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Psychological distress among healthcare providers during the COVID-19 pandemic: patterns over time

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Abstract

Background COVID-19 added to healthcare provider (HCP) distress, but patterns of change remain unclear. This study sought to determine if and how emotional distress varied among HCP between March 28, 2021 and December 1, 2023.

Methods This longitudinal study was embedded within the 42-month prospective COVID-19 Cohort Study that recruited HCP from four Canadian provinces. Information was collected at enrollment, from annual exposure surveys, and vaccination and illness surveys. The 10-item Kessler Psychological Distress Scale (K10) was completed approximately every six months after March 28, 2021. Linear mixed effects models, specifically random intercept models, were generated to determine the impact of time on emotional distress while accounting for demographic and work-related factors.

Results Between 2021 and 2023, the mean K10 score fell by 3.1 points, indicating decreased distress, but scores increased during periods of high levels of mitigation strategies against transmission of SARS-CoV-2, during winter months, and if taking antidepression, anti-anxiety or anti-insomnia medications. K10 scores were significantly lower for HCP who were male, older, had more children in their household, experienced prior COVID-19 illness(es), and for non-physician but regulated HCP versus nurses. A sensitivity analysis that included only those who had submitted at least five K10 surveys consisted of the factors in the full model excluding previous COVID-19 illness, occupation, and season, after adjustment. Models were also created for K10 anxiety and depression subscales.

Conclusions K10 scores decreased as the COVID-19 pandemic continued but increased during periods of high mitigation and the winter months. Personal and work-place factors also impacted HCP distress scores. Further research into best practices in distress identification and remediation is warranted to ensure future public health disasters are met with healthcare systems that are able to buffer HCP against short- and long-term mental health issues.

Keywords Psychological distress, Pandemic, Healthcare provider

Background

Healthcare providers (HCP) have a physically and emotionally demanding job. In 2019, prior to the COVID-19 pandemic, an estimated 36% of Canadian nurses experienced depression and 26% lived with anxiety [1] while in 2017, an estimated 34% of physicians reported having symptoms of depression [2]. By comparison, only 10% of

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the general Canadian population aged 18 years or older experienced a mood disorder in 2017/2018 [3].

Public health disasters, including pandemics and outbreaks, engender increased psychological distress. During the 2003 outbreak of severe acute respiratory syndrome (SARS), Maunder [4] noted that 29–35% of hospital workers experienced a high degree of emotional distress. In the summer of 2020, 25% of HCP working at 12 Canadian hospitals reported psychological distress [5] as measured by the 10-item Kessler Psychological Distress Scale (K10) [6]. In the fall of 2021, 45% of Canadian HCP indicated that their mental health was worse than before the pandemic and stated that they were more stressed, had increased workloads, and/or were required to do work they didn't usually perform [7]. Another study indicated that between March 2019 and April 2022, more HCP were working overtime, adding to their existing workload and stress levels [8].

Several studies have sought to determine changes in emotional distress over the course of the pandemic, but findings have been inconsistent. In a review of 18 articles that examined longitudinal changes in emotional distress during COVID-19, Umbetkulova and colleagues [9] reported that while 12 studies described worsening mental health over time, six studies identified a significant decrease in perceived stress as the pandemic progressed. These authors attributed these discrepant findings to differences in instruments, participants, timing, sampling, and geography. During the COVID-19 pandemic, psychological distress was higher among younger individuals [9–11], females [9, 11, 12], nurses as compared to physicians [5, 11], people with children at home [12, 13], not having been infected with SARS-CoV-2 [14], working on a high-risk unit [10], and providing patient-facing care [12].

The objectives of this study were to determine if and how emotional distress, as measured by the K10, varied among HCP over the course of the study (March 28, 2021 to December 1, 2023) and how K10 scores were associated with demographic and occupational factors.

Methods

Study design

The parent study, the COVID-19 Cohort Study, was a 42-month prospective study following a group of HCP as previously described [15]. Each participant was followed for the duration of their participation in the study to determine incidence and risk factors for infection with COVID-19. Participants were enrolled from June 2020 to June 2023 with data collection ending upon participant withdrawal or study termination on December 1, 2023, whichever occurred first. Recruitment occurred following ethical approval at each participating centre.

