COVID-19: Factors associated with psychological distress, fear, and coping strategies among community members across 17 countries

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Abstract

Background: The current pandemic of COVID-19 impacted the psychological wellbeing of populations globally.

Objectives: We aimed to examine the extent and identify factors associated with psychological distress, fear of COVID-19 and coping.

Methods: We conducted a cross-sectional study across 17 countries during Jun-2020 to Jan-2021. Levels of psychological distress (Kessler Psychological Distress Scale), fear of COVID-19 (Fear of COVID-19 Scale), and coping (Brief Resilient Coping Scale) were assessed.

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Introduction
The COVID-19 pandemic, with more than 226 million cases and 4.7 million deaths by mid Sep-2021, has occurred in waves [1]. The first wave raised the alarm of what was imminent; the second wave identified the in-country differences in incidence, prevalence and mortality rates as well as health system gaps, notwithstanding policy failures; while the third wave further exposed varying social, financial, policy and failures in the health system management on the global scale.

COVID-19 impacted psychological wellbeing of global populations. Studies revealed that COVID-19 pandemic affected people in discrete ways across the world and exposed varying degrees of vulnerability among divergent community members. Evidence linked emotional stress to disasters, quarantine and lockdown, where people in uncertain situations used to lose the power to predict and control their lives under conditions of threat [2]. Prevalence of psychological distress, anxiety and depression during the COVID-19 pandemic was reported as 50%, 27% and 28% respectively, in a systematic review with 398,771 participants [3]. Psychological distress had been shown to be more prevalent among middle-aged single women and mothers, and those in lower-income groups [4]. A recent review of the psychological effects of COVID-19 related lockdown reported many negative psychological effects associated with quarantine including fear, stress, insomnia, depression, frustration, and anger and some of those persisted post quarantine period [5].

Factors associated with psychological wellbeing during the current COVID-19 pandemic were diverse. However, the primary reasons for COVID-related stress were associated with contracting the virus, related complications, restrictions and mandated lockdowns, social isolation, financial loss, lack of income and disruption of daily routines which have been observed globally [6]. Moreover, critical incidents such as deaths of family members, pre-existing stressors, being older and migrant were substantial grounds for poor mental health outcomes [7]. An international study of 18 countries examining the mental health outcomes related to mandatory lockdowns showed that half of the study population (n=9,565) expressed moderate mental wellbeing; financial impacts along with lack of access to basic needs were identified as substantial grounds for such poor mental health outcomes [8]. A recent Australian study also found that people with higher psychological distress increased smoking and alcohol consumption during the pandemic period; females and people with pre-existing mental health conditions were more likely to experience higher levels of psychological distress [9]. Furthermore, being on the frontline, health care workers also confronted physical and mental health consequences of COVID 19 crisis [10].

COVID-19 was unpredictable. Varying degrees of lockdown or isolation measures were implemented nationally, depending on the stage of the pandemic. Most of the published studies examined psychological impacts of COVID-19 in a single country or small communities. A recent systematic review and meta-analysis showed that Black and Asian ethnic community people were at increased risk of COVID-19 infection, intensive care admission and deaths [11]. Evidence from multicultural communities on a global scale was lacking. Unless the issues of COVID-related mental wellbeing were addressed in a timely manner, such impacts could potentially translate into a range of long-term illnesses with severe economic impacts. As COVID-19 continued to peak in many countries, it was imperative that ongoing planning with mental health support strategies and early identification of psychological distress were realised, because people had the ability to normalise stressful situations...
when they had access to support networks and resources [12]. Therefore, our study aimed to examine the extent of and the factors associated with psychological distress, the level of fear of COVID-19 and coping strategies amongst a diverse range of community people in multi-country settings.

Materials and methods

Study design and settings

We conducted a cross-sectional study across 17 countries utilizing web-based online platforms. Participating countries included Australia, Bangladesh, Egypt, China (Hong Kong), Indonesia, Jordan, Kuwait, Libya, Malaysia, Nepal, Oman, Pakistan, Palestine, Saudi Arabia, Syria, Thailand, and the United Arab Emirates (UAE). Those countries were selected based on the existing collaborative relationships with the first author.

