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Emerging New Psychiatric Symptoms and the Worsening of Pre-existing Mental Disorders during the COVID-19 Pandemic: A Canadian Multisite Study

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Nouveaux symptômes psychiatriques émergents et détérioration des troubles mentaux préexistants durant la pandémie de la COVID-19: une étude canadienne multisite

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Abstract

Background: The coronavirus disease 2019 (COVID-19) pandemic has caused global disruptions with serious psychological impacts. This study investigated the emergence of new psychiatric symptoms and the worsening of pre-existing mental disorders during the COVID-19 pandemic, identified factors associated with psychological worsening, and assessed changes in mental health service use.

Methods: An online survey was circulated between April 3 and June 23, 2020. Respondents were asked to complete mental health questionnaires based on 2 time referents: currently (i.e., during the outbreak) and in the month preceding the outbreak. A total of 4,294 Canadians between 16 and 99 years of age were subdivided based on the presence of self-reported psychiatric diagnoses.

Results: The proportion of respondents without prior psychiatric history who screened positive for generalized anxiety disorder and depression increased by 12% and 29%, respectively, during the outbreak. Occurrences of clinically important worsening in anxiety, depression, and suicidal ideation symptoms relative to pre-outbreak estimates were significantly higher in those with psychiatric diagnoses. Furthermore, 15% to 19% of respondents reported increased alcohol or cannabis use. Worse psychological changes relative to pre-outbreak estimate were associated with female sex, younger age, lower income,

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poorer coping skills, multiple psychiatric comorbidities, previous trauma exposure, deteriorating physical health, poorer family relationships, and lower exercising. Reductions in mental health care were associated with increased suicidal ideation.

Conclusion: The worsening in mental health symptoms and the decline in access to care call for the urgent development of adapted interventions targeting both new mental disorders and pre-existing psychiatric conditions affected by the COVID-19 pandemic.

Abrégé

Contexte : La pandémie de la COVID-19 a causé des perturbations mondiales avec de sérieux impacts psychologiques. La présente étude a investigué l'émergence de nouveaux symptômes psychiatriques et la détérioration de troubles mentaux préexistants durant la pandémie de la COVID-19, identifié les facteurs associés à la détérioration psychologique, et évalué les changements dans l'utilisation des services de santé mentale.

Méthodes : Entre le 3 avril et le 23 juin 2020, des répondants ont rempli un sondage en ligne comprenant des questionnaires de santé mentale basés sur deux temps: présentement (c.-à-d. durant la pandémie) et dans le mois précédant la pandémie. Les réponses de 4 294 Canadiens âgés entre 16 et 99 ans ont été compilées selon la présence de diagnostics psychiatriques auto-rapportés.

Résultats : La proportion de répondants sans antécédents psychiatriques chez qui on a détecté des signes de trouble d'anxiété généralisée ou de dépression a augmenté de 12% et 29% respectivement durant la pandémie. Les incidences de détérioration cliniquement importante de l'anxiété, de la dépression et des symptômes d'idéation suicidaire par rapport aux estimations pré-pandémie étaient significativement plus élevées chez les personnes ayant déjà des diagnostics psychiatriques. De 15 à 19% des répondants ont rapporté une utilisation accrue d'alcool ou de cannabis. Les pires changements psychologiques relativement aux estimations pré-pandémie étaient associés au sexe féminin, au jeune âge, au faible revenu, aux capacités d'adaptation plus limitées, aux comorbidités psychiatriques, à l'exposition à un trauma entérieur, à la détérioration de la santé physique, aux relations familiales difficiles, et au manque d'exercice. La présence d'idéation suicidaire était associée à une diminution de l'utilisation des soins de santé mentale.

Conclusion : La détérioration des symptômes de santé mentale et le déclin de l'accès aux soins demandent le développement urgent d'interventions adaptées ciblant à la fois les nouveaux troubles mentaux et les troubles mentaux préexistants affectés par la pandémie de la COVID-19.

Keywords

COVID-19, pandemic, mental health, anxiety, depression, suicidal ideation, substance use, health care services

Introduction

The coronavirus disease 2019 (COVID-19) pandemic[1] has caused profound economic and societal disruption. Several studies highlighted considerable increases in stress levels during this pandemic,[2,3] and this was found to be especially prominent in individuals with diagnoses of mental disorders.[4] Accordingly, serious concerns have been raised about the emergence of new mental disorders and the worsening of pre-existing psychiatric conditions.[5,6]

In Canada, mental health worsening has been reported by more than 50% of respondents sampled from the general population.[7] Studies from around the world are reporting higher-than-usual point-estimate prevalence of symptoms suggestive of moderate to severe depression (18.1% to 46.3%) and anxiety disorders (11.4% to 45.1%).[8-14] Furthermore, 23% of Canadians endorsed consuming more alcohol, tobacco, and cannabis during the pandemic.[15]

Several demographic and socioeconomic risk factors for elevated depressive and anxiety symptoms during the pandemic have been identified in the general population.[8-14] Having a pre-existing history of mental disorder was also associated with worse symptoms of anxiety, depression, suicidal ideation, and hazardous drinking during the pandemic.[9,10,12,13,16,17] However, since most of these studies did not include baseline estimates of psychological state before the pandemic, it remains unclear what portion of these symptoms is reflective of the actual psychological changes taking place during the pandemic.

The present study aimed to investigate: (i) the emergence of symptoms suggestive of new mental disorders during the COVID-19 pandemic in people without any pre-existing mental disorder, (ii) potential differences in mental health and substance use worsening in people with pre-existing mental disorders compared to those without any psychiatric history, (iii) factors associated with mental health worsening in people with and without pre-existing mental disorders, and (iv) changes in psychiatric service use during the pandemic.