Participants

HCP were eligible for the parent study if they were 18 to 75 years old at enrolment; provided written consent; were employed ≥ 20 h per week by a participating hospital or were a physician, nurse practitioner, or midwife with hospital privileges at any site or a private practice in Toronto. Participants were excluded from this sub-study if they did not submit at least one complete K10 survey. If any single item score was missing, that K10 survey was dropped; single item scores were not imputed. As gender was considered a potential explanatory variable, those who indicated their gender was other than male or female were dropped from analyses due to the small sample size.

Survey instruments

Consenting participants were asked to complete a number of online study-specific surveys as previously described [15]. In short, risk/protective factor information was asked at enrolment and annually thereafter with ongoing/open surveys requesting COVID-19 vaccine and respiratory illness information as needed. Even though the study started after the World Health Organization had declared COVID-19 a Public Health Emergency of International Concern and characterized the outbreak as a pandemic [16], all COVID-19 illness episodes were captured as baseline questionnaires asked: "Have you ever tested positive for COVID-19 (by PCR or rapid antigen test (RAT)?" Starting in March 2021, HCP were asked to complete a K10 at enrollment (ongoing participants were asked to complete the K10 on their 6- or 12-month anniversary of enrolment) and then every six months. The K10 measures the frequency of non-specific symptoms of psychological distress experienced during the previous four weeks [17]. Consistent with established guidelines, each item was scored from one (none of the time) to five (all of the time). Summed 10-item scores can range from 10 to 50; higher scores are indicative of greater distress [17]. Psychometric properties of the K10 are well established [18] with Cronbach α estimates ranging from 0.93 [18] to 0.88 [19]. This study used a score of ≥ 16 to identify those most likely to be experiencing emotional distress [20]. K10 scores were also categorized as low (10–15 points), moderate (16–21 points), high (22–29 points), and very high (30–50 points) [21]. Further, consistent with scale conceptualization, K10 subscale scores (anxiety [four items, score range: 4 to 20]; depression [six items, score range: 6 to 30]) [22] were also derived.

Time and periodicity

For this sub-study, time was measured in four-week periods to correspond with the K10 questionnaire. The COVID-19 Policy Response Canadian tracker database,

developed by Atkenteva et al., classifies the intensity of non-pharmacological, public health measures introduced in each Canadian province and territory on an ordinal scale (0–3) for three domains (schools, work, and other) (e.g., level 3: schools: all schools closed for in-person instruction; work: all non-essential workplaces closed or operating remotely, only essential services or businesses remain open; other: stringent gathering restrictions, border closures between provinces for non-essential travel, closure of all indoor activities, and closure of most outdoor activities). Periods when restrictions summed to ≥ 7 were identified as periods of high mitigation. As most of the data were from Ontario participants and mitigation periods were very similar across provinces, mitigation periods were determined using Ontario data.

We also assessed whether winter (December 21 to March 20) versus non-winter periods impacted K10 scores. While some investigators have noted seasonal recurrences of depressive and anxiety symptoms, notably when looking at seasonal affective disorder [23], the results have been inconsistent [24]. Further, while not established for COVID-19, other respiratory viruses are associated with outbreaks during the winter months [25] which may also impact levels of emotional distress [4].

Data analysis

Measures of central tendency were run for all continuous study variables. As some participant characteristics could have varied over time, the average of the values for each continuous variable (e.g., household size) and the most frequently observed categorical variable (e.g., taking medications) were used. Univariable analyses were done in Stata (v.18) with two-tailed tests of significance and significance set at $p < 0.05$ using t-tests, Fisher's exact, chi square, or Wilcoxon signed rank tests, as appropriate.

Linear mixed effects models were fitted to determine the impact of time on the dichotomized K10 categories. The overall effect of time was determined using four-week periods, season, and intensity of mitigation strategies and a random intercept model to account for the dependence between observations from the same participant. Models were fit using the lme4 package in R software [26]. An adjusted linear mixed effects model that included all significant time factors and demographic factors (age, gender, household composition, use of anti-anxiety, antidepression or anti-insomnia prescription medications, province), occupational factors (occupation, working on a high-risk unit, level of patient contact), and COVID-19-specific factors (previous positive COVID-19 test, vaccination history) was generated. Using stepwise regression, the most parsimonious model was chosen via backward elimination using the p-value for the F-test as the determinant, with a threshold of 0.05. If all levels of a categorical variable together explained a significant amount of variation of the K10 scores, then that variable was kept in the model.

