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A prospective study revealing a compounded burden of COVID-19, sex, and clinical diagnosis of alcohol use disorder and HIV infection on quality of life, anxiety, and alcohol use

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ABSTRACT

The COVID-19 pandemic led to unprecedented restrictions to mitigate disease spread, leading to consequences affecting mental health. Many studies examining COVID-19 pandemic effects on well-being and mental health initiated inquiry after the pandemic onset, whereas we used self-report questionnaires obtained before the pandemic to re-assess the same functions during the pandemic. Participants were drawn from our ongoing longitudinal studies of people with HIV infection, alcohol use disorder (AUD), HIV + AUD comorbidity, and controls. We used phone or mail contact to invite all to participate in our COVID phone survey, which included three self-report questionnaires: Health-related Quality of Life (QoL), State-Trait Anxiety Inventory (STAI), and Alcohol Use Disorder Identification Test (AUDIT). Of 218 eligible participants, 86 responded (July 2020–March 2021): clinical (29 men, 23 women; 17 AUD, 21 HIV, 14 HIV + AUD); control (17 men, 17 women). QoL scores declined, and anxiety symptoms increased from pre-COVID surveys in all groups; clinical women reported greater negative changes than the other groups. QoL subscales revealed COVID-related declines in emotional well-being in all groups, with clinical women reporting additional declines in energy, physical and social functioning, health, and pain increase. Clinical men also reported health declines. Although AUDIT scores were stable in all groups between assessments, changes in AUDIT scores were inversely correlated with QoL scores in clinical women; in clinical men, changes in STAI scores were inversely correlated with QoL scores. Although all groups were adversely affected by the pandemic, the negative effects were greater in the clinical group regardless of diagnosis and greatest in clinical women.

1. Introduction

The coronavirus (SARS-CoV-2) that causes coronavirus disease (COVID-19) has challenged the world since March 2020. The COVID-19 pandemic led to unprecedented restrictions (i.e., lockdown) to mitigate disease spread, leading to personal, economic, and social consequences affecting mental health. Numerous studies have examined the effect of the COVID-19 pandemic on well-being and mental health outcomes. Cross-sectional studies highlighted the presence of stress, anxiety, and depressive symptoms in various general populations across the world

(Park et al., 2020; Vanderlind et al., 2021; Woon et al., 2021) with a greater negative effect on women than men (Park et al., 2020; Pieh et al., 2020; Solomou and Constantinidou, 2020; Vanderlind et al., 2021).

Longitudinal studies conducted during the COVID-19 pandemic, without reference to pre-pandemic status, report increases in anxiety and depressive symptoms in community samples (Gopal et al., 2020; Huckins et al., 2020; Wang, C. et al., 2020). In particular, the beginning of the first lockdown led to anxiety and depression symptoms. These symptoms endured even at the end of the first lockdown, with some study participants from the general population meeting criteria for

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clinically relevant depression and anxiety symptoms (Somma et al., 2021). In general, longitudinal studies verified cross-sectional reports that women were more affected than men by the COVID-19 pandemic (Alzueta et al., 2021; Fenollar-Cortes et al., 2021), although prospective results also suggested that women were more resilient, showing better mental health improvements over time than men, even without therapeutic interventions (Fenollar-Cortes et al., 2021). Prior to testing and vaccine availability, physical symptoms that could resemble COVID-19 infection were also associated with increased mental health symptoms (i.e., anxiety, depression, stress) and shown to be mediated by need for health information (Wang et al., 2021).

Longitudinal investigations on the impact of the COVID-19 pandemic in individuals with pre-existing neuropsychiatric conditions are emerging. In a study of veterans in the UK ($n = 95$) with various mental health difficulties, those who experienced more COVID-related stressors were more likely to experience increases in PTSD and common mental health symptoms including anxiety and depression (Hendrikx et al., 2021). Similar results emerged among patients with an Axis-I Anxiety diagnosis, whose symptoms worsened modestly during the early phases of the pandemic (Tundo et al., 2021). Increased severity of anxiety, depression, and post-traumatic stress symptoms during the pandemic have also been reported in people with eating disorders (Nistico et al., 2021). On the positive side, women with substance use disorder were followed after completing rehabilitation programs during the COVID-19 pandemic and showed enhanced ability to cope with stress and maintain sobriety (Hurley et al., 2021).

