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RESEARCH ARTICLE

Mental health and alcohol use among patients attending a post-COVID-19 follow-up clinic: a cohort study [version 1; peer review: 1 approved]

John Broughan [ID][1], Geoff McCombe [ID][1], Brendan O'Kelly[1,2], Gordana Avramovic[1,2], Ronan Fawsitt[3,4], Shannon Glaspy [ID][1,2], Mary Higgins[1,5], Tina McHugh[1,2], Louise Vidal[2], James Woo[2], John S Lambert [ID][1,2], Walter Cullen[1]

[1]School of Medicine, University College Dublin, Belfield, Dublin 4, DO4 V1W8, Ireland
[2]Mater Misericordiae University Hospital, Dublin, Eccles St, Dublin 7, D07 AX57, Ireland
[3]Castle Gardens Surgery, Kilkenny, R95 AY8R, Ireland
[4]Ireland East Hospital Group, One Kilmainham Square, Dublin 8, D08 ET1W, Ireland
[5]National Maternity Hospital, Holles St., Dublin 2, D02 YH21, Ireland

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1. **Patrick Ryan** [ID], University of Limerick, Limerick, Ireland

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Abstract

Background: Ongoing mental health problems following COVID-19 infection warrant greater examination. This study aimed to investigate psychiatric symptoms and problematic alcohol use among Long COVID patients.

Methods: The study was conducted at the Mater Misericordiae University Hospital's post-COVID-19 follow-up clinic in Dublin, Ireland. A prospective cohort study design was used encompassing assessment of patients' outcomes at 2-4 months following an initial clinic visit (Time 1), and 7–14-month follow-up (Time 2). Outcomes regarding participants' demographics, acute COVID-19 healthcare use, mental health, and alcohol use were examined.

Results: The baseline sample's (n = 153) median age = 43.5yrs (females = 105 (68.6%)). Sixty-seven of 153 patients (43.8%) were admitted to hospital with COVID-19, 9/67 (13.4%) were admitted to ICU, and 17/67 (25.4%) were readmitted to hospital following an initial COVID-19 stay. Sixteen of 67 (23.9%) visited a GP within seven days of hospital discharge, and 26/67 (38.8%) did so within 30 days. Seventeen of 153 participants (11.1%) had a pre-existing affective disorder. The prevalence of clinical range depression, anxiety, and PTSD scores at Time 1 and Time 2 (n = 93) ranged from 12.9% (Time 1 anxiety) to 22.6% (Time 1 PTSD). No statistically significant differences were observed between Time 1 and Time 2 depression, anxiety, and PTSD scores. Problematic alcohol use was common at Time 1 (45.5%) and

significantly more so at Time 2 (71.8%). Clinical range depression, anxiety, and PTSD scores were significantly more frequent among acute COVID-19 hospital admission and GP attendance (30 days) participants, as well as among participants with lengthy ICU stays, and those with a previous affective disorder diagnosis.

Conclusions: Ongoing psychiatric symptoms and problematic alcohol use in Long COVID populations are a concern and these issues may be more common among individuals with severe acute COVID-19 infection and /or pre-existing mental illness.

Keywords
COVID-19; Long COVID; Mental Health; Alcohol Abuse; Cohort Studies

Corresponding author: John Broughan (john.broughan@ucd.ie)

Author roles: Broughan J: Conceptualization, Data Curation, Formal Analysis, Project Administration, Writing – Original Draft Preparation, Writing – Review & Editing; **McCombe G**: Conceptualization, Writing – Review & Editing; **O'Kelly B**: Conceptualization, Writing – Review & Editing; **Avramovic G**: Conceptualization, Methodology, Project Administration, Supervision, Writing – Review & Editing; **Fawsitt R**: Funding Acquisition, Writing – Review & Editing; **Glaspy S**: Project Administration, Writing – Review & Editing; **Higgins M**: Writing – Review & Editing; **McHugh T**: Conceptualization, Methodology, Writing – Review & Editing; **Vidal L**: Investigation, Project Administration, Writing – Review & Editing; **Woo J**: Writing – Review & Editing; **Lambert JS**: Conceptualization, Funding Acquisition, Methodology, Project Administration, Supervision, Writing – Review & Editing; **Cullen W**: Conceptualization, Funding Acquisition, Methodology, Project Administration, Supervision, Writing – Review & Editing