Overall model fit, heterogeneity of variance assumptions, normality assumptions, and time dependence were all assessed to ensure model assumptions were not violated. The continuous variables were normalized to the interval [0,1] before estimating the model parameters. To adjust for heteroscedasticity, K10 scores were logarithmically transformed in all linear mixed effects models. As such, all model estimates are interpreted as the percent change in K10 scores every four-weeks per one point change in the independent variable.

A sensitivity analysis was conducted to repeat the model-building exercise using data from respondents who had submitted ≥ 5 K10 surveys to assess whether participant enrolment and/or withdrawal impacted the overall results. We used the same approach as described above to create mixed effects models. Relationships between the depression and anxiety sub-scale scores and study covariates were assessed using the methods described above.

Results

For this sub-study, 8980 complete K10 surveys were submitted between March 28, 2021 and December 1, 2023 by 2332 HCP of whom 2025 (86.8%) were female, the mean age was 40 years (95% confidence interval (CI) 40.9, 41.9), and the median household size was 3 (interquartile range (IQR) 2, 4). One third of participants were nurses, 780 (33.6%) worked on a high-risk unit (adult emergency room, intensive care unit (ICU), adult medical unit), and 1224 (52.6%) provided direct patient care. The median number of K10 submissions per person was 4 (IQR 2, 6; range 1–7) and the median interval between responses was 182 days (IQR 154, 210). Supplemental Table 1 compares participation in the K10 surveys ($n = 2332$ or 86.0%) to that of participation in the parent study ($n = 2712$).

Factors associated with changes in K10 scores

As shown in Table 1, K10 scores generally decreased over the course of the study but were higher during periods of high levels of COVID-19 mitigation activities and during the winter season. The mean K10 score during the first four weeks of the study (March/April 2021) was 20.4 (CI 19.9, 20.8), with 526 of 751 participants (70.0%) scoring ≥ 16, indicative of moderate or higher levels of distress. The average decline in K10 scores was 3.1 (CI 2.3, 3.9) points from study start to end, with 204/415 (49.2%) scoring ≥ 16 during the final four weeks of the study (November 2023). In 2021, 225 (30.0%) were categorized as having a low level of distress, 32.2% moderate, 25.0% high, and 12.8% very high.

Table 1 Percent change in K10 scores, Canadian healthcare providers (March 28, 2021-December 1, 2023), all participants and those submitting five or more K10 surveys: linear mixed effects models

	All participants Percent change[a,b] (95% CI) (*N* = 2332 participants)	**≥ 5 K10s submitted Percent change[a,b] (95% CI) (*N* = 1063 participants)**
Period, per 4 weeks	**-0.4 (-0.5, -0.3)**	**-0.5 (-0.6, -0.4)**
Mitigation: Low level	Referent	Referent
High level	**5.6 (3.8, 7.4)**	**5.9 (3.8, 8.1)**
Season: Not winter	Referent	Referent
Winter (Dec. 21-Mar. 20)	**1.5 (0.2, 2.7)**	1.4 (-0.1, 2.8)
Age, in years	**-0.8 (-0.9, -0.7)**	**-0.8 (-1, -0.7)**
Gender: Female	Referent	Referent
Male	**-5.9 (-9.3, -2.3)**	**-6.5 (-11.2, -1.5)**
Children in household, per child	**-1.1 (-2.2, -0.1)**	**-1.9 (-3.3, -0.5)**
No medications	Referent	Referent
Anti-anxiety/antidepression/anti-insomnia medication	**10.0 (7.5, 12.6)**	**7.6 (4.5, 10.7)**
No COVID-19 illnesses	Referent	NA
Previous illness(es)	**-1.7 (-3.1, -0.2)**	
COVID-19 vaccination status		
Unvaccinated	Referent	Referent
One dose	-3.7 (-7.8, 0.6)	-5.3 (-10.4, 0.2)
Primary series	-0.9 (-4.6, 2.9)	-0.4 (-5.0, 4.4)
Booster 1	2.0 (-2.1, 6.3)	3.7 (-1.5, 9.2)
Booster 2	1.5 (-3.1, 6.4)	2.9 (-2.8, 8.9)
Booster 3	3.9 (-1.2, 9.4)	5.5 (-0.7, 12.1)
Occupation		
Nurse/NP/midwife	Referent	NA
Physician/physician assistant	-4.1 (-8.3, 0.4)	
Other regulated HCP[c]	**-4.1 (-6.9, -1.2)**	
Other non-regulated[d]	-2.6 (-5.5, 0.4)	