A few longitudinal studies have used pre-pandemic data to document COVID-related changes in stress, anxiety, and quality of life. In a French community-based sample, findings reflected increased anxiety and depression symptoms during the pandemic with women showing a greater vulnerability to these effects than men (Ramiz et al., 2021). Another study followed a sample of alcohol users who reported an increase in alcohol consumption during the pandemic that was marked by an increase in the number of drinking occasions per week but a decrease in the number of drinks per occasion (Manning et al., 2021). A higher drinking frequency was observed mainly in individuals who had no drinking problems before the pandemic (Alcohol Use Disorders Identification Test; AUDIT score < 8) compared to those who were already using alcohol at harmful levels (AUDIT score > 8). Those who reported higher alcohol use also reported heightened anxiety regarding their health or economic situation (Manning et al., 2021). By contrast, there are also studies that have reported little to no increase in alcohol consumption (e.g., frequency, quantity), including a longitudinal study of 305 young adults (ages 18–26 years) in Spain (Vera et al., 2021); a cross-sectional study of 1951 Belgian college students in which 68.2% of the participants reported lower and only 17.2% reporting higher alcohol consumption during lockdown (Bollen et al., 2021); and a cross-sectional study reporting an increase in alcohol consumption in only 14% of young adults and 17% of older adults during early COVID-19 times from levels participants reported retrospectively (Steffen et al., 2021).

Overall, profiles of COVID-19 pandemic outcomes on mental health are becoming clear in the general, non-clinical populations and commonly note heightened anxiety or depressive symptoms, often greater in women than men. By contrast, factors affecting mental health in neuropsychiatric clinical populations are less consistent. To address the effects of COVID-19 in a mixed clinical sample and a matched non-clinical group, self-report evaluations of mental health taken before the onset of COVID-19 were administered again during COVID-19 to assess potential change in anxiety symptoms, quality of life, and alcohol use. We hypothesized that, although all groups would report a decline in quality of life and increase in anxiety symptoms during COVID, the clinical group would be more affected than the control group, and the clinical women would report an even greater decline in quality of life and increase in anxiety symptoms than the clinical men. Further, we inquired about change in alcohol consumption and anticipated that

greater declines in mental health would occur in participants who increased their alcohol consumption during the pandemic.

2. Methods

2.1. Participants

This project was approved by the Institutional Review Boards of SRI International and Stanford University. Participants were drawn from ongoing longitudinal studies on the effects of HIV infection and Alcohol Use Disorder (AUD) on brain structure and function (Pfefferbaum et al., 2018). Before the pandemic, all participants including control participants were evaluated by Structured Clinical Interview for DSM (SCID) during in-person laboratory visits by calibrated clinicians (S.A.S. or P.A.). The SCID evaluates lifetime and current psychopathology according to Diagnostic and Statistical Manual (DSM5) criteria to make psychiatric diagnoses (e.g., depression, anxiety, substance use disorders) (First et al., 2015); DSM-IV psychosocial and environmental stressors (Axis-IV) and global assessment of functioning (GAF, Axis-V) were also queried. Clinical and control participants were excluded at screening if they had fewer than 8 years of education or a significant history of medical (e.g., epilepsy, stroke, multiple sclerosis, uncontrolled diabetes, or loss of consciousness longer than 30 min), psychiatric (e.g., schizophrenia, bipolar I disorder), or neurological (e.g., neurodegenerative) diseases. An additional criterion for control participants was presence of DSM-IV-TR Axis I disorder (e.g., anxiety, substance abuse disorders). All enrolled participants were contacted by phone during the COVID-19 pandemic (between July 2020–March 2021). Of the 218 individuals eligible, 86 responded and gave written informed consent, received a \$20 Safeway gift card, and completed questionnaires remotely by phone interview or a website link with a unique ID to ensure anonymity.

Of the 86 respondents [mean age of 61.0 years ($SD = 8.6$ years, range 44–80 years)], 17 participants (9 women, 8 men) met DSM-5 criteria for an AUD; 21 participants (6 women, 15 men) were HIV seropositive (HIV); 14 participants (8 women, 6 men) were comorbid for AUD and HIV (AUD + HIV); and 34 participants (17 women, 17 men) were healthy controls. For subsequent analyses, the clinical group comprised participants from the three diagnostic groups (AUD, HIV, and AUD + HIV) and included 23 women (ClinW) and 29 men (ClinM). At the time of the interview, 46.5% of participants were working, and 76.7% reported a form of “shelter in place.”

2.1.1. Measures acquired before and during COVID

Pre-COVID measures were from the in-person laboratory visit most proximal to the start of the COVID-19 pandemic and included results from SCID interviews and self-reported questionnaires. During COVID, data were obtained via remotely administered (i.e., phone or weblink) questionnaires.

Health-related quality of life. Health-related quality of life (QoL) was evaluated with the SF-21 (Bozzette et al., 1995), a 21-item questionnaire covering 8 domains of health-related quality of life: cognitive functioning, emotional wellbeing, current health perceptions, pain, energy, physical functioning, role functioning, and social functioning. A standardized score ranging from 0 (poor quality of life) to 100 (excellent quality of life) was calculated for each QoL subscale and the total QoL score.

Anxiety. The State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983), a 40-item self-report questionnaire, assessed anxiety. The first part of the questionnaire (20 items) evaluated trait anxiety with general statements. The second part assessed state anxiety by presenting various anxiety symptoms that individuals felt at the moment. Participants answered these items on a Likert scale from 1 (not at all) to 4 (very much so). A higher STAI score reflects greater anxiety.