Introduction

Knowledge regarding the nature, scale, and treatments for COVID-19's long-term health effects (i.e., Long COVID, Ongoing Symptomatic COVID-19, post-COVID-19 Syndrome) is limited and research addressing these matters is ongoing[1–3]. Long-term psychiatric problems following COVID-19 infection are one issue warranting greater examination.

The COVID-19 pandemic has adversely impacted the mental health of people throughout the world[4–6]. Lockdowns[6,7], COVID-19 infection anxiety[8,9], economic stress[10], and COVID-19 grievances and traumas[11–14] have been especially challenging. To compound matters, acute COVID-19 infection has also been linked to psychiatric problems[1,15], and more recently, understanding has developed around Long COVID related mental health issues.

Research estimates that that 20–30% of acute COVID-19 patients experience lasting psychiatric issues[2,16] although the wider literature on this topic reports a much broader range. Several psychiatric conditions have been reported in Long COVID populations including depression, anxiety, post-traumatic stress, fatigue, cognitive impairment, and sleep disturbance[16–18]. There is also inconsistency in the literature regarding typical symptom duration. Studies have indicated that psychiatric symptoms can last weeks to several months, and even up to a year and possibly beyond among severe acute COVID-19 patients[17,19]. It has also been said that persistent psychiatric sequelae gradually subside with the passing of time and so are unlikely to continue indefinitely[16].

The diversity of conclusions in the literature regarding all the above matters is likely owing to many factors. These notably include inconsistencies regarding Long COVID diagnostic and coding practices which have confounded prevalence estimates[20], but is also conceivable that individual differences in study populations such as age, sex, pre-existing mental health difficulties, and acute-COVID-19 experiences may play an important role determining patient outcomes. However, there is no evidence to date, at least to our knowledge, that age is a risk factor for persistent COVID-19 mental health issues, and findings regarding the influence of biological sex and pre-existing mental illness is also mixed[16,21–24]. Evidence of ongoing mental health issues among severe acute-COVID-19 patients is also diverse[2,16,25–28].

This study aims to make a novel contribution to the understanding of Long COVID related mental health sequelae. Using a sample of patients attending a post-COVID-19 follow-up clinic at the Mater Misericordiae University Hospital (MMUH) in Dublin, Ireland, it will investigate Long COVID related psychiatric symptoms in a deprived and multi-cultural inner-city community, and it will infer whether previously reported findings regarding the occurrence, duration, and determinants (i.e., age, sex, pre-existing psychiatric diagnosis, and acute COVID-19 severity) of psychiatric problems in Long COVID populations are applicable in this context. Lastly, the study will also examine alcohol misuse among participants. Links between alcohol misuse and psychiatric issues have been well

documented over the years[29] but to our knowledge, no studies have yet examined this relationship in a Long COVID cohort.

Methods

Overview

A prospective cohort study design was used encompassing baseline assessment of participant outcomes at 2–4 months following an initial visit to the hospital's post-COVID-19 follow-up clinic, and subsequent follow-up assessment at 7–14 months. The study was informed by and conducted according to the 'Strengthening the reporting of observational studies in epidemiology (STROBE) statement' guidelines[30], and was approved by the MMUH Research Ethics Committee (Ref # 1/378/2141). Written informed consent for publication of the participants details was obtained from the participants.

Setting

The study was conducted at the post-COVID-19 follow-up clinic at the MMUH, in North Inner-City Dublin, Ireland, over fourteen months through June 2020-August 2021. The post-COVID-19 follow-up clinic provides care for patients experiencing long-term COVID-19 health issues. It specializes in the delivery of clinical assessment for post-COVID-19 populations and the facilitation of referral to appropriate specialist care services where required.