Bold identifies group significantly different ($p < 0.05$) from the referent

NP Nurse practitioner, *HCP* Healthcare practitioner, *NA* Not applicable

[a] Variance estimates adjusted for clustering within province

[b] Adjusted for all variables with estimates provided in column

[c] Respiratory therapist, laboratory technician, physical therapist, occupational therapist, imaging technician/technologist, pharmacist, pharmacy technician, psychologist, and social worker

[d] Infection prevention and control practitioner, food service, ward clerk, administration, healthcare aids, housekeeper, porter, research, and other clinical support

By November 2023, the percent of participants with a low level of distress was 211/415 (50.8%) while 26% had moderate, 14.9% had high, and 8.2% had very high K10 scores. Decreases in K10 scores were also associated with being male, older age, having more children in the household, prior COVID-19 illness(es), and being a regulated HCP other than a nurse.

As seen in Fig. 1, decreases in mean K10 scores were not monotonic. After an initial decline, mean scores increased again to > 20 in January/February 2022 before generally decreasing for the remainder of the follow-up.

Mean score: raw mean K10 scores (dotted line).

Fitted score: median K10 scores as estimated by linear mixed effects model adjusted for time, mitigation level, and season (solid line).

In the sensitivity analysis, limited to participants with five or more K10 submissions ($N = 5953$ observations from 1063 participants), K10 scores were 18.9 (CI 17.1, 20.7) in March/April 2021 and 16.4 (CI 14.4, 18.3) in November 2023. This corresponded with 68.5% of HCP scoring ≥ 16 points in March/April 2021 compared with 48.3% in November 2023; similar to the full cohort. Decreases in K10 scores were also associated with being male, older versus younger age, having more children in the household, and generally over the period of the study. Higher scores were associated with being on medications to reduce anxiety, depression, or sleeping problems and during periods of high mitigation activities.

K10 sub-scores: anxiety and depression

The estimated anxiety scores resulting from linear mixed effects modelling indicated that scores were lower for older compared to younger respondents, males versus females, those who had previously tested positive for SARS-CoV-2, and that they generally decreased over

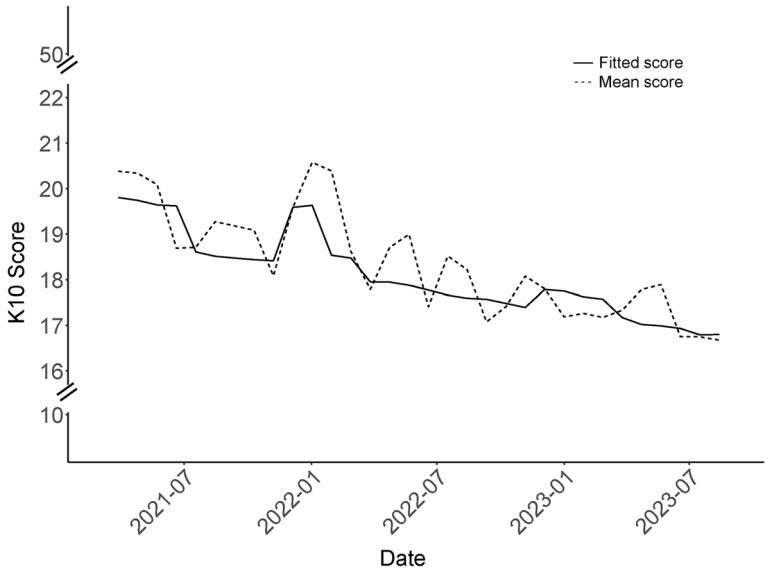

Fig. 1 K10 scores over time, Canadian healthcare providers, March 28, 2021-December 1, 2023

the period of the study. Anxiety scores were, however, higher for people taking medications to help with anxiety, depression, and/or sleep problems, during periods of high mitigation, and during the winter (see Table 2).