Methods

Study Design and Measures

An online survey (ClinicalTrials.gov: NCT04369690) for individuals aged 12 years and older was distributed in a convenience sample via social media posts, interviews in mainstream

media, web-based platforms from multiple organizations, and mailing lists of staff and clients who consented to be contacted for research from 4 hospitals (see Acknowledgments section). Data presented in the current report were collected in Canada (mostly in Ontario and Quebec, 2 of the Canadian provinces most affected by the pandemic, see Supplemental Table S1) between April 3 and June 23, 2020.

The survey was available in English and French and was conducted following the Checklist for Reporting Results of Internet E-Surveys guidelines.[18] It included the Generalized Anxiety Disorder Scale (GAD-7); the Quick Inventory of Depressive Symptomatology-Self Report (QIDS-SR16); the Perceived Stress Scale (PSS); the Brief Resilient Coping Scale (BRCS); and questions about current psychiatric diagnoses, alcohol and cannabis use, physical health, and social interactions (see details in Supplementary Materials). Participants were asked to complete these questionnaires (except the BRCS) based on 2 time referents: before the outbreak (i.e., during the month before the outbreak) and "during the outbreak" (i.e., during the 7 days preceding survey completion). The time elapsed since the pandemic declaration was defined by the number of days between the World Health Organization pandemic declaration and the date at which the survey was completed.

This study was approved by the Clinical Trials Ontario-Qualified Research Ethics Board (Protocol #2131). Electronic informed consent was obtained from each participant.

Participants

To address the first objective, all respondents who met the following criteria were selected: no self-reported history of a psychiatric diagnosis and no current use of antidepressant or anxiolytic medication ($n = 2{,}562$).

To address all other objectives, 2 groups were created based on the presence of self-reported diagnosis of mental disorders. All respondents who indicated having a current diagnosis of a mental disorder given by a health-care provider were included in the clinical group ($n = 1{,}732$). A control group ($n = 1{,}732$) was selected from the sample without a psychiatric history (as per criteria listed above) and matched to the clinical group based on the time elapsed since the pandemic declaration, age, sex, employment status, and total family income. This was done via nearest neighbor propensity score matching with the MatchIt package in R (Supplementary Table S2).[19,20]

Main Analyses

The proportions of individuals with GAD-7 and QIDS-SR16 scores falling in the established ranges of clinically significant anxiety and depression symptoms (i.e., positive screen; GAD-7 ≥ 5 and QIDS-SR16 ≥ 6) were compared between the 2 time referents (pre-outbreak vs. outbreak) with McNemar tests.

Mann-Whitney U (for data not normally distributed data not normally distributed) and chi-square tests were used to compare survey respondents across the clinical and control groups. For each individual, changes in GAD-7 and QIDS-SR16 scores were calculated by subtracting pre-outbreak estimates from scores obtained during the outbreak, thereby generating "worsening" scores. Chi-square tests were used to assess group differences in the occurrences of clinically important worsening on GAD-7 and QIDS-SR16 (i.e., worsening scores greater than established minimal clinically important difference thresholds[21,22]), worsening in suicidal ideation (as indicated on item 12 of the QIDS-SR16), and increases/decreases in alcohol and cannabis consumption relative to pre-outbreak estimates.

Multivariate linear regressions was used to identify factors independently associated with GAD-7 and QIDS-SR16 worsening scores with the "enter" pairwise approach based on the independent variables identified in Table 1. A logistic regression was run to identify which of the independent variables significantly associated with changes in anxiety and depression in the previous analyses were linked to the transition to more severe suicidal ideation on item 12 of the QIDS-SR16 during relative to before the outbreak (with depression symptoms estimated from QIDS-SR16 scores recalculated without item 12 to avoid circularity). All regression analyses were conducted in the control and clinical groups separately.

Given the relatively large sample size and the risk of artificial P value deflation,[23] only results with both a P value $< .05$ and an effect size above the "small effect size" threshold[24,25] were interpreted as statistically significant (see Supplementary Materials). All analyses were done using the Statistical Package for Social Sciences (IBM SPSS Statistics, Version 23.0, Armonk, United States) and R (RStudio, Version 1.2.1335, Boston, United States).

Results

Emergence of Clinically Significant Anxiety and Depression Symptoms in People without a Psychiatric History

The sample without a psychiatric history was 61.2% female and ranged between 16 and 99 years of age (mean [M] = 56.8, standard deviation [SD] =16.4 years; Supplementary Table S2). Their average pre-outbreak scores were below the clinical cutoff criterion for the GAD-7 ($M = 2.7$, $SD = 3.2$) and the QIDS-SR16 ($M = 3.8$, $SD = 2.7$).

The proportion of individuals without a psychiatric history screening positive for generalized anxiety disorder increased from 23.1% (613/2,651) in pre-outbreak estimates to 34.7% (920/2,651) during the outbreak (GAD-7; $P < .001$, Cohen $g = .25$; Figure 1A). The proportion of individuals screening positive for depression increased from 19.3% (512/2,651) in pre-outbreak estimates to 48.7% (1,290/2,651) during the outbreak (QIDS-SR16; $P < .001$, Cohen $g = .41$; Figure 1B).

Table 1. Factors Linked to Changes in Anxiety and Depression Symptoms.