Alcohol use. The Alcohol Use Disorder Identification Test (AUDIT; Babor et al., 2001), a 10-item questionnaire developed by the World Health Organization, evaluated severity of alcohol consumption and

dependence symptoms. Each item of the AUDIT is scored from 0 to 4 (maximum score = 40). A total score of 0 indicates an abstainer who has never had a problem with alcohol use. A total AUDIT score of 13 or greater for women and 15 or greater for men suggests moderate-severe AUD, scores ranging from 8 to 15 suggests hazardous or harmful drinking, and scores ranging from 1 to 7 indicates low-risk alcohol consumption.

2.1.2. Statistical analyses

Change scores were computed for the QoL, STAI, and AUDIT by calculating the difference in scores obtained on questionnaires during COVID compared to pre-Covid responses. Initial analysis of variance (ANOVA) models examined 4 group differences across all measures. Given our focus on two-group analyses, comparing group (control vs. clinical) and sex (men vs. women), we adopted an overall p-value of .10 for omnibus testing, followed up with post-hoc t-tests with alpha level set at 0.05. Paired t-tests were conducted to examine differences in QoL (total and subscale), STAI, and AUDIT scores during COVID compared with before COVID within each participant group. Pearson correlations examined relations among QoL, STAI, and AUDIT change scores within the clinical groups and between these change scores and demographic variables including age, education, and socioeconomic status (SES). Time interval between testing sessions ranged from 29.6 to 82.7 months (mean = 29.6 months, SD = 19.1 months, median = 23.9 months) and was not included as a covariate in analyses as it was not correlated with change scores [with one exception: longer interval time correlated with greater AUDIT change score in clinical men ($n = 29$; $r = -0.47$, $p = .01$)].

3. Results

3.1. Comparison of participants who completed the survey vs. those who did not

Demographic descriptors of the 128 eligible participants who were invited but unavailable or declined to participate were compared to the 86 participants who completed the COVID survey. Based on pre-COVID data, participants who completed the COVID survey had higher SES ($t(190) = 6.64$, $p < .001$) and lower STAI ($t(85) = 3.85$, $p < .001$) and AUDIT ($t(204) = 5.40$, $p < .001$) scores than those who did not. The non-participating group had a higher percentage of men (71%) than the participating group (53.49%) ($\chi^2(1) = 6.18$, $p = .01$). Relative to non-participating men, men who completed the COVID survey had higher SES ($t(92) = 5.43$, $p < .001$) and lower STAI ($t(46) = 3.22$, $p = .002$) and AUDIT ($t(125) = 4.43$, $p < .001$) scores. The same pattern of results was observed among women, with higher SES ($t(72) = 3.73$, $p < .001$) and lower STAI ($t(36) = 2.23$, $p = .03$) and AUDIT ($t(49) = 2.33$, $p = .02$) scores in participating vs. non-participating women.

3.2. Between-group comparisons: COVID-related change in QoL, STAI, and AUDIT scores

QoL: ANOVA indicated that the change score in self-reported QoL was modestly significant among groups (Fig. 1) (Table 1). Follow-up t-tests indicated that the clinical women reported a greater decline in QoL during COVID than any of the other participant groups (ClinW vs. Ctrl t(39) = 2.16, $p = .034$, ClinW vs. CtrlM t(39) = 2.10, $p = .039$, ClinW vs. ClinM t(51) = 2.17, $p = .033$).

STAI: Similarly, the change score for STAI modestly distinguished groups. Follow-up t-tests indicated that the clinical women reported a greater increase in anxiety symptoms compared with the control men ($t(39) = 2.58$, $p = .012$). Other group comparisons were not significant.

AUDIT: In contrast to the QoL and STAI change scores, the groups did not differ in reported change in alcohol use during COVID compared with before COVID.

3.3. Within-group comparisons: paired t-tests on QoL, STAI, and AUDIT change scores

QoL: Paired t-tests indicated that the clinical women, clinical men, and the control women reported significantly lower QoL scores during COVID than before COVID (Table 2). Control men reported modestly lower QoL scores during COVID than before COVID.

STAI: Paired t-tests also indicated an increase in self-reported anxiety symptoms during COVID compared with before COVID in the clinical women, clinical men, and control women. Only the control men reported no change in anxiety symptoms during COVID.

AUDIT: There was no significant difference in AUDIT score during COVID relative to before COVID within any of the 4 groups.

3.4. Health-related quality of life subscales: between and within group differences

ANOVAs examining change scores among groups for the QoL subscales indicated a group difference on the pain and social functioning subscales, with post-hoc t-tests indicating that the clinical women reported greater pain-related QoL decline (ClinW vs. CtrlW: $t(39) = 2.39$, $p = .019$; ClinW vs. CtrlM(39): $t = 2.41$, $p = .018$; ClinW vs. ClinM: $t(51) = 2.03$, $p = .045$) and a modest to significant decline in social functioning (ClinW vs. CtrlW(39): $t = 2.12$, $p = .038$; ClinW vs. CtrlM: $t(39) = 2.61$, $p = .011$; ClinW vs. ClinM: $t(51) = 1.86$, $p = .066$) compared with the other 3 participant groups (Fig. 2).