Depression scores were lower for older respondents, males, people with more children in their household, regulated HCP in comparison to nurses, and generally decreased over time. Depression scores were higher for people taking medications to help with anxiety, depression, and/or sleep problems, during periods of high mitigation, and during the winter.

Discussion

This research provides critical insights into how and why emotional distress, measured approximately every six months, varied from March 2021 to December 2023. In our study of Canadian HCP, mean K10 scores decreased from 20.4 to 17.3 from study start to end. Despite the declared end of the global health emergency in May 2023 [16], close to half of all HCP were still reporting moderate or higher levels of distress by study end, indicating long-lasting emotional impacts. Of interest, K10 scores did not decline monotonically; rather they increased during periods of increased COVID-19 mitigation activities and during the winter months. Non-periodic factors were also associated with levels of distress. Those who were taking medication to treat anxiety, depression, or insomnia had higher K10 scores while lower K10 scores were associated with older age, being male, having more children in the household, having been previously infected with COVID-19, and being a non-physician regulated HCP versus a nurse.

Time-related changes in emotional distress have been noted by other researchers. López Steinmetz and colleagues, who used the Argentinian version of the K10 (cut off > 20), reported a significant increase in the percent of HCP with K10 scores indicative of distress between April/May (52.5%) and September 2020 (62.6%) [27]. Using the 6-item Kessler Psychological Distress Scale (K6) [6], Maunder et al. reported that Canadian HCP emotional distress increased between September 2020 and January 2021 [13]. Both studies examined differences prior to vaccines being widely available. Kameno et al. followed HCP from 19 Japanese hospitals from February 2021 to October 2022 [28] and, similar to the current study, found that distress scores, as measured by the K6, significantly decreased over time and that the rate of change varied over time [28].

The decline in mean distress scores was not uniform; periodic factors impacted distress level trajectories. Our results indicate that K10 scores, as well as anxiety and depression sub-scale scores, were higher during the winter months. Winthorst et al. [22] reported a small increase in depressive symptoms in healthy controls during the winters of 2004–2007. Similarly, Maunder et al. [13] reported an increase in K6 scores during the winter of 2021. Wang et al. reported that, among Chinese operating room nurses surveyed between December 2021 and January 2022, lower K10 scores were associated with reduced sunlight exposure hours [26].

K10 scores also increased by 5.6% during periods when the mitigation intensity score associated with the three domains (schools, work, and other) was higher (≥ 7). For example, this could be when schools were closed

Table 2 Percent change in K10 anxiety and depression sub-scale scores, Canadian healthcare providers (March 28, 2021-December 1, 2023): linear mixed effects models

	Percent change[a,b] (95% CI) Anxiety scores (*N* = 2332)	**Percent change[a,b] (95% CI) Depression scores (*N* = 2332)**
Four-week period	**-0.4 (-0.5, -0.2)**	**-0.5 (-0.6, -0.4)**
Mitigation: Low level	Referent	Referent
High level	**4.9 (3.0, 6.9)**	**6.0 (4.0, 8.0)**
Season: Not winter	Referent	Referent
Winter (Dec. 21-Mar. 20)	**1.4 (0, 2.8)**	**1.5 (0.1, 3.0)**
Age, in years	**-0.9 (-1.0, -0.8)**	**-0.7 (-0.8, -0.6)**
Gender: Female	Referent	Referent
Male	**-6.6 (-10.0, -3.1)**	**-5.7 (-9.4, -1.9)**
Children in household, per child	NA	**-1.4 (-2.5, -0.2)**
No medications	Referent	Referent
Anti-anxiety/antidepression/anti-insomnia medication	**10.2 (7.5, 13.0)**	**10.6 (7.8, 13.5)**
No COVID-19 illness	Referent	NA
Previous illness	**-2.0 (-3.6, -0.4)**	
COVID-19 vaccination status		
Unvaccinated	Referent	Referent
One dose (of 2 dose vaccines)	-3.7 (-8.3, 1.1)	-3.8 (-8.4, 1)
Primary series	-3.3 (-7.2, 0.8)	0.6 (-3.6, 4.9)
Booster 1	-0.2 (-4.6, 4.4)	3.0 (-1.7, 7.8)
Booster 2	-1.4 (-6.3, 3.8)	2.7 (-2.5, 8.2)
Booster 3	0.6 (-4.9, 6.3)	5.6 (-0.3, 11.7)
Occupation: Nurse/NP/midwife	Referent	Referent
Physician/physician assistant	NA	-3.8 (-8.4, 1)
Other regulated HCP[c]		**-4.5 (-7.6, -1.3**)
Other non-regulated[d]		-3.2 (-6.4, 0.1)