	Anxiety (ΔGAD-7)										Depression (ΔQIDS-SR16)									
	Control group					Clinical group					Control group					Clinical group				
			95% CI					95% CI					95% CI					95% CI		
	B	*SE*	LL	UL	*P*	*B*	*SE*	LL	UL	*P*	*B*	*SE*	LL	UL	*P*	*B*	*SE*	LL	UL	*P*
Time since pandemic declaration (per week)	−0.05	0.05	−0.16	0.05	.291	−0.16	0.04	−0.24	−0.08	<.001	0.06	0.05	−0.04	0.16	.258	0.11	0.04	0.02	0.19	.013
General demographics																				
Sex: males (vs. females)	−0.10	0.17	−0.43	0.22	.528	0.16	0.21	−0.24	0.56	.433	−0.66	0.17	−0.98	−0.33	<.001	−0.57	0.21	−0.98	−0.15	.007
Ethnicity: non-Caucasians (vs. Caucasians)	−0.06	0.23	−0.50	0.39	.798	0.01	0.25	−0.47	0.50	.960	−0.33	0.23	−0.78	0.13	.159	0.27	0.25	−0.22	0.77	.279
Age (per 10 years)	0.01	0.06	−0.11	0.13	.868	−0.12	0.07	−0.25	0.01	.077	−0.28	0.06	−0.40	−0.16	<.001	−0.26	0.07	−0.39	−0.13	<.001
Education: no university (vs. University)	−0.10	0.16	−0.42	0.21	.526	0.22	0.18	−0.13	0.57	.213	0.25	0.17	−0.08	0.57	.137	−0.04	0.18	−0.40	0.32	.842
Income: <30 K/year (>30 K/year)	−0.05	0.34	−0.72	0.61	.872	−0.12	0.26	−0.64	0.40	.653	−0.35	0.35	−1.03	0.33	.308	0.55	0.27	0.02	1.09	.043
Employed (vs. unemployed)	0.11	0.19	−0.25	0.48	.541	−0.07	0.20	−0.46	0.31	.702	0.17	0.19	−0.21	0.54	.380	−0.28	0.20	−0.68	0.12	.166
Physical health domain																				
C19 symptoms index (0 to 30 scale)[a]	0.04	0.03	−0.02	0.11	.195	0.03	0.03	−0.02	0.09	.269	0.07	0.04	0.00	0.14	.053	0.06	0.03	0.00	0.11	.050
Physical condition at risk (vs. none)[b]	0.33	0.15	0.03	0.63	.034	−0.02	0.17	−0.36	0.32	.907	−0.22	0.16	−0.53	0.09	.162	0.07	0.18	−0.28	0.42	.711
Worsening physical health[c] (vs. none)	0.15	0.20	−0.24	0.54	.458	0.28	0.19	−0.10	0.66	.147	0.93	0.20	0.54	1.33	<.001	0.90	0.20	0.51	1.29	<.001
Social/behavioral domain																				
Family relationship (per 10 units; 0 to 100 scale)	−0.02	0.03	−0.08	0.05	.640	−0.03	0.03	−0.10	0.04	.377	−0.10	0.04	−0.17	−0.03	.005	−0.12	0.04	−0.19	−0.05	.001
Weekly alcohol use ≥7 drinks (vs. <7 drinks)	0.05	0.17	−0.28	0.38	.769	0.16	0.20	−0.24	0.56	.420	0.08	0.17	−0.26	0.42	.638	0.30	0.21	−0.11	0.71	.154
Weekly cannabis use (vs. none)	0.06	0.24	−0.40	0.52	.803	0.31	0.21	−0.10	0.73	.138	0.51	0.24	0.04	0.98	.035	0.28	0.22	−0.15	0.70	.208
<30 min exercising/week (vs. >30 min)	−0.05	0.15	−0.34	0.24	.737	−0.10	0.18	−0.45	0.24	.556	0.60	0.15	0.30	0.90	<.001	0.64	0.18	0.29	1.00	<.001
<30 min interacting with people/week (vs. >30 min)	0.07	0.15	−0.21	0.36	.616	0.05	0.17	−0.29	0.39	.776	0.36	0.15	0.07	0.65	.017	0.19	0.18	−0.16	0.54	.293
Psychological domain																				
Pre-outbreak GAD-7 or QIDS-SR16	−0.17	0.02	−0.21	−0.12	<.001	−0.19	0.02	−0.23	−0.15	<.001	−0.31	0.03	−0.37	−0.26	<.001	−0.37	0.02	−0.41	−0.33	<.001
BRCS (per 4 units; 4 to 20 scale)	−0.21	0.11	−0.44	0.01	.064	−0.26	0.12	−0.49	−0.04	.024	−0.25	0.12	−0.48	−0.02	.034	−0.56	0.12	−0.80	−0.33	<.001
Past exposure to trauma (vs. none)	0.07	0.15	−0.22	0.36	.638	−0.33	0.19	−0.70	0.04	.085	0.52	0.15	0.22	0.82	.001	0.67	0.19	0.29	1.05	.001
Δ PSS	0.39	0.02	0.36	0.43	<.001	0.37	0.02	0.34	0.41	<.001	0.15	0.02	0.11	0.19	<.001	0.21	0.02	0.18	0.25	<.001
Δ GAD-7/QIDS-SR16	0.35	0.03	0.30	0.40	<.001	0.34	0.02	0.29	0.38	<.001	0.34	0.03	0.29	0.40	<.001	0.36	0.03	0.31	0.41	<.001
Psychiatric comorbidities (vs. single diagnosis)						0.49	0.19	0.11	0.86	.011						0.79	0.19	0.41	1.18	<.001
Anxiolytic/antidepressant use (vs. no medication)						−0.01	0.19	−0.39	0.37	.949						0.08	0.20	−0.31	0.47	.694

Note. Coefficients from the multiple linear regression for changes in anxiety and depression symptoms. Family relationship rated on scale from "0-Very difficult/conflictual", "50-Neutral," to "100-Excellent". *B* = Unstandardized coefficients (calculated per 1 unit for continuous variables, except for the time elapsed since the pandemic declaration, which was calculated for each 7 days, age and family relationships which were calculated per 10 years and units respectively, and BRCS which was calculated per 4 units). Units (for continuous variables) and reference groups (for categorical variables) are presented in parentheses in the first column. GAD-7 = Generalized Anxiety Disorder Scale; QIDS-SR16 = Quick Inventory of Depressive Symptomatology-Self Report, short version; BRCS = Brief Resilient Coping Scale; PSS = Perceived Stress Scale; Δ = change from pre-outbreak to during the outbreak; *SE* = standard error of *B*; CI = confidence interval; LL = lower limit; UL = upper limit.