Participants

Approximately 12–15 patients attended the post-COVID-19 follow-up clinic weekly during the enrolment period resulting in an overall attendance estimate of 250–300 patients. Patients were eligible for inclusion in the study if they were adults attending the clinic during the study enrolment period. Participants were also required to have received laboratory confirmed and/or clinically diagnosed COVID-19. It is not clear how many of the clinic's patients met these study inclusion criteria and / or were invited to take part in the study. Clinic patients had either been hospitalised with COVID-19, been placed on a COVID-19 ambulatory home monitoring programme or had been referred to the clinic by local general practitioners (GPs).

Procedure

Participating patients completed identical healthcare professional / researcher administered questionnaires at Time 1 (2–4 months after an initial clinic visit) and Time 2 (7–14 months after initial clinic visit). Participants completed a large questionnaire as part of a wider research project, but only responses relating to participants' core demographics (age & sex), acute COVID-19 severity (illustrated by acute COVID-19 healthcare service utilization trends), mental health status, and alcohol usage were examined in this study.

Instruments

Participants were asked to indicate their age and sex details, as well as whether they had previously been diagnosed with an affective disorder. Questions regarding healthcare utilization asked participants whether they had been admitted to hospital / ICU, and if they had been readmitted to hospital following

an initial acute COVID-19 hospital stay. Where applicable, questions enquired as to the length of participants' hospital / ICU stays, and they also asked whether participants had attended GPs within seven and / or 30 days of an acute COVID-19 related hospital discharge. Participants' mental health was measured using standardized depression, anxiety, and post-traumatic stress scales, all of which have previously been used in Long COVID research[31–33]. Depression was measured using the PRIME-MD 'Patient Health Questionnaire' (PHQ-9)[34], anxiety was assessed using the 'PRIME-MD Generalized Anxiety Disorder' questionnaire (GAD-7)[35], and post-traumatic stress was evaluated using the 22-item version of the 'Impact of Events Scale Revised' instrument (IES-R)[36]. Alcohol usage was measured using the AUDIT-C brief screening tool for alcohol misuse[37].

Data analysis
Data was analysed using descriptive and inferential statistics in IBM SPSSv26.0[38]. Non-parametric statistics were used throughout due to the non-normal nature of the data. Participants were excluded from analyses where ≥20% of relevant

questionnaire responses were missing, and mean data was imputed for the standardized questionnaires' total score figures when missing data was present but below the ≥20% cut-off point. The results outlined demonstrate study recruitment and retention rates, missing data statistics, patient demographics, psychiatric medical history, healthcare utilization trends, the prevalence and duration of psychiatric/alcohol use outcomes, and risk factors for adverse psychiatric/alcohol use outcomes.