Bold identifies groups significantly different ($p < 0.05$) from referent group

NP Nurse practitioner, *HCP* Healthcare provider, *NA* Not applicable

[a] Variance estimates adjusted for clustering within province

[b] Adjusted for all variables with estimates provided in column

[c] Respiratory therapist, laboratory technician, physical therapist, occupational therapist, imaging technician/technologist, pharmacist, pharmacy technician, psychologist, and social worker

[d] Infection prevention and control practitioner, food service, ward clerk, administration, healthcare aids, housekeeper, porter, research, and other clinical support

(school domain rank as 3), when working from home was strongly suggested or most businesses were closed except for specific sectors/worker categories (work domain ranked as 2), and when there were moderately strict public gathering restrictions, some inter-provincial travel restrictions, closure or significantly reduced capacity of most indoor activities, and closure of some outdoor activities (other domain ranked as 2). HCP are not just essential workers but people who live within a social context impacted by all mitigation strategies. For example, an American survey of HCP conducted in December 2020 found that 49% of respondents had emergency childcare needs that disrupted their work in the past year and that 41% anticipated having unmet childcare needs in the next year [29]. Contextual factors need to be considered when determining the overall impact of stressful events on the emotional states of HCP.

While unmet childcare needs led to increased distress in some studies, similar to two other studies of Canadian HCP [13, 30], we found that having more children living in the household was associated with lower K10 scores. Mehta et al. [30] reported that living with child(ren) was associated with lower anxiety subscale scores but not with depression scores in Canadian ICU staff surveyed in 2020. Styra et al. [31] reported that informal sources of support from family members and others mitigated Canadian HCP distress and that 77% of HCP relied on such informal supports early in the pandemic. Taken together, having familial social support appears to mitigate HCP emotional distress but being unable to meet

the needs of these important family members appears to increase distress.

Non-periodic factors were also associated with emotional distress. HCP K10 scores were 10% higher, on average, for respondents who were taking antidepressants, anti-anxiety or anti-insomnia medications. These drugs may have been prescribed for a pre-existing emotional health issue and, if so, should have helped mitigate symptoms of COVID-19-related emotional distress if they had been taken for an appropriate period of time. While some studies have linked pre-existing mental health issues with increased distress during COVID-19 [32], we were unable to determine whether the use of these medications preceded or followed the stresses of working during the pandemic. Other researchers of coping strategies used by HCP during the COVID-19 pandemic reported that Turkish physicians and German HCP coped by taking antidepressants [33, 34] or using psychotropic drugs [35] while a Canadian study found that HCP used alcohol [36] to cope with the increased stress. A second Canadian study also found that HCP used alcohol to cope with stress during the pandemic, but in addition, and similar to other studies [37], during qualitative interviews they also identified physical exercise, yoga, meditation, and interacting with friends and family as frequently used coping strategies. Regardless of the method of stress relief, there is a clear need to provide HCP working during stressful events with evidence-based stress relief.

In a systematic review of mental issues among HCP working during COVID-19, Arias-Ulloa et al. also noted that females were at greater risk of emotional distress. These authors suggest that sex differences may be due to the fact that males find it more difficult to recognize psychological distress [11]. Zhang et al. postulate that gender differences may be due to gender roles that may vary with age [38] suggesting further examination of possible interactions between other exploratory factors and gender in future studies. Further, considering that in 2021, 91% of the Canadian nurses were female [39] while in 2022, 45% of Canadian physicians [40] and 70% of physiotherapists [41] were female, further research into the impact of gendered roles on jobs performed during the pandemic and subsequent risk of emotional distress is warranted.