[a] An index reflective of the number and severity of potential COVID-19 symptoms (see Supplementary Materials).

[b] Physical condition at risk for COVID-19: respiratory, cardiovascular, or autoimmune conditions.

[c] Worsening in physical health since the start of the outbreak.

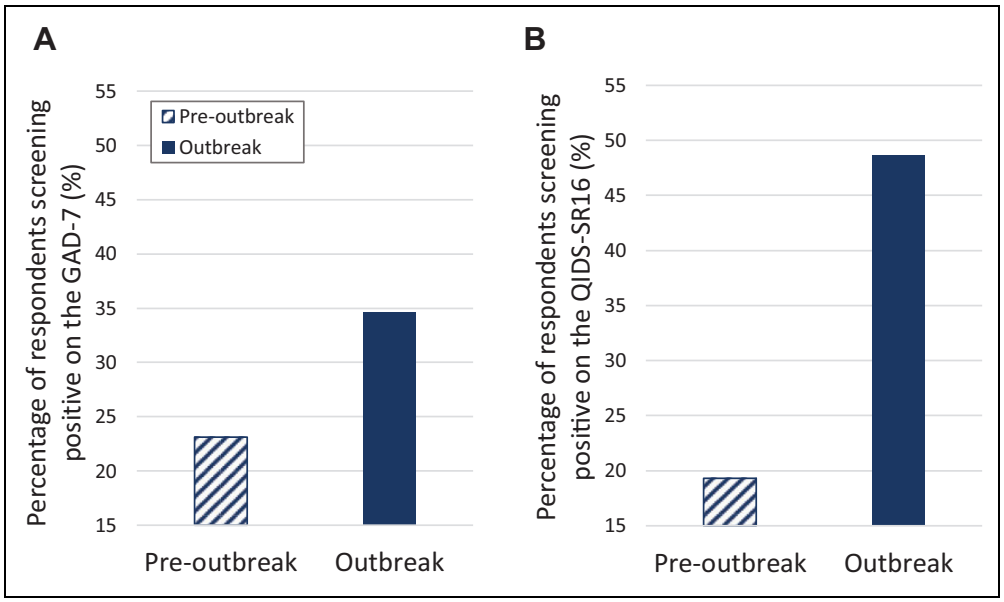

Figure 1. Percentage of all respondents without a psychiatric history ($n = 2{,}562$) who endorsed clinically significant anxiety symptoms on the GAD-7 (Generalized Anxiety Disorder Scale; panel A) and depression symptoms on the QIDS-SR16 (Quick Inventory Of Depressive Symptomatology-Self Report, short version; panel B) before the outbreak (striped bars) and since the start of the outbreak (full bars).

Psychological Changes and Substance Use Based on Psychiatric History

Case-control group characteristics. Table 2 reports main sample characteristics in the control and clinical groups. Overall, the control and clinical groups were comparable in terms of the time elapsed since the pandemic declaration and had similar rates of employment. Compared to the control group, the clinical group was slightly younger and more educated, had a higher percentage of females and people with lower income, worse symptoms that could be linked to COVID-19, and poorer coping skills (BRCS). Compared to the control group, the clinical group had higher pre-outbreak stress, anxiety, and depression levels as reflected by the PSS, GAD-7, and QIDS-SR16 (Table 2). In the clinical group, the average pre-outbreak scores on the GAD-7 and QIDS-SR16 were in the mild anxiety and depression ranges, respectively.

Anxiety and depression symptoms. The proportion of clinically important worsening in anxiety and depression symptoms relative to pre-outbreak estimates was significantly higher in the clinical group (GAD-7: 37.4%, 632/1,689; QIDS-SR16: 56.6%, 916/1,619) than in the control group (GAD-7: 22.7%, 394/1,732; $\chi^2(1) = 87.7$, $P < .001$, $V = .16$, QIDS-SR16: 42.5%, 736/1,732; $\chi^2(1) = 66.4$, $P < .001$, $V = .14$).

Suicidal ideation. Supplementary Figure S1 shows the percentages of respondents who endorsed suicidal ideation before and during the outbreak in the control and clinical groups; 17.9% (296/1,657) of individuals from the clinical group had an increase in suicidal ideation severity from before to during the outbreak, a proportion significantly higher than the 3.8% (65/1,732) observed in the control group, $\chi^2(1) = 177.2$, $P < .001$, $V = .23$.

Alcohol and cannabis use. The control and clinical groups had similar proportions of individuals who reported changes in alcohol consumption relative to pre-outbreak estimates, $\chi^2(2) = .5$, $P = .792$, $V = .01$. In the control and clinical groups, respectively, 14.8% ($n = 254$) and 14.5% ($n = 249$) had a reduction in alcohol consumption, while 29.4% ($n = 506$) and 30.5% ($n = 524$) had an increase. In cannabis users, the proportions of those who reported changes in cannabis use relative to pre-outbreak estimates were also similar across both groups, $\chi^2(2) = 3.1$, $P = .208$, $V = .05$. In the control and clinical groups, 5.0% ($n = 86$) and 6.2% ($n = 106$), respectively, showed a reduction, while 16.6% ($n = 286$) and 18.9% ($n = 325$) showed an increase.

Factors Linked to Changes in Perceived Psychological States and Substance Use

Anxiety and depression symptoms. Coefficients from the multiple linear regression models assessing factors independently associated with changes in anxiety and depression symptoms in the control and clinical groups are presented in Table 1. In both groups, less severe initial anxiety and depression symptoms before the outbreak were associated with more pronounced worsening in anxiety and depression symptoms, respectively. Worse changes in other psychological indices (perceived stress and anxiety/depression symptoms) were independently associated with higher worsening in anxiety and depression symptoms for both groups.

