

COVID-19 Burden and Risk Among People With HIV

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Background: This study evaluated COVID-19 risk and burden among people with HIV (PWH) in a US city with high rates of HIV and SARS-CoV-2 transmissions and examined the interrelationship between psychosocial factors and COVID-19 risk and burden.

Setting: Participants were drawn from an existing consent to contact database of PWH. Database candidates were PWH, adults older than 18 years, people who had received HIV care at the University of Miami HIV clinics, people who spoke English or Spanish, and people who had agreed to be contacted for future research.

Methods: An adapted version of the Multicenter AIDS Cohort Study/Women's Interagency HIV Study Combined Cohort Study COVID-19 survey was telephonically administered, requiring 15–30 minutes.

Results: Psychological stress was a predictor of COVID-19 burden (financial and social burden) and COVID-19 risk (health factors associated with an increased risk of severe health outcomes due to infection with COVID-19). Having a history of traumatic events was associated with increased COVID-19 risk, and stress was associated with increased COVID-19 burden and COVID-19 risk.

Conclusions: Overall, results suggest that the intersection of the HIV and COVID-19 pandemics may be most profound among those who have experienced traumatic events; and traumatic events may be associated with heightened vigilance regarding illness and infection.

Key Words: COVID-19, HIV, trauma, depression, stress

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INTRODUCTION

Since first declared a pandemic on March 11, 2020, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2 of COVID-19) has created a tremendous burden on the general population, with more than 30 million cases and more than 1 million deaths worldwide.¹ Individuals aged 60 years and older and those with asthma, chronic lung, kidney or liver disease, diabetes, cardiovascular conditions, or obesity are more likely to experience COVID-19-related morbidity and mortality.^{2,3} In addition, those with immunocompromising conditions such as cancer and HIV with low CD4 counts or without treatment are also at increased likelihood.² Racialized communities are often at disproportionate risk of severe illness due to COVID-19 caused by multiple comorbidities,^{3,4} and non-HIV-related comorbidities such as diabetes and hypertension are more frequent among people with HIV (PWH),² with even higher rates among older PWH.⁵

In addition to disease burden, lifestyle challenges associated with COVID-19, for example, shelter-in-place orders, home quarantine, and social distancing have contributed to profound social, behavioral, and financial disruption among the general population, especially among those at risk of more severe health outcomes.^{6,7} Disruption of resources (eg, health care access, commodity shortages, change in childcare, loss of income, or employment), social isolation, and confusing public health information have also contributed to increased psychosocial stress.^{8,9} Early research on the effects of COVID-19 highlighted increased levels of anxiety and depressive symptoms^{7,9}; risk factors associated with depression and anxiety have included reduced income, having a chronic disease, or having family member with chronic disease, all factors more frequent during the pandemic.^{7,10} Previous research found that stress negatively impacts physical and emotional health and health behaviors and may be higher among PWH, many of whom have heightened health risks due to comorbidities and are from racial and sexual minorities and living in poverty.¹¹ As a result, PWH may have greater anxiety associated with COVID-19, which may also reduce quality of life.^{12,13}

Although PWH with high CD4 counts and on effective antiretroviral treatment do not seem to be at greater risk of COVID-19 transmission,^{14,15} it is their non-HIV-related comorbidities that create a greater and realistic threat of contracting and experiencing complications from COVID-19.^{16–19} In addition, PWH may face greater psychosocial burden—living with HIV and with the mandates arising from

efforts to control the pandemic—including intimate partner violence, stigma, isolation, discrimination, and challenges to obtaining treatment.^{20–23} Traumatic events, in particular, can increase the likelihood of stress and depression, which compounded may be a risk factor for increased mortality.²⁴ Existing health disparities, psychosocial pressures, health concerns, and psychological distress may exacerbate the overall risk and burden associated with COVID-19 among PWH.^{16,25,26} This study evaluated the burden and risk of COVID-19 at the intersection of HIV and COVID-19 in a US HIV epicenter and a national “hotspot” for COVID-19 cases, Miami, FL, and explored the impact of COVID-19-related stress among PWH in Miami. We hypothesized that psychosocial factors, such as having a history of traumatic events, stress, and depression, likely predicts the burden of COVID-19 among PWH.

METHODS

Participants and Procedures

Participants were drawn from an existing consent to contact database of PWH at the University of Miami. Candidates enrolled in the database were PWH older than 18 years who had received HIV care at the University of Miami HIV clinics, spoke English or Spanish, had participated on the Miami Center for AIDS Research (CFAR)/Center for HIV Research and Mental Health (CHARM) patient database registry study, and agreed to be contacted for future research.