Results
One hundred and fifty-three of the approximately 250–300 post-COVID-19 follow-up clinic patients took part in the study at Time 1, thus yielding a participant recruitment estimate of 55%. The number of participants involved at Time 2 was 93 (retention rate = 60.78%). Participants' reasons for not participating at Time 2 were not available. Some participants were excluded from parts of the Time 1 and Time 2 analyses because ≥20% of the relevant data was missing. With respect to the standardized questionnaire responses, these participants accounted for a maximum of 5.2% and 8.6% of the Time 1 and Time 2 samples respectively (see Figure 1).
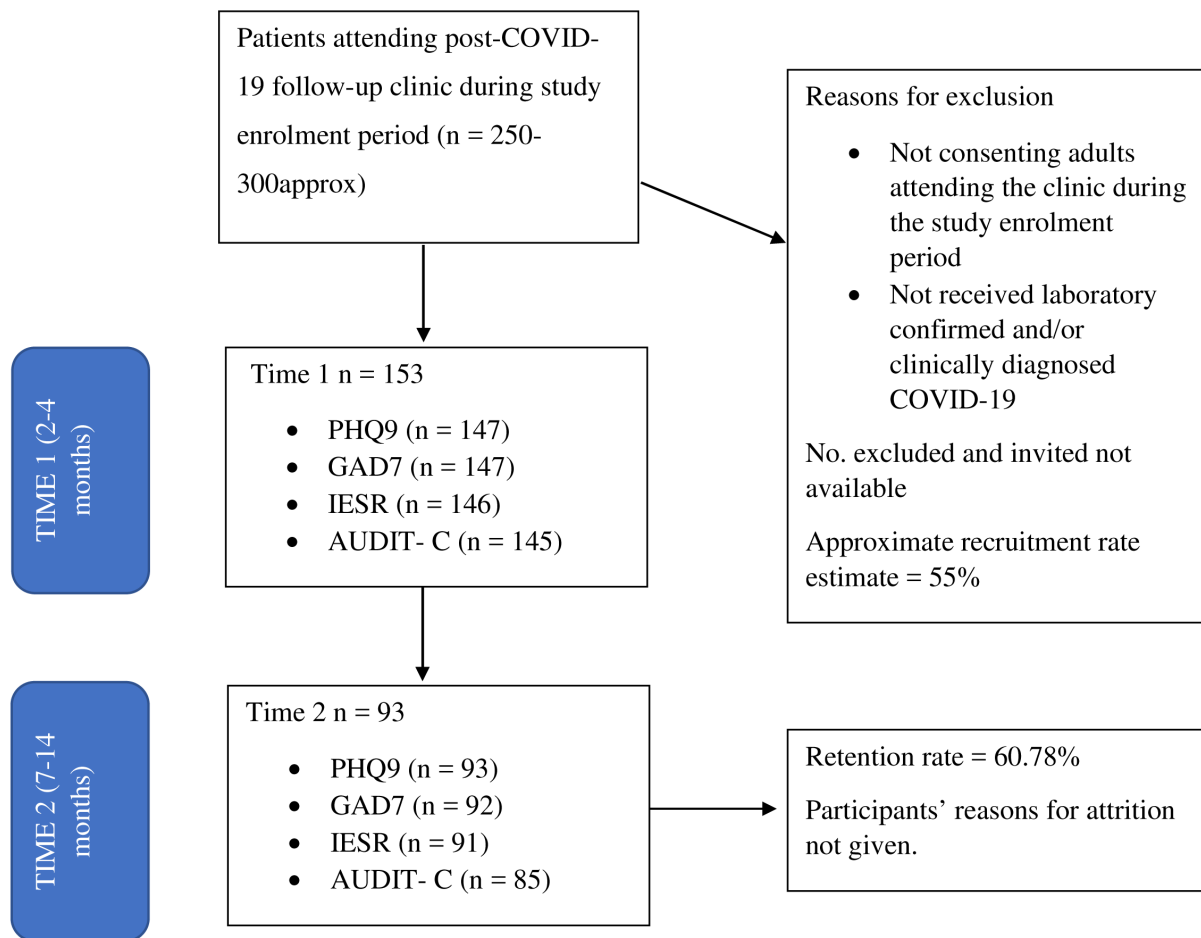

Figure 1. Flowchart outlining participant recruitment and retention processes.

Sample demographics and healthcare utilization experiences

The sample's median age at baseline was 43.45yrs (IQR = 21.18). There were 105 (68.6%) females and 48 (31.4%) males. Seventeen of 153 participants (11.1%) reported that they had previously being diagnosed with an affective disorder. Sixty-seven (43.8%) of 153 patients were admitted to hospital with acute COVID-19, nine of the these (13.4%) were admitted to ICU, and 17/67 (25.4%) had been readmitted to hospital following their initial acute COVID-19 hospital stay. The median initial hospital stay was seven days (IQR = 13), the median ICU stay was 26 days (IQR = 20.5), and the median readmission stay was three days (IQR = 4.75). Sixteen patients (23.9%) reported visiting a GP within seven days of their initial hospital discharge, and 26 (38.8%) reported doing so within 30 days of initial hospital discharge.

PHQ-9, GAD-7, IES-R, and AUDIT-C outcomes

Table 1 shows the median (IQR) Time 1 and Time 2 scores for the PHQ-9, GAD-7, IES-R, and AUDIT-C. Table 2 outlines the instruments' Time 1 and Time 2 prevalence scores per clinical category, as well as 'symptoms' vs 'no symptoms'

Table 1. Medians for PHQ-9, GAD-7, IES-R, and AUDIT-C at Time 1 and Time 2.