Next, within-group paired comparisons of change in QoL subscale scores were conducted (Table 2). Clinical women reported a decline in 6 of the 8 QoL subscales: emotional wellbeing, energy, health, pain, physical functioning, and social functioning during COVID compared with before COVID. Clinical men reported a decline in emotional wellbeing, health, and social functioning. Control men and control women

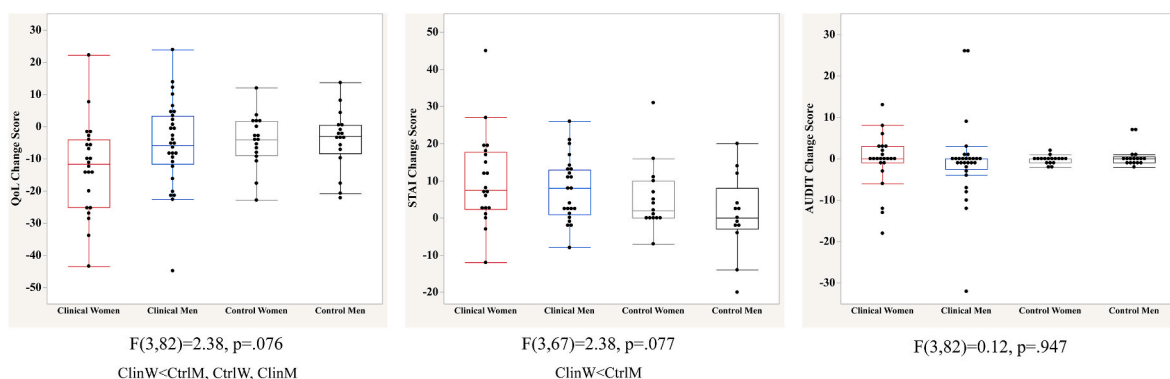


Fig. 1. Boxplots depicting the distribution, mean, and group differences for QoL, STAI, and AUDIT change scores in each participant group.

Table 1
Demographic and change scores for diagnostic and participant groups.

Sex	CTRL (n = 34)		AUD (n = 17)		HIV (n = 21)		AUD + HIV (n = 14)		CTRL Men (n = 17)		CTRL Women (n = 17)		CLIN Men (n = 29)		CLIN Women (n = 23)		One-way ANOVA	Follow-up t-tests		
	17 M, 17 W		8 M, 9 W		15 M, 6 W		6 M, 8 W													
Age	60.35		58.88		62.86		62.29		60.12		60.59		62.90		59.52		F(3, 82) = 0.764 0.5175	n/a		
	9(.80) 44 to 79		8(.67) 47 to 79		7(.45) 52 to 80		6(.84) 56 to 80		9(.82) 45 to 79		10(.07) 44 to 79		8(.95) 47 to 80		5(.62) 50 to 72					
SES	21.12		33.12		31.86		42.43		19.53		22.71		33.35		37.35		F(3, 82) = 8.892 p < .0001	Clin M > CTRL M, CTRL W Clin W > CTRL M, CTRL W		
	7(.90)		18(.32)		9(.60)		15(.83)		7(.37)		8(.31)		16(.21)		13(.40)					
	11 to 40		11 to 69		18 to 54		11 to 69		11 to 33		11 to 40		11 to 69		11 to 69					
COVID QoL Total Score	Before 87.08 During 82.72		Before 74.85 During 62.56		Before 74.68 During 69.07		Before 69.44 During 61.17		Before 88.25 During 84.01		Before 85.91 During 81.43		Before 76.72 During 71.46		Before 69.04 During 56.44		F(3, 82) = 8.734 p < .0001	Clin M < CTRL M, CTRL W Clin W < CTRL M, CTRL W, Clin M	F(3, 82) = 12.311 p < .0001	Clin M < CTRL M, CTRL W Clin W < CTRL M, CTRL W, Clin M
	8(.16) 67 to 99	10(.08) 60 to 100	13(.98) 49 to 96	21(.19) 33 to 90	17(.03) 40 to 98	19(.40) 34 to 100	17(.71) 35 to 92	20(.40) 29 to 92	8(.76) 67 to 99	10(.05) 64 to 100	7(.60) 70 to 96	10(.25) 60 to 96	15(.66) 35 to 98	18(.60) 29 to 100	16(.06) 40 to 96	19(.30) 32 to 90				
STAI-State Total Score	27.79	31.32	30.08	41.35	30.50	37.86	31.90	40.21	31.15	31.35	24.87	31.29	26.96	35.62	35.00	44.70	F(3, 67) = 3.868 p = .013	Clin W > CTRL W, Clin M	F(3, 82) = 6.291 p = .0007	Clin W > CTRL M, CTRL W, Clin M
	8(.52) 20 to 48	10(.36) 20 to 61	11(.62) 20 to 56	12(.39) 20 to 63	11(.38) 20 to 54	11(.49) 20 to 61	12(.13) 20 to 49	15(.34) 20 to 69	10(.23) 20 to 48	9(.39) 20 to 46	5(.53) 20 to 38	11(.54) 20 to 61	10(.71) 20 to 54	11(.52) 20 to 57	10(.79) 20 to 56	12(.62) 20 to 69				
AUDIT Total Score	2.09	2.24	10.29	7.00	1.48	1.71	8.00	9.29	2.29	2.82	1.88	1.65	6.55	5.93	5.57	4.91	F(3, 82) = 2.760 p = .0474	Clin M > CTRL W	F(3, 82) = 2.381 p = .0755	n/a
	1(.40) 0 to 5	2(.51) 0 to 12	10(.80) 0 to 36	7(.52) 0 to 26	1(.78) 0 to 8	2(.57) 0 to 11	7(.14) 0 to 21	8(.84) 0 to 28	1(.45) 0 to 5	3(.21) 0 to 12	1(.36) 0 to 5	1(.41) 0 to 4	8(.94) 0 to 36	7(.69) 0 to 28	7(.20) 0 to 21	6(.48) 0 to 20				