Candidates from the database were contacted through text message and 2 consecutive phone calls. Data for this cross-sectional study were collected from participants from May to August 2020 and combined with existing patient registry data. Interview staff described the nature of the study, and of those contacted, $N = 200$ participants provided verbal consent and were enrolled in the current study. An adapted version of the MACS/WIHS Combined Cohort Study COVID-19 survey²⁷ developed in response to the COVID-19 pandemic was verbally administered by telephone, requiring 15–30 minutes. Participants completed the survey in their preferred language, English or Spanish, and survey data were collected using REDCap licensed with the University of Miami. Participants were compensated US\$25 on completion of the survey.

Variables/Measures

Database Variables

The following variables and surveys were abstracted from the existing participant database:

Demographics

Participants completed a demographic questionnaire including age, sex at birth, race, employment, average monthly income, and living/housing situation.

Trauma/History of Traumatic Events

The Brief Trauma Questionnaire was used to examine exposure to 10 potentially traumatic events, including participation in a war zone, serious car accident, major natural or technological disaster, life-threatening illness, physical abuse in childhood, physical assault, unwanted sexual contact, other situations in which respondent was seriously injured or feared being seriously injured or killed, violent death of a close friend or family member, and witnessing a situation in which someone was seriously injured or killed or in which the respondent feared someone might be seriously injured or killed.²⁸ Participants indicated whether they had experienced traumatic events and their assessment of how dangerous these events were. In addition, respondents reported whether they had been injured. Total scores for this scale ranged from 0 to 16.

Childhood and Adult Physical and Sexual Abuse

Participants reported the occurrence of childhood and adult physical and sexual abuse through 4 questions: As a child, were you ever beaten, physically attacked, or physically abused? As a child, were you ever sexually attacked, raped, or sexually abused? As an adult, have you ever been beaten, physically attacked, or physically abused? As an adult, have you ever been sexually attacked, raped, or sexually abused? Answers to these items were summed and the total score was used in analyses. Internal consistency in this sample was adequate ($\alpha = 0.73$).

Posttraumatic Stress Disorder Symptoms

The Primary Care Posttraumatic Stress Disorder (PTSD) Screen is a 4-item screening questionnaire intended to assess symptoms of PTSD, including nightmares, avoidance, hypervigilance, and detachment.²⁹ Answers to these items were summed, and the total score was used in analyses. Internal consistency in this sample was acceptable ($\alpha = 0.82$).

Sleep Difficulties

The 7-item Insomnia Severity Index was used to measure sleep difficulties. The Insomnia Severity Index has been shown to be a sensitive and specific measure of insomnia.³⁰ Internal consistency in this sample was acceptable ($\alpha = 0.84$).

Substance Use

Drug use was assessed using the Drug Abuse Screening Test-10 (DAST-10, Spanish),³¹ which measures problems related to drug use, excluding alcohol and tobacco. A total DAST-10 score was used in analyses ($\alpha = 0.89$).

MACS/WIHS Combined Cohort Study COVID-19 Survey

The MACS/WIHS Combined Cohort Study survey, developed in response to the COVID-19 pandemic, consisted of 10 sections used to assess sociodemographic information, household and tobacco use, risk factors for SARS-CoV-2 acquisition (eg, travel and contact to infected individuals), COVID-19 signs and symptoms, COVID-19 contingency

behaviors, medical history and medications for HIV and non-HIV comorbidities, COVID-19 contact risk, testing and treatment, disruption to resources, abuse and psychosocial factors. Psychological factors assessed in the survey were drawn from existing instruments and adapted for the survey to reflect the period of the pandemic.²⁷ From this survey, the following measures were used:

COVID-19 Burden

COVID-19 burden was a total sum score of items regarding COVID-19 (eg, “Have you tested positive for COVID-19?”), COVID-19 symptoms (eg, fever, chills, and muscle aches), having suspect COVID-19, income loss, childcare loss, loss of other sources of income, loss of housing, being unable to obtain medications (including ART) or healthcare, or being unable to receive substance use or mental health treatment. Sum scores are widely used to study the accumulation of burden and risk.^{32–34}

COVID-19 Risk

COVID-19 risk was defined as a sum score of endorsing having cardiovascular, renal, neurological, gastrointestinal, pulmonary condition, or an active malignancy or immunosuppression.

Loneliness

A 3-item University of California, Los Angeles Loneliness Scale was used to measure loneliness.³⁵ Participants are asked to report on feelings of lack of companionship, feeling left out, or being isolated from others. Items were summed, and the total sum score was used. Internal consistency in this sample was acceptable ($\alpha = 0.74$).