Instrument	Time 1 n	Time 1 median (IQR)	Time 2 n	Time 2 median (IQR)
PHQ-9	147	5(7)	93	4(6)
GAD-7	147	3(5)	92	2.5(5)
IES-R	146	10.5(28)	91	12(24)
AUDIT-C	145	2(3)	85	4(4)*

*Statistically significant difference between Time 1 and Time 2

Table 2. Prevalence and relative risk ('symptoms' vs 'no symptoms') of psychiatric issues and problematic alcohol usage.

Instrument	Time 1 n	Time 1 n (%)	Time 2 n	Time 2 n (%)	RR (95%CI)
PHQ-9	147		93		.98 (.76-1.26)
No signs of depression (<5)		72(49)		46(49.5)	
Mild (≥5)		44(29.9)		26(28)	
Moderate (≥10)		20(13.6)		12(12.9)	
Moderately Severe (≥15)		7(4.8)		4(4.3)	
Severe (≥20)		4(2.7)		1(1.1)	
GAD-7	147		89		1.15 (.81-1.64)
No signs of anxiety (<5)		90(61.2)		59(64.1)	
Mild (≥5)		38(25.9)		18(19.6)	
Moderate (≥10)		15(10.2)		4(4.3)	
Severe (≥15)		4(2.7)		8(8.7)	
IES-R	146		91		1.07 (.65-1.76)
No signs of PTSD (<33)		113(77.4)		71(78)	
PTSD likely (≥33)		33(22.6)		19(20.9)	
AUDIT-C	145		85		.65 (.52-.81)
Normal alcohol use (<3)		79(55.5)		24(28.2)	
Problematic alcohol use (≥3)		66(45.5)		61(71.8)	

Time 1 and Time 2 relative risk statistics. Wilcoxon signed-rank tests identified no statistically significant differences between Time 1 and Time 2 for PHQ-9, GAD-7, and IES-R median scores. A statistically significant difference was observed between Time 1 and Time 2 median scores on the AUDIT-C measure, with Time 2 scores being significantly higher ($Z = -5.291$, $p = .000$).

Risk factor analysis

As no differences were observed between Time 1 and Time 2 outcomes on the PHQ-9, GAD-7, and IES-R measures, risk factor analyses relating to these measures were conducted for Time 1 scores only. As test outcomes highlighted significant differences between Time 1 and Time 2 AUDIT-C scores, risk factor analyses were conducted for both AUDIT-C time periods.

Age, sex, and acute-COVID-19 severity did not influence median outcomes on the PHQ-9, GAD-7, IES-R, and AUDIT-C measures for most part. However, participants who were admitted to hospital with acute COVID-19 were statistically more likely to have higher PHQ-9 scores ($U = 2106.5$, $p = .041$), participants attending GPs within 30 days of hospital discharge were more likely to have higher GAD-7 ($U = 298.5$, $p = .031$) and IES-R scores ($U = 247.0$, $p = .006$), and a positive statistically significant relationship was observed between IES-R scores and length of ICU stay ($r = .737$, $p = .023$). Participants who reported having been previously diagnosed with an affective disorder had significantly higher PHQ-9 ($U = 314.000$, $p = .000$), GAD-7 ($U = 508.5$, $p = .000$), and IES-R ($U = 575.000$, $p = .002$) scores. There were no significant differences between affective disorder categories for the Time 1 and Time 2 AUDIT-C outcomes.

Discussion

Summary of findings

This study aimed to investigate the occurrence, duration, and determinants of long-term psychiatric problems and problematic alcohol use among patients attending a post-COVID-19 follow-up hospital clinic at the MMUH in Dublin, Ireland. Mental health concerns and problematic alcohol use were both evident and persistent in the study sample. Depression, anxiety, and PTSD issues were notably more common among participants who had previously been diagnosed with an affective disorder, and in some instances, these issues were more common among patients who received acute COVID-19 related hospital care (depression), ICU care (PTSD) and subsequent GP/primary care follow-up (anxiety and PTSD).