Notes: Pre-COVID STAI-s: 28/34 CTRL, 13/17 AUD, 20/21 HIV, 10/14 ALC + HIV; 13/17 CTRL Men, 15/17 CTRL Women, 23/29 CLINICAL Men, 20/23 CLINICAL Women.

Higher SES score reflects lower SES status.

Table 2

Within-group comparisons of scores before COVID minus during COVID: STAI, AUDIT, and Total QoL scores and QoL subscale scores.

Test	Control Men (n = 17)		Control Women (n = 17)		Clinical Men (n = 29)		Clinical Women (n = 23)	
	Mean ± SD Change Score	paired t-test	Mean ± SD Change Score	paired t-test	Mean ± SD Change Score	paired t-test	Mean ± SD Change Score	paired t-test
STAI	0.9 ± 10.7	t(12) = 0.31, p = .762	5.3 ± 9.1	t(14) = 2.27, p = .039	7.7 ± 8.6	t(22) = 4.27, p = .0003	10.4 ± 12.3	t(19) = 3.76, p = .001
AUDIT	0.5 ± 10.7	t(16) = 0.86, p = .405	-0.2 ± 1.0	t(16) = 1.00, p = .332	-0.6 ± 10.1	t(28) = 0.33, p = .743	0.7 ± 6.7	t(22) = 0.47, p = .643
QoL total	-4.2 ± 9.4	t(16) = 1.86, p = .082	-4.5 ± 8.2	t(16) = 2.26, p = .038	-5.3 ± 13.5	t(28) = 2.10, p = .045	-12.6 ± 14.1	t(22) = 4.28, p = .0003
QoL Subscales								
Cognitive Functioning	0.0 ± 10.5	t(16) = 0.00, p = 1.00	-3.9 ± 10.0	t(16) = 1.61, p = .126	-2.8 ± 23.3	t(28) = 0.64, p = .530	-7.2 ± 21.3	t(22) = 1.63, p = .116
Emotional Wellbeing	-7.8 ± 14.4	t(16) = 2.25, p = .039	-8.6 ± 15.9	t(16) = 2.23, p = .040	-10.5 ± 19.3	t(28) = 2.95, p = .006	-14.5 ± 19.1	t(22) = 3.63, p = .002
Energy	-11.2 ± 18.3	t(16) = 2.51, p = .023	-4.7 ± 8.0	t(16) = 2.43, p = .028	3.1 ± 25.2	t(28) = 0.66, p = .513	-11.3 ± 24.7	t(22) = 2.19, p = .039
Health Perception	-4.4 ± 13.9	t(16) = 1.31, p = .208	-2.9 ± 12.5	t(16) = 0.97, p = .346	-8.9 ± 16.2	t(28) = 2.96, p = .006	-9.4 ± 19.3	t(22) = 2.33, p = .029
Pain	-0.7 ± 12.7	t(16) = 0.24, p = .815	-0.9 ± 12.5	t(16) = 0.29, p = .774	-4.2 ± 21.6	t(28) = 1.05, p = .302	-13.9 ± 16.1	t(22) = 4.14, p = .0004
Physical Functioning	-2.9 ± 16.8	t(16) = 0.72, p = .482	-3.7 ± 16.4	t(16) = .92, p = .369	-2.6 ± 19.0	t(28) = 0.73, p = .460	-12.0 ± 26.8	t(22) = 2.14, p = .044
Role Functioning	-1.5 ± 25.7	t(16) = 0.24, p = .817	0.0 ± 19.8	t(16) = 0.00, p = 1.00	-0.9 ± 27.9	t(28) = 0.17, p = .869	-8.7 ± 35.0	t(22) = 1.19, p = .247
Social Functioning	-6.9 ± 16.9	t(16) = 1.69, p = .111	-10.9 ± 20.8	t(16) = 2.15, p = .047	-14.7 ± 27.3	t(28) = 2.91, p = .007	-27.7 ± 29.1	t(22) = 4.57, p = .0002

Note.