Table 2. Demographic Characteristics and Descriptive Statistics of Self-Report Indices in the Control and Clinical Groups.

	Control group			Clinical group					
	n	Mean/Fr	*SD*/%	*n*	Mean/Fr	*SD*/%	Z/χ^2	*P*	η_p^2/V
Time since pandemic declaration	1732	57.7	10.1	1732	56.0	15.1	−1.5	.129	.03
General demographics									
Sex (females)	1731	1192	68.9%	1731	1284	74.2%	12.0	.001	.06
Ethnicity (Caucasian)	1732	1516	87.5%	1732	1483	85.6%	2.7	.100	.03
Age	1732	51.7	16.5	1732	48.1	15.6	−7.0	<.001	.12
Education	1732			1732			74.9	<.001	.10
No College/University		1182	68.2%		934	53.9%			
College		333	19.2%		474	27.4%			
University		217	12.5%		324	18.7%			
Income	1732			1732			76.7	<.001	.11
<30 K		85	4.9%		234	13.5%			
30 to 100 K		875	50.5%		802	46.3%			
>100 K		772	44.6%		696	40.2%			
Employed (vs. unemployed)	1732	928	53.6%	1732	894	51.6%	1.3	.247	.02
Physical health factors									
C19 symptoms index (0 to 30 scale)[a]	1732	1.0	2.2	1732	1.8	3.1	−6.3	<.001	.11
Physical condition at risk[b]	1252	464	37.1%	1434	660	46.0%	22.1	<.001	.09
Pre-outbreak substance use									
Alcohol (drinks/week)	1722	4.0	6.2	1722	3.6	6.8	−7.4	<.001	.13
Cannabis (vs. none)	1712	.1	4.0	1710	1.8	6.4	−9.9	<.001	.17
Increases/decreases in substance use									
Alcohol (increase/decrease)	1719	506/254	29.4/14.8	1718	524/249	30.5/14.5	0.5	.792	.01
Cannabis (increase/decrease)	1722	286/86	16.6/5.0	1717	325/106	18.9/6.2	3.1	.208	.05
Psychological factors									
BRCS (4 to 20 scale)	1694	15.1	2.6	1658	13.6	3.2	−14.0	<.001	.24
Pre-outbreak symptoms									
PSS	1700	11.4	5.7	1654	17.7	7.0	−25.9	<.001	.45
GAD-7	1732	3.0	3.3	1690	7.1	5.0	−26.7	<.001	.46
QIDS-SR16	1732	3.8	2.8	1627	7.7	5.1	−25.8	<.001	.45
Clinically important worsening									
GAD-7	1732	394	22.7	1689	632	37.4	87.7	<.001	.16
QIDS-SR16	1732	736	42.5	1619	916	56.6	66.4	<.001	.14
Suicidal ideation	1732	65	3.8	1657	296	17.9	177.2	<.001	.23
Current diagnoses	1732			1732					
Mood disorder		0	0%		1,206	69.6%			
Anxiety disorder		0	0%		959	55.4%			
PTSD		0	0%		394	22.7%			
OCD		0	0%		122	7.0%			
Substance-related/addictive disorder		0	0%		92	5.3%			
Other mental disorder[c]		0	0%		136	7.9%			
Psychiatric comorbidities	1732			1732					
2 Diagnoses		0	0%		480	28.0%			
>2 Diagnoses		0	0%		439	25.6%			
Medications	1732			1732					
Anxiolytic		0	0%		390	25.6%			
Antidepressant		0	0%		965	63.4%			

Note. Means, standard deviations (*SD*), frequencies (Fr), and percentages (%) of main demographic variables in the control and clinical groups. Estimates of effect sizes: ηp^2 = partial eta squared, V = Cramer V, Z/χ^2 = *Z* score/chi-square statistic. COVID-19 = coronavirus disease 2019; GAD-7 = Generalized Anxiety Disorder Scale, QIDS-SR16 = Quick Inventory of Depressive Symptomatology-Self Report, short version; BRCS = Brief Resilient Coping Scale; PSS = Perceived Stress Scale; PTSD = post-traumatic stress disorder; OCD = obsessive-compulsive and related disorders.

[a] An index reflective of the number and severity of potential COVID-19 symptoms (see Supplementary Materials).

[b] Physical condition at risk for COVID-19: respiratory, cardiovascular, or autoimmune conditions.

[c] Other mental disorder: for example, eating disorder, psychotic disorder, or personality disorder.

Table 3. Factors Linked to Increased Suicidal Ideation.

	Control group						Clinical group					
				95% CI						95% CI		
	B	*SE*	Exp(*B*)	LL	UL	*P*	*B*	*SE*	Exp(*B*)	LL	UL	*P*
Time since pandemic declaration (per week)	0.02	0.01	1.02	0.99	1.04	.183	0.01	0.01	1.01	1.00	1.03	.127
Sex: males (vs. females)	0.17	0.34	1.18	0.61	2.30	.622	0.49	0.21	1.63	1.08	2.46	.020
Age (per 10 years)	−0.03	0.10	9.97	9.77	10.17	.753	−0.09	0.06	9.91	9.80	10.03	.148
Income: <30 K/year (vs. >30 K/year)	−0.10	0.65	0.90	0.25	3.22	.874	0.04	0.26	1.04	0.63	1.72	.873
Worsening physical health (vs. no worsening)	−0.07	0.33	0.94	0.49	1.79	.839	0.20	0.18	1.22	0.86	1.73	.275
Family relationship (per 10 units; 0-100 scale)	−0.06	0.06	9.94	9.82	10.06	.317	−0.09	0.03	9.91	9.84	9.97	.003
Weekly cannabis use (vs. none)	0.55	0.39	1.74	0.81	3.75	.158	−0.07	0.21	0.93	0.62	1.40	.737
≤30 min exercising/week (vs. >30 min)	0.25	0.31	1.28	0.70	2.33	.419	0.27	0.18	1.31	0.92	1.87	.137
≤30 min interacting with people/week (vs. >30 min)	0.54	0.31	1.72	0.94	3.13	.078	0.18	0.18	1.19	0.84	1.69	.320
BRCS (per 4 units; 4 to 20 scale)	−0.32	0.21	3.69	3.32	4.09	.127	−0.29	0.11	3.72	3.53	3.92	.008
Past exposure to trauma (vs. none)	0.37	0.30	1.44	0.80	2.59	.219	0.15	0.19	1.16	0.80	1.68	.432
Δ PSS	0.03	0.03	1.03	0.96	1.10	.399	0.03	0.02	1.03	0.99	1.07	.175
Δ GAD-7	0.02	0.04	1.02	0.94	1.11	.584	0.06	0.03	1.06	1.01	1.12	.019
Δ QIDS-SR16*	0.22	0.05	1.25	1.14	1.37	<.001	0.16	0.03	1.18	1.12	1.24	<.001
Psychiatric comorbidities (vs. single diagnosis)							0.30	0.19	1.35	0.94	1.94	.109