Strengths and limitations

The post-COVID-19 follow-up clinic facilitated ongoing access to a population sub-group that is hard to reach, and its staffs' efforts also ensured healthy participant recruitment and retentions rates[39,40], as well as low levels of missing data[41]. The study design and reporting benefitted from applying the STROBE guidelines[30] which ensured a trustworthy methodological framework to follow, and greater transparency in terms of reporting the procedures employed during the data collection and analysis processes.

As for study limitations, our sample was relatively small, and out of necessity, purposeful/convenient sampling methods, rather than randomization techniques, were used for recruitment. These factors may have limited the extent to which study's findings are generalizable to wider Long COVID / post-severe acute COVID-19 populations. It may also have been preferable to use more direct methods of measuring acute COVID-19 severity (e.g., symptomology)[42] instead of, or in combination with, the healthcare utilization surrogate endpoints employed.

Comparisons with existing literature

Previous literature regarding the prevalence of psychiatric issues in Long COVID populations is inconsistent. When considering a range of moderate to severe psychiatric issues, especially depression and PTSD, this study's findings align most closely with Schou et al.'s[16] pooled estimation range of 20–30%. This study's findings also reflect those of COVID-19 era studies examining the prevalence of depression and anxiety in COVID-19 pandemic in the Irish general population[43,44].

Further, and as previously mentioned, we believe this study is the first to examine alcohol use among Long COVID populations. The high problematic alcohol use figures observed are both alike (Time 1) and in excess of (Time 2) previously reported data for the general Irish population using the AUDIT-C instrument[45]. There was no evidence suggesting that the AUDIT-C outcomes observed in this study were influenced by acute and/or Long COVID effects, or by other factors such as pre-existing mental illness, or the pandemic's adverse psychosocial impacts[46].

In line with the consensus of previous research, this study's results did not suggest that age is a risk factor for persistent COVID-19 mental health issues. Likewise, the results did not support the relatively few claims made that male or female sex is linked to adverse mental health outcomes in persistent COVID-19 populations[21,22]. The findings strongly support claims that Long COVID patients with pre-existing psychiatric diagnoses are more likely to experience ongoing mental health difficulties[24]. Moreover, this study's findings provide some evidence supporting previous claims that severity, as measured by healthcare utilization experiences in this instance, is an indicator of persistent psychiatric issues in affected populations[47,48].

Whilst this study's sample size was much smaller than some published studies examining psychiatric post-acute COVID-19 sequelae[48–50], it is comparable to most studies conducted on the topic so far. This study is also one of many cohort studies in this area, although its follow-up period of 7–14months exceeds those of all the studies reported by Schou et al.[16] in their recently published systematic review of psychiatric and neuropsychiatric post-acute COVID-19 sequelae. Further, this study's finding that the prevalence of psychiatric issues typically remained stable over long periods of time appears to be at odds with the findings of previous robust studies[15,16,49]. It remains to be seen whether future large-scale studies with equally comparable or lengthier follow-up periods align more closely with this study's findings regarding symptom duration.

The psychiatric instruments employed in this study have also been used by several other studies investigating the research topic[21,23,32,51–53], although an enormous variety of methods have been adopted for classifying psychiatric outcomes in Long COVID study populations to date. It is possible that instrument selection in this and other studies influenced study outcomes. Having said this, for all their differences, the range of validated psychiatric instruments used to date should be sensitive and specific enough to capture a reasonably correct depiction of psychiatric prevalence in this population, at least collectively speaking.

Implications for practice, policy, and future research

Severe acute COVID-19 patients experiencing long-term sequelae are a vulnerable population with complex care needs, and this study's findings suggest that clinicians and policymakers should consider this groups' long-term psychological health. Providers that deliver continual and holistic care such as GPs are likely well suited to this task[26]. Whilst the mixed evidence in the literature regarding psychiatric risk factors for affected patients to date makes it difficult to identify individuals with an increased chance of experiencing long-term mental health issues, we contend that there is sufficient evidence to suggest that close attention should be paid to the needs of patients who have pre-existing mental health difficulties and those who experienced severe forms of acute COVID-19.