Stress

To assess stress, the four-item Perceived Stress Scale³⁶ was used. Three items are reverse coded and then summed. Internal consistency in this sample was adequate ($\alpha = 0.78$).

Depressive Symptoms

The Center for Epidemiologic Studies Depression Scale³⁷ was used to measure depressive symptoms. Respondents are asked to rate the frequency of each mood or symptom during the past 2 weeks on a 4-point scale. The reliability coefficient for this scale was in the acceptable range ($\alpha = 0.88$).

Analytic Plan

Descriptive analyses included mean and SD for key study variables. Path analyses were used to test 3 different linear regression models. Model 1 included history of traumatic events, childhood and adult physical and sexual abuse, PTSD symptoms, loneliness and stress as predictors of COVID-19 burden, and COVID-19 risk. Following model 1, model 2 tested stress and depressive symptoms as mediators in the association between history of trauma and COVID-19 burden. Model 3 included COVID-19 burden and COVID-19 risk as predictors of depressive symptoms, sleep problems, and substance use. Descriptive analyses were conducted in SPSS v26, whereas path analyses were conducted in Mplus 8.4, which uses

maximum likelihood estimation to estimate regression models. Maximum likelihood is robust to deviations from normality as well as outliers.³⁸ A threshold of $P < 0.05$ was used to establish statistical significance.

RESULTS

Demographic Characteristics of Participants

On average, participants were aged 54.56 (SD = 10.86) years, and 57% of participants were women. Two-thirds of participants (66%) were born in the United States, and 70% were Black/African American. Only 20% of participants were employed, and nearly half (48%) had a monthly income of \$501–\$1000. Further demographic information is described in Table 1. COVID-19 burden and risk are described in Table 2. COVID-19 burden and risk or history of traumatic events did not differ by sex ($P = 0.862$, $P = 0.319$, $P = 0.053$, respectively). In addition, although COVID-19 burden and risk were associated with age ($\rho = 0.241$, $P = 0.001$ and $\rho = 0.060$, $P = 0.398$, respectively), traumatic events were not ($\rho = -0.264$, $P < 0.001$). Therefore, these variables were not controlled for in subsequent analyses.

TABLE 1. Demographic Characteristics (N = 200)

	M (SD) N (%)
Age	53.56 (10.86) Range: 26, 75 Median: 55
Sex	
Male	87 (43.5)
Female	113 (56.5)
Born in the United States	132 (66.0)
Race	
Black/African American	140 (70.0)
White	47 (23.5)
Asian	1 (0.5)
Native American	3 (1.5)
Other	9 (4.5)
Employed	40 (20.0)
Average monthly income	
\$500 or less	37 (18.5)
\$501–\$1000	95 (47.5)
\$1001–\$1500	24 (12.0)
\$1501–\$2000	17 (8.5)
\$2001–\$2500	9 (4.5)
\$2501–\$3000	5 (2.5)
\$3001–\$6250	12 (6.0)
Living/housing situation	
Own house/apartment	153 (76.5)
Parents’ house	13 (6.5)
Someone else’s house	29 (14.5)
Rooming, boarding, or halfway house	4 (2.0)
On the street(s)	1 (0.5)

COVID-19 burden was calculated as the sum score of participants providing a “yes” response to the items above. Similarly, COVID-19 risk was calculated as the sum score of participants providing a “yes” response to the items above.

Model 1: History of Traumatic events, Childhood and Adult Physical and Sexual Abuse, PTSD Symptoms, Loneliness, and Stress Predicting COVID-19 Burden and Risk

Model 1 included history of traumatic event, childhood and adult physical and sexual abuse, PTSD symptoms, loneliness, and stress as predictors of COVID-19 burden and COVID-19 risk. History of traumatic events was associated with increased COVID-19 risk [$\beta = 0.230$ ($SE = 0.081$), $P = 0.004$], and stress was associated with increased COVID-19 burden [$\beta = 0.282$ ($SE = 0.081$), $P < 0.001$] and COVID-19 risk [$\beta = 0.169$ ($SE = 0.080$), $P = 0.035$]. The full model is presented in Table 3.