Note. Coefficients from the logistic regression for changes in suicidal ideation. Family relationship rated on scale from "0-Very difficult/conflictual", "50-Neutral," to "100- Excellent". Units (for continuous variables) and reference groups (for categorical variables) are presented in parentheses in the first column. *B* = coefficients (calculated per 1 unit for continuous variables, except for the time elapsed since the pandemic declaration, which was calculated for each 7 days, age, and family relationships which were calculated per 10 years and units respectively; and BRCS which was calculated per 4 units); GAD-7 = Generalized Anxiety Disorder Scale; QIDS-SR16 = Quick Inventory of Depressive Symptomatology-Self Report, short version (*recalculated minus the suicidality item); BRCS = Brief Resilient Coping Scale; PSS = Perceived Stress Scale. Δ = change from pre-outbreak to during the outbreak; *SE* = standard error of *B*; Exp(*B*) = exponentiation of B; CI = confidence interval, LL = lower limit; UL = upper limit.

In the clinical group, longer time elapsed since the pandemic declaration was associated with lower anxiety symptoms worsening and higher depression symptoms worsening. Poorer coping skills and psychiatric comorbidities were significantly associated with more pronounced worsening in both anxiety and depression symptoms. Poorer coping skills were also associated with more depression symptoms worsening in the control group.

Additional factors were found to be independently associated with worsening in depression, but not anxiety symptoms. Being female, younger age, physical health worsening since the start of the outbreak, past exposure to trauma, poorer family relationships, and spending less time exercising were associated with depression symptoms worsening in both groups. In the clinical group only, having a lower income was also associated with depression symptoms worsening. In the control group only, worsening depression was linked to regular cannabis consumption and spending less time interacting with people. In the clinical group, no significant association was observed between the use of anxiolytic or antidepressant medication and anxiety or depression symptoms worsening.

Suicidal ideation. The following factors were found to be independently associated with suicidal ideation in the clinical group (Table 3): being male, reporting poorer family relationships, poorer coping skills, and higher worsening of anxiety and depression symptoms. In the control group, having more severe worsening in depression symptoms was the only factor reaching statistical significance.

Alcohol use. In both the control and clinical groups, increased alcohol use during the outbreak relative to pre-outbreak estimates was significantly associated with current cannabis use, lower pre-outbreak alcohol consumption, and higher worsening of depression symptoms (Table 4). In the control group, increased alcohol use was also associated with being female.

Changes in Mental Health Services Use

While the proportions of respondents who had weekly or biweekly appointments for their mental health underwent a more modest decrease from pre-outbreak to during the outbreak, there was a 2-fold decrease in rates of monthly appointments during the outbreak (Figure 2). Conversely, the proportion of respondents with less than 1 appointment per month increased across the 2 time referents. Of the 429 respondents who reported having had a mental health appointment since the start of the outbreak, 59.9% ($n = 257$) had appointments over the phone, 38.9% ($n = 167$) via the Internet, and 33.8% ($n = 145$) in person. Of those who indicated having changed their medications since the start of the outbreak, 13.5% (53/392) had not discussed these changes with their doctor.

The proportions of respondents who endorsed increased suicidal ideation nearly doubled in the group who reported a

Table 4. Factors Linked to Changes in Alcohol Consumption.

	Control group					Clinical group				
			95% CI					95% CI		
	B	*SE*	LL	UL	*P*	*B*	*SE*	LL	UL	*P*
Time since outbreak start (per week)	−0.05	0.07	−0.19	0.09	.513	0.12	0.08	−0.04	0.29	.133
General demographics										
Sex: males (vs. females)	−0.67	0.23	−1.12	−0.21	.004	−0.21	0.41	−1.02	0.59	.600
Age (per 10 years)	0.02	0.07	−0.11	0.16	.736	−0.16	0.12	−0.39	0.07	.175
Income: <30 K/year (vs. >30 K/year)	−0.80	0.48	−1.74	0.14	.095	−0.72	0.51	−1.72	0.28	.160
Physical health domain										
Worsening physical health (vs. no worsening)	0.04	0.28	−0.51	0.59	.877	−0.07	0.38	−0.81	0.66	.846
Social/behavioral domain										
Family relationship (per 10 units; 0 to 100 scale)	0.00	0.05	−0.10	0.10	.995	0.01	0.07	−0.12	0.15	.873
Pre-outbreak weekly alcohol use (drinks)	−0.27	0.02	−0.31	−0.24	.000	−0.07	0.03	−0.12	−0.02	.003
Current weekly cannabis use (vs. none)	1.52	0.34	0.86	2.18	.000	1.80	0.42	0.98	2.62	.000
<30 min exercising/week (vs. >30 min)	−0.04	0.21	−0.46	0.38	.844	−0.12	0.35	−0.81	0.56	.729
<30 min interacting with people/week (vs. >30 min)	−0.05	0.21	−0.47	0.36	.799	0.54	0.35	−0.14	1.22	.120
Psychological domain										
BRCS (per 4 units; 4 to 20 scale)	−0.12	0.16	−0.44	0.20	.458	0.09	0.22	−0.34	0.52	.679
Past exposure to trauma (vs. none)	0.00	0.21	−0.42	0.42	.996	0.55	0.37	−0.18	1.28	.140
Δ PSS	0.03	0.03	−0.03	0.09	.293	0.03	0.04	−0.05	0.11	.406
Δ GAD-7	0.03	0.04	−0.05	0.11	.436	−0.02	0.05	−0.12	0.09	.769
Δ QIDS-SR16	0.10	0.04	0.03	0.18	.008	0.10	0.05	0.00	0.19	.044
Psychiatric comorbidities (vs. single diagnosis)						−0.22	0.36	−0.93	0.50	.555