Higher negative change scores on QoL and QoL subscales reflect greater decline during COVID compared with before COVID levels.

Greater positive change scores on STAI and AUDIT scores reflect a greater increase during COVID compared with before COVID levels.

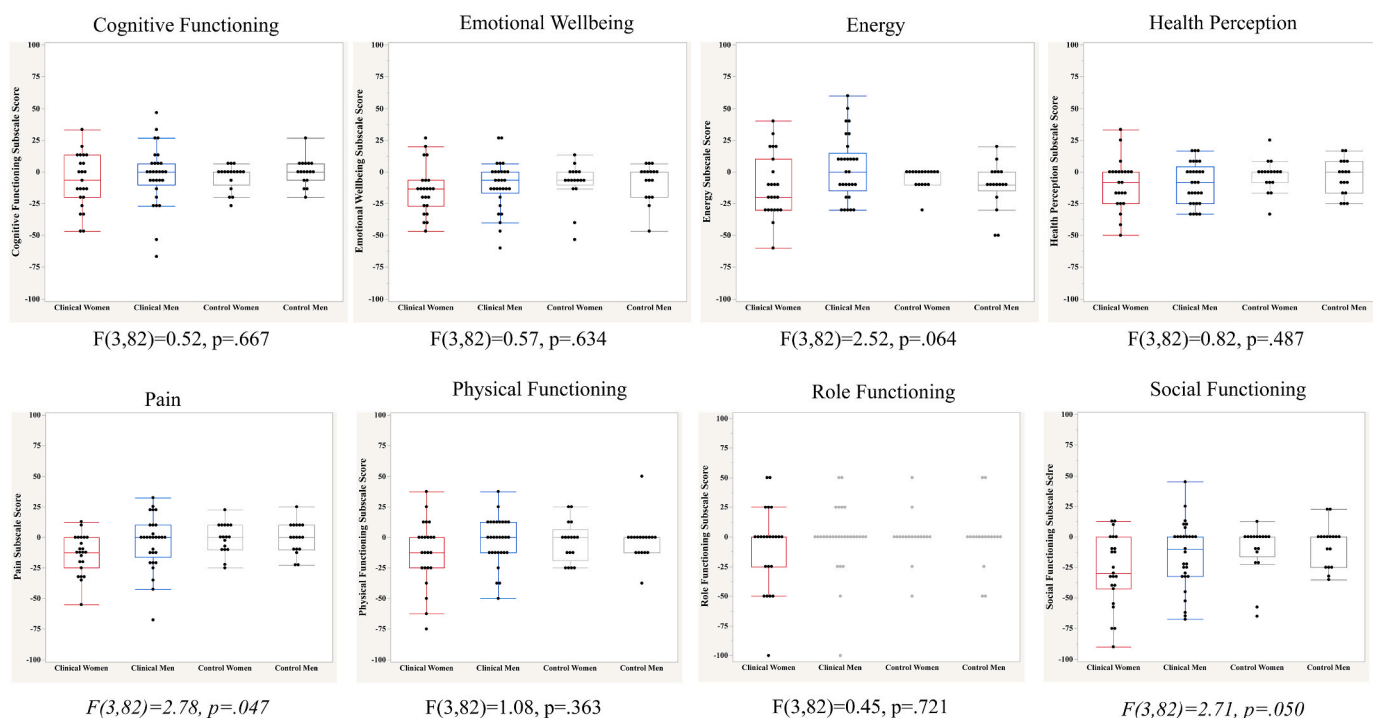


Fig. 2. Boxplots depicting the distribution, mean, and group differences for QoL subscale change scores in each participant group.

reported declines in emotional wellbeing and energy during COVID. Control women also reported a decline in social functioning.

3.5. Correlations between QoL, STAI, and AUDIT change scores and demographic variables

In the clinical women, an increase in AUDIT score during COVID correlated with a greater decline in total QoL (n = 23 r = -0.46, p =

.027) and heightened STAI change scores ($n = 20$, $r = 0.54$, $p = .015$) (Fig. 3). By contrast, in the clinical men a greater decline in QoL score correlated with heightened STAI change scores ($n = 23$, $r = -0.60$, $p = .003$). The difference between the STAI-AUDIT correlation coefficients of the clinical women and clinical men was significant ($Z = 2.30$, $p = .011$); the QoL-AUDIT correlation coefficient difference approached significance ($Z = 1.57$, $p = .058$).

In the control group, correlational analyses indicated a greater decline in QoL scores was related to heightened STAI change score in both the men ($n = 13$, $r = -0.57$, $p = .04$) and the women ($n = 15$, $r = -0.59$, $p = .02$). Neither QoL nor STAI change scores were related to AUDIT change score in the control men or the control women.