Study population

Adults aged ≥18 years, living in the participating countries, able to respond to an online questionnaire in English/Arabic/Thai/Nepali were eligible. Thus, study participants included general community members, healthcare professionals, patients, university students and staff. Patients were defined as individuals who attended a general practice or an allied healthcare setting (for any medical condition including COVID-19 related illness) in the previous four weeks at the time of data collection. Frontline or essential service workers were defined as individuals who self-identified themselves as being in contact with patients/clients during the pandemic period.

Sampling

Sample size was calculated using OpenEpi. Study population and estimated prevalence of stress varied across the participating countries. Therefore, keeping the population size as 100,000,000, assuming 50% prevalence of stress globally, 95% confidence intervals and 80% power, the estimated minimum sample size was 385. That number was the highest possible number, even if the population size and the prevalence of stress varied across countries. Therefore, careful consideration and taking into account the opinion of the cooperating countries, we agreed a minimum sample size of 385 participants for each collaborating country.

Data collection

An online link was created with a structured survey questionnaire using the Google form. Data were collected in Jun-2020 in Australia, Aug-Sep-2020 in Bangladesh and Malaysia, and during Nov-2020 to Jan-2021 for the other 14 countries. A separate link was created for each language (English, Arabic, Thai and Nepali). The plain language information statement (PLIS) and the consent form appeared on the first screen. Only participants, who provided consent and met the eligibility criteria, could move to the next screen. The subsequent seven screens contained the full study questionnaire, comprising of 39 questions. All responses were anonymous.

The English version of the PLIS, consent form and the study questionnaire were translated into other languages as mentioned above, back-translated to English, reviewed and pilot-tested by the team of local lead investigators for Arabic (Egypt, Saudi Arabia, UAE), Thai (Thailand) and Nepali (Nepal) versions. An invitation with the online survey link and QR code were shared using different social media platforms, online community networks, staff and student email databases of participating universities/hospitals. Text messages using SMS, Viber, WhatsApp were also shared. Flyers containing the QR codes of the study were also distributed and posted in university/healthcare settings. The survey was open to minimise selection bias, so anyone having the survey link could participate in the study; and no incentives were provided for participation in the study.

Study tool

The structured survey questionnaire was adapted from the previous study conducted in Australia [9]. The survey questionnaire was pre-tested across different electronic devices. Psychological distress was measured using the Kessler Psychological Distress Scale (K-10) having 10-items, [13] fear was measured using the Fear of COVID-19 Scale (FCV-19S) having 7-items, [14] and coping was measured using Brief Resilient Coping Scale (BRCS) having 4-items [15]. Reliability of those tools in the English version was examined in the Australian study, and it was found that they worked for migrants and non-migrants [16].

Data analyses

The database was downloaded from the Google platform and Stata statistical software Stata/SE V.15.0 for Windows (StataCorp, College Station, USA, 2017) was used for data analyses. Descriptive statistics, including frequencies and percentages, were generated for categorical variables; means and standard deviations (SD) were generated for continuous variables. Psychological distress (based on the K-10 scoring) was categorised into low (score 10-15) and moderate to very high (score 16-50), fear of COVID-19 (based on the FCV-19S scoring) was categorised into low (score 7-21) and high (score 22-35), and coping (based on the BRCS scoring) was categorised into low (score 4-13) and medium to high (score 14-20).

Univariate and multivariate logistic regression analyses were conducted to examine the association between
variables. Multivariate analyses were conducted to control potential confounders and the results are presented with odds ratios (ORs), adjusted ORs (AOR) and 95% confidence intervals (CIs). We also tested the sensitivity of analyses by excluding the non-significant association from the univariate model, but no changes were observed in the adjusted model. We investigated potential effect modification between age groups, gender and psychological distress, fear of COVID-19 and coping strategies. The additive log risk model was compared with multiplicative odds ratio model using the likelihood ratio test and Bayesian information criterion. A cut-off of p<0.05 was considered as statistically significant. For the country-wise comparison, we selected the reference country based on the lowest prevalence of moderate to very high psychological distress, lowest prevalence of high level of fear of COVID-19 and lowest prevalence of medium to high resilience coping, then we organised other countries chronologically for each outcome based on the scores prior to conducting the multivariate analyses.

Ethics
Ethics approval was obtained from the Human Research Ethics Committee from each participating country. The survey was voluntary in nature and participants got the opportunity to have informed decision to participate in the study. Privacy and confidentiality of the collected data were maintained.

