evidence on the positive impact of nurturing environments and the adverse effect of stressful life events (e.g. physical abuse, social stress and deprivation, maternal depression, displacement, institutionalization, poverty, late adoption) on early brain development in children (Davidson and McEwen 2012; Hanson et al. 2010; Lupien et al. 2011; Nelson et al. 2007; Tottenham et al. 2010). Hormones released due to chronic stress burden maintained over time causes changes in the brain and body that can lead to disease (McEwen 2012). Dysfunctions or structural changes in some of the brain components have been implicated in psychopathology (Davidson et al. 2000; Johnstone et al. 2007; Kim and Whalen 2009). In studies of adverse childhood experiences (e.g. verbal, physical and sexual violence), increased inflammation responses and increased risk of depression and metabolic risk biomarkers (e.g. overweight, high blood pressure, high total cholesterol, low high-density lipoprotein cholesterol) have been observed in adulthood (Danese et al. 2009; Miller and Chen 2010).

An important strength of our study is that quantitative studies using several measures to evaluate stress, depression and PTSD using validated tools have not previously been administered to Indigenous women living with and without HIV with a high completion rate.

Our study had several limitations. A small number of women were recruited into the study ($n=90$); therefore, our findings must be interpreted with caution. Our findings are generalizable to women accessing services for diverse needs (e.g. housing, education, food security, health care, support or culture) and to urban First Nations women. In addition, the scales have not been validated for use with Indigenous women and many of the studies described in this paper focused on African-American women and men for whom some of the scales (i.e. ULSS, IRSS) were validated (Bastos et al. 2010; Jaffee et al. 2005; Jipguep et al. 2004; Sanders-Phillips 1996; Utsey 1996, 1999). In addition, it is important to acknowledge that the life experiences for African-American women will differ from Indigenous women living in Canada and the scales do not account for different cultural understandings of stress and mental health, making comparisons across cultures challenging. Furthermore, much of the literature reported mean scores for scales in contrast to median scores reported in our study with the exception of the CES-D. Another factor which may have contributed to elevated levels of stress in our study is related to the difficulties encountered in recruiting women living with HIV, such as fear of HIV disclosure and

discrimination in addition to concerns related to participating in research for all women.

The frequency of chronic stress is evidence of ongoing systemic failures and the prevalence of depressive and PTSD symptoms, although from a small number of women, is concerning given that the women are accessing services. Moreover, over 80 % of the women were living with co-morbidities; consequently, the deterioration of health and the development of health concerns is a possibility given the evidence associating chronic stress and depression with adverse health outcomes, including HIV disease progression (Bouhnik et al. 2005; Evans et al. 2002; Leserman 2003, 2008; Massad et al. 2011; Slavich et al. 2014). The high levels of chronic stress, depression, PTSD and co-morbidities demand that more should be done to develop and support interventions with the dual objective of improving physical and mental health in spaces where services are already being accessed. Although changing life circumstance to reduce or eliminate chronic stress may not be feasible in the short-term, stress-reducing interventions may have beneficial health consequences in the short term and, with continued practice, sustainable effects on health in the long term. In addition, culturally based approaches cognizant of emotional and spiritual health along with mental and physical health will be critical for some Indigenous women. Also, for Indigenous persons in general, a communal experience of trauma has occurred; therefore, a collectivist approach to healing should be considered. Community-based approaches have long been involved in the traditional healing process (i.e. healing circles, sharing circles, talking circles, sweat lodges and feast) with much success and can be used in conjunction with individual healing approaches (DeGagne 2007; Duran 2006; Iwasaki et al. 2005; Poonwassie 2006; Walters et al. 2011) and more conventional approaches that may include medications and psychotherapies. Greater awareness is needed in health care spaces that Indigenous women accessing care may be living with a dual diagnosis (e.g. depression and substance use) or multiple co-morbidities such as depression or PTSD.

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