In the current study, older participants tended to have lower K10 scores across the 2.5 years of follow-up; a ten-year increase in age was associated with K10 scores that were 8% lower than those a decade younger. The relationship between age and emotional distress has not been consistent. Umbetkulova and colleagues [9] found that younger HCP were at greater risk for developing mental health issues than older ones in their systematic review. Meanwhile, Arias-Ulloa et al. [11] postulated that inconsistencies may be due to how stress was measured, how age was grouped, what confounders were measured, and how they were used in the analysis. In a third review paper, Galanis and colleagues [10] suggested that younger nurses may be more susceptible to burnout as they may be less familiar with infection control measures and less able to handle extreme events, such as a pandemic.

These findings suggest that in the face of highly stressful situations, healthcare institutions should closely monitor the mental health of staff to provide needed psychological support and stress relieving strategies such as regular meetings to reflect on existing problems and open comprehensive evaluation of organizational risk [42]. Supportive institutional practices identified by more than half of Canadian ICU staff responding to one survey included the need for clear and unambiguous communication from their institution, expressions of gratitude from the hospital's leadership, having leadership who were open to hearing staff concerns, free or subsidized parking, and scrubs so they could change before going home [30].

The results of our study may have limited generalizability among HCP as study participants were self-selected leaving room for possible selection bias where those more interested in SARS-CoV-2 enrolled in the parent study and those more interested in distress completed the K10 surveys. As well, there is some suggestion that our study participants may be younger, on average (41.4 years), than the Canadian HCP population (mean age; nurses: 43–44 years [39]; physicians: 49 years [40]). Selection bias may also be present as younger participants were less likely to continue for the full follow-up period, thus reducing the number of K10s completed later in the study. As well, all results are self-reported and may suffer from social desirability bias; i.e., respondents may have been reluctant to endorse symptoms associated with emotional distress. As no pre-pandemic K10 measures are available and data were not collected for the first year of the pandemic, this study cannot provide information to compare with those periods. However, these limitations are somewhat mitigated by the fact that this was a pan-Canadian study with a large sample size that collected data for 32 consecutive months using a validated distress scale.

Conclusion

During the COVID-19 pandemic, distress scores generally declined between 2021 and 2023; however, the downward trend was interrupted during periods of increased viral activity and high public health mitigation measures and by the winter seasons. Higher levels of distress were observed for those who took anti-anxiety, antidepression or anti-insomnia medications, while lower levels were observed among those who were

older, male, had children at home, had experienced COVID-19, and were regulated HCP who were not physicians (versus nurses) after adjusting for time- and period-related measures. These findings indicate the need for early identification of distress followed with effective, evidence-based stress relief measures.

Abbreviations

HCP Healthcare provider
K10 10-Item Kessler Psychological Distress Scale
ICU Intensive Care Unit
K6 6-Item Kessler Psychological Distress Scale

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12913-024-11577-w.

Supplementary Material 1: Supplemental Table 1. Characteristics of Canadian healthcare providers participating in the COVID-19 Cohort Study and Sub-Study Participants: N (%) unless otherwise stated.

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Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to information that could compromise the privacy of research participants but are available from the corresponding author on reasonable request.

Data availability

Study data cannot be shared openly. The datasets generated and/or analysed during the current study are not publicly available due to information that could compromise the privacy of research participants. Data are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Research Ethics Boards of Sinai Health System (20–0080-E, 2020–04-17), Sunnybrook Health Sciences Centre (1644, 2020–04-13), Michael Garron Hospital (807–2004-Inf-055, 2020–04-29), North York General Hospital (20–0017, 2020–05-06), University Health Network (20–5368, 2020–05-21), Unity Health Toronto (20–109, 2020–06-01), Oak Valley Health (121–2010, 2020–11-04), William Osler Health System (2020–12-18), Hamilton Health Sciences Centre (12809, 2020–12-31), St. Joseph's Healthcare Hamilton (13044, 2020–12-31), University of Alberta (Pro00106776, 2021–01-13), Nova Scotia Health (1026317, 2021–02-02), The Ottawa Hospital (20210024-01H, 2021–02-05), and Centre hospitalier universitaire de Sherbrooke (MP-31–2021-4104, 2021–06-09).
Informed consent was obtained from all participants involved in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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