Results
A total of 8987 individuals from 17 countries met the eligibility criteria and consented to participate in the study. However, 8559 of them (95%) completed the questionnaire and were included for analyses. Most countries contributed 6-7% of the study population except Bangladesh (11%) and Saudi Arabia (9%). Mean age (±SD) of the participants was 33 (±13) years and two-thirds (64%) were females. More than one-third (42%) had a source of income during the pandemic, while 51% had their jobs adversely affected by COVID-19. More than one-third (40%) self-identified as frontline or essential service workers, which included 14% doctors and 16% nurses. Only 4% reported having a history of psychiatric or mental health issues. The majority (81%) had never been smokers, and only 11% reported drinking alcohol in the last four weeks prior to data collection.

Psychological distress
The univariate analyses showed reasonable evidence against the null hypothesis of no association between moderate to very high levels of psychological distress and a number of variables (Table 2). However, when adjusted for potential confounders, being female, perceived distress due to change of employment status, self-identification as a doctor, being affected by the change of financial situation, comorbidities with mental health conditions, unsure and indirect contact with COVID-19 patient, being a patient, use of healthcare service to overcome COVID-related stress, and higher levels of fear of COVID-19 were found to be associated with moderate to very high levels of psychological distress. We did not identify any effect modification between age groups, gender, and psychological distress.

Levels of fear
Similar to psychological distress, participants from all 17 countries demonstrated significant levels of fear to COVID 19 (Table 3). After adjusting for potential confounders, high levels of fear were associated with being aged 30-59 years, being female, perceived distress due to a change of employment status, self-identification as a frontline or essential service worker, being affected by the change of financial situation, having comorbidities, drinking alcohol in the previous four weeks, unsure contact with a COVID-19 case, health service use to overcome COVID-related stress, and having moderate to very high levels of psychological distress. We did observe some effect modification with gender and fear of COVID-19 (contact with a COVID-19 patient) (data not shown).

Coping strategies
Table 4 shows the univariate analyses identifying significant association between medium to high resilient coping and other variables. From the multivariate analyses, we identified that participants who were ≥60 years old, self-identification as a nurse, whose financial situation was impacted negatively, who perceived their own mental health as good to excellent, who...
Table 1 Characteristics of the study population