As for future research, larger scale studies with sample sizes akin to Al-Aly *et al.*[48], Chevinsky *et al.*[49], Daugherty *et al.*[50], and Taquet *et al.*[15] should be conducted with lengthier follow-up periods, as studies of this nature have the greatest potential to determine the long-term burden of psychiatric issues in affected populations. This study's findings also suggest that the impact of studies like this would be enhanced by continuing to include robust comparison of enduring outcomes for severe, mild, and moderate acute COVID-19 patients, as well as controls. Comparisons of behavioural outcomes such as alcohol/substance use in study populations should also be examined.

Conclusion

This study's findings indicate that mental health and alcohol use issues are common and durable among Long COVID populations. Depression, anxiety, and PTSD may be more prevalent among Long COVID patients that have a history of mental illness and / or who experienced more severe forms of acute COVID-19 infection. Clinicians and policymakers should be mindful of such, and large-scale studies should draw more conclusive findings by examining these issues over longer time periods than has been the case so far.

Data availability

Zenodo: Mental health and alcohol use among patients attending a post-COVID-19 follow-up clinic: A cohort study, https://doi.org/10.5281/zenodo.6138081.

This project contains the following underlying data:
- Data.xlsx (Mental health and alcohol use among patients attending a post-COVID-19 follow-up clinic: a cohort study)

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

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Open Peer Review

Current Peer Review Status: ✓

- -

Version 1

Reviewer Report 16 May 2022

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✓ **Patrick Ryan** (iD)

Department of Psychology, University of Limerick, Limerick, Ireland

The paper aims to add to the emerging understanding of the psychological sequelae for people who have experienced COVID-19 and who continue to report symptoms. The specific foci of the study are mental health symptoms (anxiety, depression and traumatic stress) and use of alcohol. Overall this is a well written, clear and succinct manuscript, the basis for which has been generated from a sound understanding of the extant literature. A sound methodology has framed a nicely contained study with a clear research aim, valid analyses and generally sound discussion and conclusions. A study like this is important as it adds to emerging literature that will clearly assist the current understanding of COVID and its impact but will also assist researchers to continue to explore long term public health impact and consequent requirements, clinically and in policy-making.

Some points to enhance the manuscript:
1. Be consistent in use of 'psychiatric' or 'psychological' or clarify if and how they are interchangeable.

2. Clarify if PTSD is being examined or is it traumatic stress? PTSD implies the existence of a diagnosed disorder - post traumatic stress doesn't.

3. I'm not entirely clear on how long term psychiatric problems overlap with long term COVID i.e. what are the time frames that define 'acute' for both and 'chronic' for both. And if they are different is it valid to imply correlation between the concepts?

4. Make clear that the long term psychiatric problems are not being linked to the onset of COVID. There is a blurring of this in some of the writing.

5. In the Participants section - I am unclear as to why it wasn't clear how many patients met study criteria or why this is relevant?

6. Does describing the participant pool as coming from a 'deprived' or 'multi-cultural'

      community add to the research being examined?

7. Summary of findings. I'm not convinced that the study investigated the 'determinants' of long-term psychiatric problems given the methodological set-up of the study. Correlates perhaps - some clarity on this would be useful.

8. The finding that long covid patients with pre-existing diagnoses experience ongoing mental health difficulties is tautological. Why would they not? There seems to be an inference that long covid is causing the continuance of pre-existing conditions but is it not that they are co-existing?

9. In the implications section just clarify if 'severe acute COVID-19 patients' refers to original covid symptoms because if they are experiencing long-term consequences then is it not 'chronic'?

10. Just to repeat the point about PTSD and traumatic stress from earlier - refer to what was reported and measured.

Is the work clearly and accurately presented and does it cite the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Yes

Are all the source data underlying the results available to ensure full reproducibility?
Yes

Are the conclusions drawn adequately supported by the results?
Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Clinical psychology; mental health - its development and the impacts on it; trauma; trauma assessment; trauma interventions.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.