Model 2: Stress and Depressive Symptoms as Mediators Between History of Traumatic Events and COVID-19 Burden

As a follow-up to model 1, model 2 tested stress and depressive symptoms as mediators in the association between history of traumatic events and COVID-19 burden. The total

indirect effect of history of traumatic events on COVID-19 burden through stress and depressive symptoms was significant (*total indirect effect* = 0.091, $SE = 0.027$, $P = 0.001$). Examining the specific pathways, a history of trauma predicted COVID-19 burden through stress (indirect effect = 0.042, $SE = 0.020$, $P = 0.040$) and depressive symptoms (*indirect effect* = 0.049, $SE = 0.022$, $P = 0.025$). That is, both stress and depressive symptoms mediated the associations between history of trauma and COVID-19 burden. Given that model 2 is an extension of model 1, it is presented in the full model in Table 3.

Model 3: COVID-19 Burden and COVID-19 Risk Predicting Depressive Symptoms, Sleep Problems, and Substance Use

Model 3 examined COVID-19 burden and COVID-19 risk as predictors of depressive symptoms, sleep problems, and substance use in a path analysis. COVID-19 burden was associated with increased depressive symptoms [$\beta = 0.289$ ($SE = 0.064$), $P < 0.001$] and sleep difficulties [$\beta = 0.206$ ($SE = 0.066$), $P = 0.002$] per every SD increase in COVID-19 burden. COVID-19 risk was similarly associated with both increased depressive symptoms [$\beta = 0.184$ ($SE = 0.066$), $P = 0.005$] and sleep difficulties [$\beta = 0.244$ ($SE = 0.065$), $P < 0.001$] per every SD increase in COVID-19 risk. Neither COVID-19 burden nor risk was associated with substance use. The full path analysis is presented in Table 4.

DISCUSSION

This study evaluated COVID-19 risk and burden among PWH in one of the cities with the highest numbers of HIV and SARS-CoV-2 transmissions in the United States and examined the interrelationship between psychosocial factors and COVID-19 risk and burden. Results indicate that psychological stress was a predictor of COVID-19 burden (financial and social burden) and COVID-19 risk (health factors associated with an increased risk of severe health outcomes due to COVID-19); and history of traumatic events was associated with increased COVID-19 risk. In addition, COVID-19 burden and COVID-19 risk were predictors of depression and sleep problems, but not substance use. Overall, results suggest that the intersection of the HIV and COVID-19 pandemics may be most profound among those who have experienced traumatic events because trauma may create a hypervigilant state with heightened vigilance regarding COVID-19. Having a history of traumatic events was associated with increased COVID-19 risk, and stress was associated with increased COVID-19 burden and COVID-19 risk. In a mediational model intended to examine pathways among these variables, having a history of traumatic events was associated with increased stress, which was in turn associated with greater COVID-19 burden. As a mediator, trauma explained the observed relationship of stress and depression with COVID-19 burden, such that stress and depression influenced COVID-19 burden through the trauma history.

Participants with a history of traumatic events were most likely to experience the negative impact of COVID-19

TABLE 2. COVID-19 Burden and Risk (N = 200)

	N (%)
COVID-19 burden	
Test positive for COVID-19	7 (3.5)
COVID-19 symptoms	11 (5.5)
Suspect COVID-19 infection	7 (3.5)
COVID-19 impact	93 (46.5)
Employment loss due to COVID-19	82 (41.0)
Childcare loss	23 (11.5)
Financial loss	17 (8.5)
Housing loss	16 (8.0)
Unable to obtain medications	19 (9.5)
Unable to obtain HIV medications	15 (7.5)
Unable to afford medical care	31 (15.5)
Health insurance loss	9 (4.5)
Mental health treatment loss	23 (11.5)
Substance use treatment loss	25 (12.5)
COVID-19 risk	
Hypertension	103 (51.5)
Heart disease (eg, cardiomyopathy and coronary artery disease)	20 (10.0)
Diabetes	43 (21.5)
Renal disease	7 (3.5)
Pulmonary disease	39 (19.5)
Neurological conditions	21 (10.5)
Gastrointestinal conditions	9 (4.5)
Cancer	15 (7.5)
History of transplant	3 (1.5)
Rheumatological disease	22 (11.0)
Pneumonia	12 (6.0)
Former tobacco smoker	21 (10.5)
Current tobacco smoker	11 (5.5)

COVID-19 burden was calculated as the sum score of participants providing a "yes" response to the items above. Similarly, COVID-19 risk was calculated as the sum score of participants providing a "yes" response to the items above.