| Characteristics                                      | Total, n(%) |
|------------------------------------------------------|-------------|
| Total study participants                              | 8559        |
| Age (in years)                                        | 7665        |
| Mean (±SD)                                            | 33.3 (12.5) |
| IQR (25th percentile to 75th percentile)             | 23-41       |
| Age groups                                            | 7664        |
| 18-29 years                                           | 3683 (48.1) |
| 30-59 years                                           | 3646 (47.6) |
| ≥60 years                                             | 335 (4.4)   |
| Gender                                                | 8475        |
| Male                                                  | 3016 (35.6) |
| Female                                                | 5459 (64.4) |
| Country of residence                                  | 8559        |
| Australia                                             | 587 (6.9)   |
| Bangladesh                                            | 962 (11.2)  |
| Egypt                                                 | 416 (4.9)   |
| Hong Kong                                             | 555 (6.5)   |
| Indonesia                                             | 541 (6.3)   |
| Jordan                                                | 538 (6.3)   |
| Kuwait                                                | 417 (4.9)   |
| Libya                                                 | 114 (1.3)   |
| Malaysia                                              | 720 (8.4)   |
| Nepal                                                 | 311 (3.6)   |
| Oman                                                  | 437 (5.1)   |
| Pakistan                                              | 418 (4.9)   |
| Palestine                                             | 417 (4.9)   |
| Saudi Arabia                                          | 803 (9.4)   |
| Syria                                                 | 408 (4.8)   |
| Thailand                                              | 498 (5.8)   |
| UAE                                                   | 417 (4.9)   |
| Born in the same country of residence                 | 8463        |
| No                                                    | 1310 (15.3) |
| Yes                                                   | 7153 (83.6) |
| Living status                                         | 8441        |
| Live without family members                           | 1908 (22.6) |
| Live with family members                              | 6533 (77.4) |
| Highest educational/vocational qualification          | 8449        |
| Primary/Grade 1 to 6                                  | 62 (0.7)    |
| Secondary/Higher Secondary/Grade 7 to 12              | 1546 (18.3) |
| Certificate/Diploma/Trade qualifications              | 877 (10.4)  |
| Bachelor/Masters/PhD                                  | 5964 (70.6) |
| Current employment condition                          | 8206        |
| Unemployed/Housewife/Home maker/Home duties (No source of income) | 643 (7.8) |
| Jobs affected by COVID-19 (lost job/working hours)    | 4148 (50.5) |
| Table 1 Characteristics of the study population (Continued) |
|                                                                                       |
| Characteristics                                      | Total, n(%) |
| Reduced/afraid of job loss                            |             |
| Have an income source (employed/Government benefits) |             |
| Perceived distress due to change of employment status |             |
| A little to none                                      | 4712 (61.8) |
| Moderate to a great deal                               | 2916 (38.2) |
| Improved working situation due to change of employment situation |         |
| A little to none                                      | 4473 (76.8) |
| Moderate to a great deal                               | 1349 (23.2) |
| Self-identification as a frontline or essential service worker |         |
| No                                                    | 5046 (59.5) |
| Yes                                                   | 3430 (40.1) |
| Self-identification as a healthcare worker            |             |
| No                                                    | 3843 (61.1) |
| Yes, doctor                                           | 887 (14.1)  |
| Yes, nurse                                            | 1032 (16.4) |
| Yes, other healthcare worker                          | 528 (8.4)   |
| COVID-19 impacted financial situation                 |             |
| No impact                                             | 3783 (44.5) |
| Yes, impacted positively                              | 1017 (12.0) |
| Yes, impacted negatively                             | 3707 (43.6) |
| Affected by the change in financial situation         |             |
| Not at all                                            | 1397 (22.8) |
| Unsure at this time                                   | 912 (14.9)  |
| Somewhat                                              | 2770 (45.2) |
| A great extent                                        | 1043 (17.0) |
| Co-morbidities                                        |             |
| No                                                    | 5975 (71.0) |
| Mental health issue                                   | 362 (4.3)   |
| Other co-morbidity                                    | 2079 (24.7) |
| Co-morbidities                                        |             |
| No                                                    | 5975 (71.0) |
| Single co-morbidity                                   | 1547 (19.3) |
| Multiple co-morbidities                               | 474 (5.9)   |
| Smoking                                               |             |
| Never smoker                                          | 6910 (81.2) |
| Ever smoker (Daily/Non-daily/Ex)                      | 1597 (18.8) |
| Increased smoking over the last 6 months              |             |
| No                                                    | 535 (52.6)  |
| Yes                                                   | 483 (47.4)  |
| Current alcohol drinking (last 4 weeks)               |             |
| No                                                    | 7435 (88.9) |
| Yes                                                   | 8365        |
had indirect contact and direct contact with known or suspected cases of COVID-19, and who visited a healthcare provider in the previous six months were more likely to have medium to high resilient coping. We did not identify any effect modification between age group, gender, and coping strategies (data not shown).

Country-wise findings
Country-wise analyses (Table 5) showed that moderate to very high levels of psychological distress was common in all 17 countries. The lowest prevalence (46%) was reported from Thailand and the highest (91%) from Egypt. When other countries were compared considering Thailand as the baseline, it was found that participants from 10 countries (Hong Kong, Oman, Libya, Kuwait, Saudi Arabia, UAE, Jordan, Syria, Palestine and Egypt), demonstrated statistically significant high psychological distress. Prevalence on high levels of fear of COVID-19 varied across 17 countries (Libya: 9%, Bangladesh: 38%). Participants from four countries (Oman, Indonesia, Hong Kong and Pakistan) exhibited higher levels of fear of COVID-19 compared to the participants from Libya. Finally, participants from 12 countries (Jordan, Egypt, Saudi Arabia, Kuwait, Hong Kong, UAE, Palestine, Thailand, Oman, Nepal, Indonesia and Syria) demonstrated statistically significant medium to high resilience coping compared to those from Australia.

Discussion
To our knowledge, this study is one of the few large-scale global cross-sectional studies that assessed psychological distress, levels of fear, and coping strategies and their associated factors among community members, frontline workers, and patients across 17 countries during the first and second wave of the COVID-19 pandemic. We found that more than two-thirds (69%) participants experienced moderate to very high levels of psychological distress and about a quarter (24%) had a high level of fear of COVID-19. Despite having moderate to high levels of psychological distress and fear, more than half of the participants (57%) reported medium to high levels of resilient coping.