QoL, STAI, and AUDIT change scores were not related to age, education, or socioeconomic status in either the clinical men or the clinical women. In the control group, SES was related with STAI change score in only the control women. Specifically, higher SES (indicated by lower scores) was related to heightened anxiety (STAI change score) ($n = 15$, $r = -0.53$, $p = .04$).

Exploratory analyses to examine the influence of diagnostic category (i.e., AUD, HIV, AUD + HIV) on reported results within the clinical groups, indicated that there were no group differences among diagnoses within the clinical women or the clinical men on any of the change scores (QoL, STAI, AUDIT, QoL subscales).

Post-hoc analyses excluding clinical participants who reported living in a homeless shelter (1 clinical women) and those who reported living in a sober living or treatment facility (1 clinical man and 3 clinical women) yielded a similar pattern of group results as reported when they were included for QoL, STAI, and AUDIT change scores. In fact, group analyses including only participants who were living alone, with friends, or with family the group difference for STAI change score was now significant [$F(3,63) = 3.55$, $p = .019$], and follow-up analyses indicated that clinical women reported significantly heightened anxiety during COVID than control women [$t(33) = 2.07$, $p = .043$] and clinical men showing a trend for heightened anxiety compared to control men [$t(34) = 1.94$, $p = .057$] in addition to the previously reported difference between clinical women and control men. The correlational analyses among QoL, STAI, and AUDIT difference scores within the clinical men and the clinical women remained the same with or without these 5 clinical participants.

4. Discussion

This study was based on self-reported questionnaires from men and women who have participated in our ongoing research on AUD and HIV infection. Because of the COVID-19 pandemic, we were required to hold in-person laboratory visits in abeyance. Instead, we attempted to contact our clinical and control participants by phone or email to invite them to complete remote questionnaires they had done before the pandemic lockdown. Accordingly, remote contact enabled a prospective assessment of how the pandemic affected selective features of everyday life

such as health-related quality of life, anxiety, and alcohol use. Salient pre-COVID to during-COVID changes were noted for QoL and anxiety. Additionally, our results supported previous findings that the well-being of women was more detrimentally affected by the COVID-19 pandemic than the well-being of men (Alzueta et al., 2021; Pieh et al., 2020).

All participant groups reported a decline in QoL during COVID compared to before COVID, confirming previous cross-sectional results showing low QoL during the COVID-19 pandemic in various community samples (Ferreira et al., 2021; Lesser and Nienhuis, 2020; Qi et al., 2020; Suryavanshi et al., 2020; Wang, X. et al., 2020). Longitudinal studies also indicated a decline in QoL during the pandemic in clinical groups (Gvozdanic et al., 2021; Shalash et al., 2020), although ours is novel in showing QoL decline using data obtained before the pandemic in a clinical population.

Our results revealed steeper declines in QoL among clinical women (AUD, HIV, AUD + HIV) compared to clinical men or control men or women. The QoL decrease is especially salient in that, even before COVID, clinical women reported lower QoL than the other three groups. Further, another study reported that low QoL during the COVID-19 pandemic was related to cognitive impairment, psychiatric comorbidities, and observed specifically among women (Ferreira et al., 2021; Mendez et al., 2021). Cognitive impairments identified in members of our clinical sample (AUD, HIV, AUD + HIV) (Fama et al., 2012, 2016) might have contributed to observed lower QoL. Previous studies also underscored lower cognitive performance in women compared to men in both AUD (Fama et al., 2020; Nixon, 1994) and HIV (Dreyer et al., 2022; Rubin et al., 2020), which might partially explain the increased vulnerability of women under pandemic conditions.

Prior results suggested that poor QoL was related to lockdown restrictions and possible SARS-CoV-2-related symptoms, particularly affecting physical activity and physical health, including muscular pain (Jacobs et al., 2020; Qi et al., 2020; Wang, X. et al., 2020). Our study extends this observation in that clinical women reported specific difficulties in pain management and physical functioning, subscales of QoL that were greater during than before the pandemic. The perception and sensitivity of pain in women previously described indicate a role of early-life exposure to stress, sex hormones, social influences, and differences in pain coping between men and women (Bartley and Fillingim, 2013). Indeed, individuals with clinical diagnoses are already struggling with disease conditions at the intersection with pain mechanisms (Velly and Mohit, 2018). The initial higher pain experienced by women in association with clinical conditions such as AUD and HIV (Azagew et al., 2017; Maleki et al., 2019) may have exacerbated this pain phenomenon under pandemic conditions.