Note. Coefficients from the multiple linear regression for changes in alcohol use. Family Relationship rated on scale from "0-Very difficult/conflictual," "50-Neutral," to "100- Excellent." *B* = unstandardized coefficients (calculated per 1 unit for continuous variables, except for the time elapsed since the pandemic declaration, which was calculated for each 7 days, age and family relationships which were calculated per 10 years and units respectively, and BRCS which was calculated per 4 units). Units (for continuous variables) and reference groups (for categorical variables) are presented in parenthesis in the first column. GAD-7 = Generalized Anxiety Disorder Scale; QIDS-SR16= Quick Inventory of Depressive Symptomatology-Self Report, short version; BRCS = Brief Resilient Coping Scale; PSS = Perceived Stress Scale; Δ = Change from pre-outbreak to during the outbreak. SE = standard error of *B*; CI = confidence interval; LL = lower limit; UL = upper limit.

reduction in mental health appointments (33.6%; 25/75) compared to those who did not report changes in the frequency of their appointments (18.7%, 110/588, $\chi^2(1) = 8.8$, $P = .003$, $V = .12$).

Discussion

The current findings showed that nearly half a large sample of Canadians who reported no previous psychiatric history screened positive on standard clinical tools for clinical depression during the COVID-19 pandemic and over a third screened positive for generalized anxiety disorder. The proportion of individuals with clinically important worsening in anxiety, depression, and suicidal ideation were higher in those with pre-existing psychiatric conditions than in those without a psychiatric history, suggesting that the psychological impacts of the pandemic may be even more concerning in this subgroup.

These findings echo previous studies indicating that psychiatric conditions present before the pandemic are associated with worse anxiety and depression symptoms, as well as suicidal ideation during the pandemic.[9,10,12,13,14,16,17] To our knowledge, only one previous study featured a case-control design where participants with and without psychiatric conditions were age- and gender-matched.[17] They reported worse psychological outcomes in those with psychiatric conditions, but since there was no pre-outbreak estimate, the portion of psychiatric symptoms linked to the pandemic as opposed to differences that would be expected between people with psychiatric conditions and healthy controls could not be quantified. A study assessing the magnitude of psychological changes during the pandemic relative to prepandemic levels in Canadian youth with psychiatric conditions versus community youth showed a slightly worse deterioration on a global mental health index in the latter.[26] In that previous study, a very high score on this global index in the clinical group before the pandemic left little room for capturing further worsening. Herein, more severe initial anxiety and depression symptoms before the outbreak were associated with less pronounced worsening in anxiety and depression symptoms, which may also be reflective of a ceiling effect. Nevertheless, together with our observation that worsening depression symptoms were associated with younger age in the control group, this highlights the need for further studies assessing potential interactions between age and psychiatric history.

We identified several factors associated with changes in depression and anxiety symptoms during the pandemic, with

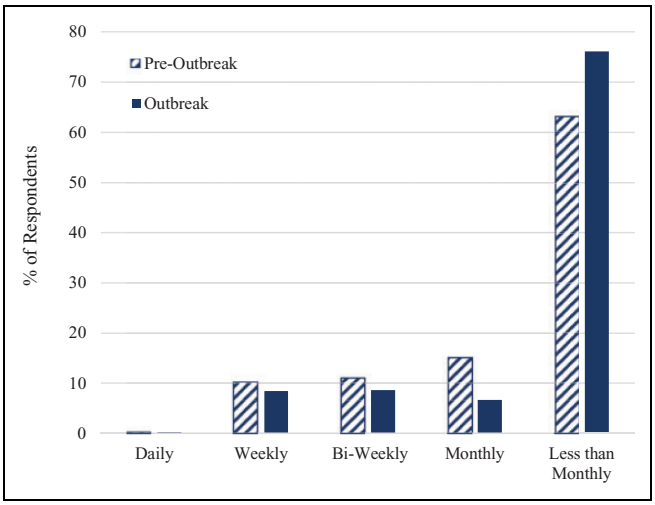

Figure 2. Changes in mental health services use percentage of respondents from the clinical group who reported attending daily, weekly, biweekly, monthly, or less frequent appointments for their mental health in the last 6 months before the outbreak (striped bars) and since the start of the outbreak (full bars).

some overlap and some disparities between those with and without a psychiatric disorder. While it is well established that chronic stress exacerbates psychiatric symptoms,[27] the current findings indicate that changes in stress emerging during the COVID-19 pandemic were linked to higher worsening of anxiety and depression symptoms regardless of pre-existing psychiatric history.