TABLE 3. Model 1: History of Trauma, Childhood and Adult Physical and Sexual Abuse, PTSD Symptoms, Loneliness, and Stress Predicting COVID-19 Burden and Risk

	β	SE	<i>t</i>	<i>P</i>
Outcome: COVID-19 risk				
Childhood and adult physical and sexual abuse	0.023	0.081	0.28	0.778
Posttraumatic stress disorder symptoms	-0.043	0.080	-0.54	0.592
Loneliness	0.128	0.080	1.61	0.108
Stress	0.169	0.080	2.12	0.035
History of trauma/traumatic events	0.230	0.081	2.85	0.004
Outcome: COVID-19 burden				
Childhood and adult physical and sexual abuse	0.048	0.076	0.63	0.528
Posttraumatic stress disorder symptoms	0.082	0.078	1.05	0.295
Loneliness	-0.045	0.082	-0.55	0.580
Stress	0.282	0.081	3.51	<0.001

Standardized coefficients are presented. Model 2 was based off Model 1.

prevention measures and more likely to have comorbid disorders associated with an increased risk of severe COVID-19. Previous studies have illustrated greater prevalence of trauma among PWH³⁹⁻⁴² and have highlighted the far-reaching consequences of trauma on overall health.^{43,44} Expanding training and capacity in trauma aware care for HIV care providers, especially through virtual platforms, may be a useful strategy for better health outcomes for affected individuals. Existing research on trauma among women has supported group interventions for trauma as an important step in coping with HIV^{43,45}; creative strategies are needed to enable those struggling with trauma to remain engaged or become engaged in interventions during periods of mandated social isolation. Work by this team in Argentina suggests that interventions focused on coping and resilience may be effective in reducing the impact of COVID-19 stress and stressors.⁴⁶ Similarly, home- and neighborhood-based healthy lifestyle promotions seem both timely and challenging during what may be a period of rolling lockdown pending the outcome of COVID-19 vaccine trials. Novel, technology

TABLE 4. Model 3: COVID-19 Burden and COVID-19 Risk Predicting Depressive Symptoms, Sleep Problems, and Substance Use

	β	SE	<i>t</i>	<i>P</i>
Outcome: depressive symptoms				
COVID-19 risk	0.184	0.066	2.81	0.005
COVID-19 burden	0.289	0.064	4.52	<0.001
Outcome: substance use				
COVID-19 risk	0.121	0.070	1.73	0.083
COVID-19 burden	-0.112	0.070	-1.60	0.11
Outcome: sleep difficulties				
COVID-19 risk	0.244	0.065	3.73	<0.001
COVID-19 burden	0.206	0.066	3.12	0.002

Standardized coefficients are presented.

driven interventions such as mHealth and smart phone collaborative apps are needed to provide stimulation and support for those most in need and to reduce the increased stress in those maintaining a more sedentary lifestyle.⁴⁷⁻⁴⁹

This study illustrated a bidirectional impact between psychological stress and the cumulative burden of factors associated with COVID-19 prevention, for example, disruptions to health care, finances, housing, childcare, transportation, and factors associated with COVID-19 risk (eg, smoking, diabetes, heart disease, and obesity) among a sample of older, low income, minority PWH in urban Miami. Previous research among PWH has found high rates of comorbid chronic illness⁵; in the current study, comorbid conditions were highly prevalent, with the most common being hypertension (52%) and diabetes (22%). Many PWH have been faced with a new level of uncertainty regarding their risk of COVID-19 after successfully navigating the uncertainty of their health status after an HIV diagnosis. Educational campaigns are needed for PWH and the general public to clarify risk factors and enable the discrimination of accurate health information to counter the impact of the current infodemic⁵⁰—the excessive information, misinformation, and rumors on COVID-19 that stymie an effective public health response by creating confusion and distrust of information. In addition, as communities open and the use of public transportation and community spaces resumes, accurate information is needed to reduce COVID-19 stress and anxiety regarding health and risk on mass transport.

There are important limitations to this research that relate to the cross-sectional design necessary in this very new area of research, as well as the small sample size, which did not allow us to test interactions between exposures and different demographics to look at the modifying effects of race/ethnicity/sex/and/or age on the associations of interest. In addition, the study relied on self-reporting and lack of testing for verification of HIV health status, clinical visits, and COVID-19 status. Because of the nature of the study design during an evolving pandemic, other limitations included difficulties contacting participants through phone and limited time frame for data collection. The study was conducted early in the pandemic, and findings may be different as the pandemic continues causing severe disruptions to health and to the lives of PWH. However, this study described a novel bidirectional model of psychological factors and COVID-19 risk and burden, and discussion emphasized the potential role of interventions to ameliorate the impact of both trauma and COVID-19 risk and burden. Longitudinal evaluation is needed to assess the psychological trajectory of living in the era of the COVID-19 pandemic, particularly among communities disproportionately affected by COVID-19 and HIV.

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