Our study also evaluated changes in anxiety levels during the COVID-19 pandemic. Specifically, the clinical and control women and the clinical men (but not the control men) reported an increase in anxiety-related symptoms during COVID relative to before COVID. Increased anxiety symptoms during the pandemic was previously reported in longitudinal studies of community samples (Huckins et al., 2020; Wang,

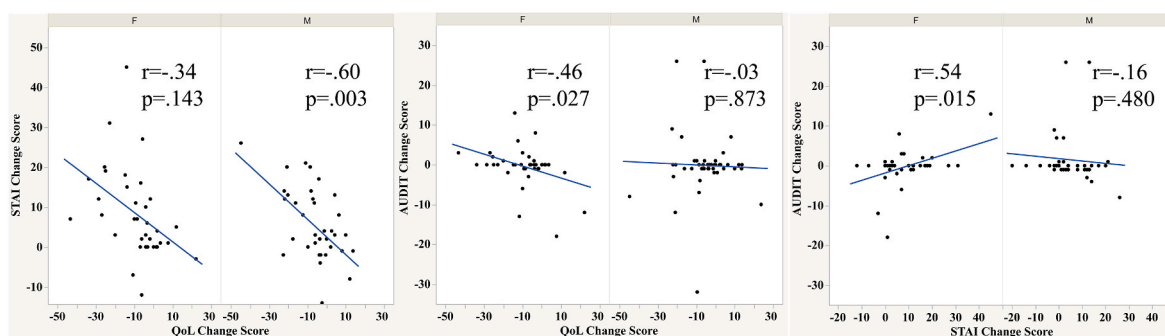


Fig. 3. Scatterplots depicting the relations between QoL, STAI, and AUDIT change scores in the clinical groups: women (left side of each plot) and men (right side of each plot).

C. et al., 2020) and was described as particularly relevant in women (Gopal et al., 2020); however, available findings in clinical samples lacked consistency regarding potential changes in anxiety related to the pandemic (Hendriks et al., 2021; Tundo et al., 2021). Here, by using change scores computed from data collected before the COVID-19 pandemic and during the first lockdown, we underscore higher levels of anxiety symptoms during the pandemic among clinical groups with AUD or HIV and specific difficulties in women.

Whereas the decline in QoL during COVID was related to an increase in anxiety symptoms in the clinical men, the decline in QoL and increase in anxiety symptoms during COVID was related to a self-reported increase in alcohol use in the clinical women. This observation comports with previous studies showing that anxiety levels during COVID were related to alcohol consumption (Acuff et al., 2022; Manning et al., 2021). Manning et al. (2021) also note that alcohol use changes during the pandemic were mainly observed in individuals who did not present alcohol problems before the pandemic compared to individuals who did. Similarly, in our clinical sample composed of participants with AUD, we did not find a significant increase in alcohol use. The COVID lock-down experience has taught us that use of online based technology such as those that track alcohol consumption (Zhang et al., 2016) or other remote based interventions may be helpful to individuals with heightened alcohol consumption or anxiety when face-to-face counseling is not feasible (Alzueta et al., 2021).

This study has limitations. First, our sample size is modest and limited in generalizability and statistical power. Second, we observed differences in socioeconomic status, anxiety, and alcohol use between the people who agreed to participate in the online survey and the those who were contacted but did not respond or chose not to participate. Our questionnaire was completed remotely rather than in person because of COVID restrictions, and there are studies that report answers to questions pertaining to alcohol-related harms can differ depending on mode of questionnaire administration (Midanik et al., 2001). Our results should be considered accordingly, as individuals who have not been included in the study may have been particularly vulnerable to anxiety and alcohol use increase. It is worth noting, however, that our results were not related to age, education, or socioeconomic status in the respondents. Further, although unlikely, it is possible that an individual who met criteria for being a control participant during previous test administrations could have developed AUD or become HIV-positive, as a diagnostic interview was not conducted with this questionnaire.

In summary, this study is among the few to document mental health changes during the COVID-19 pandemic by comparing scores with the same measures collected before the pandemic. Although the self-reports indicated that all groups were adversely affected by the pandemic, the negative effects were consistently greater in the clinical group regardless of diagnosis and were greatest in the clinical women. Thus, clinical status exerted a heightened burden on the social and mental health throes of the pandemic. This constellation of factors should raise awareness of the potential of diminishing quality of life in intensifying symptoms of stress and anxiety that emerged with the pandemic and may inform research in the potential utility of remote based treatment paradigms.

Credit author statement

Séverine Lannoy: Conceptualization, Data curation, Investigation, Methodology, Writing – original draft, Writing – review and editing; **Rosemary Fama:** Conceptualization, Data curation, Investigation, Methodology, Supervision, Visualization, Writing – original draft, Writing – review and editing; **Stephanie A. Sassoon:** Conceptualization, Data curation, Formal acquisition, Investigation, Methodology, Project administration, Supervision, Writing – review and editing; **Anne-Pascal Le Berre:** Conceptualization, Data curation, Investigation, Methodology, Writing – review and editing; **Priya Asok:** Formal acquisition, Project administration, Writing – review and editing; **Natalie M. Zahr:**

Data curation, Investigation, Project administration, Resources, Writing – review and editing; **Adolf Pfefferbaum:** Investigation, Resources, Writing – review and editing; **Edith V. Sullivan:** Conceptualization, Investigation, Methodology, Project administration, Resources, Supervision, Writing – review and editing.

Declaration of competing interest

None.

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