Our cross-sectional analyses suggest acute anxiety responses to the pandemic and a potential lagged effect on mood. Anxiety may have been more prevalent in the earlier stages of the pandemic because of the more prominent uncertainty and daily life adaptations imposed by the pandemic situation.[28] Also, consistent with diathesis-stress models, higher levels of stress and anxiety sustained over longer time periods during the pandemic may contribute to the subsequent development of depressed states.[29] For instance, sustained cortisol elevations following prolonged stress exposure can lead to a dampening of the negative feedback circuit which tones down stress responses[30] and to changes in functional brain connectivity networks linked to the pathophysiology of depression. Depression may also arise later because of the effects of prolonged social isolation and family tensions (potentially reflected by the association we observed between poorer family relationships and depression worsening), the progressive realization that many aspects of life may not return to normal for some time (which may gradually increase feelings of hopelessness), and accumulating financial strain (a factor which may echo the strong association we found between lower family income and further worsening depression). Future research should determine whether the temporal dynamics of the psychological response to the pandemic may reflect processes such as kindling versus stress sensitization, both of which may potentiate the risks of depression as the pandemic continues.

General worsening in physical health, rather than specific symptoms that could be linked to COVID-19 or having a medical condition at risk for adverse COVID-19 outcomes, was found to be a stronger predictor of worsening depression symptoms. This suggests that, beyond the fear of contracting COVID-19, other physical health issues which may go untreated due to reduced access to care during the pandemic also generate significant psychological distress. Our findings also suggest that the higher sensitivity of mental health indices previously observed in females compared to males[9,12,16] may be more prominent for the worsening of depression than anxiety symptoms. Past exposure to trauma and psychiatric comorbidities were related to higher worsening in anxiety and/or depression. This could notably reflect increased vulnerability inherent to the more complex psychological challenges these individuals face and to the unmet needs for external support to manage their conditions during the pandemic. Although no significant association was found for the use of anxiolytic or antidepressant medications, better coping skills and exercising were linked to less mental health worsening. Therefore, enhancing coping skills and promoting regular exercise may be relevant strategies to limit the adverse psychological impacts of a global external stressor.

Alcohol- or drug-related self-medicating behaviors while facing psychological challenges linked to the pandemic could have long-term consequences for mental health.[31] Herein, regardless of prior psychiatric history, changes in alcohol and cannabis use patterns during the pandemic were quite heterogeneous. The observation that alcohol/cannabis consumption was an independent predictor of depression worsening in the control group, combined with the observation that higher depression worsening was an independent predictor of increased alcohol consumption during the pandemic in both the control and clinical groups supports the notion of a vicious cycle between substance misuse and poor mental health when facing external stressors. In addition to those with elevated depression symptoms, females and cannabis users may represent important populations to target in prevention efforts aiming to better manage alcohol use.

The pandemic was accompanied by a rapid transformation of outpatient mental health care. Telehealth has been found to be as effective as in-person interventions,[32,33] but few Canadian mental health-care providers offered such services before the pandemic.[34] In the current study, the clinical group experienced a decreased frequency of mental health appointments and one-third of mental health appointments were still taking place in person, suggesting that more resources are required to adapt the delivery of mental health services to confinement constraints. In China, the disruption of mental health services during the pandemic has been associated with delays in diagnosis, reduced adherence to medication, and medication discontinuation, which may have contributed to relapses.[35] Of concern, the present study indicated that a considerable number of people with psychiatric conditions made changes to their medications without first discussing this with their care provider, and that

disruptions in mental health care were associated with increased suicidal ideations.

Limitations of the current study include the reliance on retrospective and self-report measures administered online. While this permitted rapid large-scale recruitment, it increases the risk of participant and memory bias and precludes generalization to individuals without computer or Internet access. Considering the elevated rates of anxiety and depression symptoms that prevailed before the pandemic, especially in those with established mental disorders,[36-40] it was deemed that having a baseline estimate was important to get a sense of the effects of the pandemic. Some studies suggested that recall biases typically intensify retrospective symptom estimates, including indicators of affective states in both mentally healthy individuals and people with depression.[41,42] Consequently, such biases would be most likely to inflate pre-outbreak estimates of mental health symptoms, thereby reducing rather than increasing changes relative to pre-outbreak estimates. It is thus unlikely that these biases could entirely explain the changes observed in the current study. Furthermore, in the current study, retrospective recall was related to relatively short time periods (i.e., 3 to 15 weeks), which may restrict the impact of recall bias. Another limitation is the unequal time span over which retrospective and current mental health indicators were estimated. While current estimates were based on the past 7 days, in accordance with the typical time span of most of the validated questionnaires used, it was judged that retrospectively pinpointing mental health state within a specific week preceding the outbreak would have been more arduous than providing this retrospective estimate over a larger time span reflecting global experiences around that period (i.e., a month). This aligns with previous findings that recall biases for retrospective symptom estimates spanning over 28 days are lower than for those spanning over 7-day periods.[42] Despite our attempt to match the demographic profile of the control group as closely as possible to that of the clinical group, small group differences in potential confounders like sex and income level persisted. Representativeness (e.g., age distribution skewed toward middle-age, higher rates of females, highly educated individuals with high income status; not representative of the global Canadian population) is likely to have been limited by the dissemination strategy and by volunteer bias. Nevertheless, our demographic characteristics are consistent with other published surveys.

Collectively, the current observations from a large sample of respondents using well-established clinical measures during the peak of the COVID-19 pandemic provide some insights on the extent of the added mental health burden of this unprecedented situation. While the acute psychological reactions to this pandemic may gradually attenuate with time for some individuals, for others, they may crystalize into chronic conditions if left unattended. The severity of these psychological changes warrants urgent development and implementation of large-scale resources for the screening and treatment of emerging and worsening mental disorders. The identification of factors that may confer risk versus protection for changes in mental health, substance use, and mental health service utilization could inform the planning and implementation of interventions to address the mental health sequelae of the pandemic.

Authors' Note

Proposals to access data from this study can be submitted to the corresponding author and may be made available upon data sharing agreement.

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Supplemental Material

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