Findings from this study were consistent with the previous Australian study [9]. Similarly, the previous research found almost a third of the participants (33%) experienced high to very high levels of psychological distress; however, they found more participants experienced a high level of fear of COVID-19 (32%), while our study found only 24%. Furthermore, the Australian study found that almost all participants (97%) had low resilient coping, whereas this global study found 57% participants

### Table 1 Characteristics of the study population (Continued)

| Characteristics                                      | Total, n(%) |
|------------------------------------------------------|-------------|
| Yes                                                   | 930 (11.1)  |
| Increased alcohol drinking over the last 6 months     | 921         |
| No                                                    | 645 (70.0)  |
| Yes                                                   | 276 (30.0)  |
| Contact with known/suspected case of COVID-19         | 8341        |
| No                                                    | 4899 (58.7) |
| Unsure                                                | 710 (8.5)   |
| Yes, indirect contact                                 | 952 (11.4)  |
| Yes, provided direct care                             | 1780 (21.3) |
| Experience related to COVID-19 pandemic (multiple responses possible) | 8171 |
| No known exposure to COVID-19                         | 6337 (77.6) |
| Tested positive for COVID-19                          | 494 (6.0)   |
| Tested negative for COVID-19 by self-isolated         | 1135 (13.9) |
| Had recent overseas travel history and was in quarantine | 205 (2.5)  |
| Self-identification as a patient (visited a healthcare provider in the last 6 months) | 8322 |
| No                                                    | 5570 (66.9) |
| Yes                                                   | 2752 (33.1) |
| Healthcare service use in the last 6 months           | 2727        |
| In-person visit to a healthcare provider              | 1896 (69.5) |
| Telehealth consultation/Use of national helpline     | 636 (23.3)  |
| Used both services                                    | 195 (7.2)   |
| Perceived mental health status                        | 6290        |
| Poor to fair                                          | 1753 (27.9) |
| Good to excellent                                     | 4537 (72.1) |
| Healthcare service use to overcome COVID-19 related stress in the last 6 months | 8264 |
| No                                                    | 7183 (86.9) |
| Yes                                                   | 1081 (13.1) |
| Type of healthcare service used to overcome COVID-19 related stress in the last 6 months | 1041 |
| Consulted a GP                                        | 356 (34.2)  |
| Consulted a Psychologist                              | 53 (5.1)    |
| Consulted a Psychiatrist                              | 63 (6.1)    |
| Used specialised mental healthcare settings            | 26 (2.5)    |
| Used mental health resources                          | 93 (8.9)    |
| Used mental health resources available through media   | 171 (16.4)  |
| Used mental health support services                    | 79 (7.6)    |
| Used combination of services                          | 199 (19.1)  |
## Table 2 Predictors for psychological distress among the study participants (based on the K-10 score)

| Characteristics                        | Low (score 10-15) | Moderate to Very High (score 16-50) | Unadjusted analyses | Adjusted analyses |
|-----------------------------------------|-------------------|------------------------------------|---------------------|-------------------|
|                                         | n                 | %                                 | p                   | ORs 95% CIs        | p     | AORs 95% CIs |
| **Age groups**                          |                   |                                    |                     |                   |       |              |
| 18-29 years                             | 2434              | 32.1                               | Ref                 | Ref               |       |              |
| 30-59                                   | 1429              | 39.7                               | <0.001              | 0.41 0.37-0.45    | <0.001| 0.50 0.41-0.61|
| ≥60 years                               | 230               | 69.1                               | <0.001              | 0.12 0.08-0.15    | <0.001| 0.15 0.09-0.23|
| **Gender**                              |                   |                                    |                     |                   |       |              |
| Male                                    | 1100              | 36.7                               | Ref                 | Ref               |       |              |
| Female                                  | 1522              | 30.7                               | <0.001              | 1.50 1.36-1.64    | 0.003 | 1.31 1.09-1.57|
| **Born in the same country of residence**|                   |                                    |                     |                   |       |              |
| No                                      | 421               | 32.7                               | Ref                 | Ref               |       |              |
| Yes                                     | 2190              | 30.7                               | 0.118               | 1.06 0.96-1.18    | 0.193 | 1.18 0.92-1.52|
| **Living status**                       |                   |                                    |                     |                   |       |              |
| Live without family members             | 608               | 32.1                               | Ref                 | Ref               |       |              |
| Live with family members                | 2001              | 30.9                               | 0.133               | 1.09 0.97-1.24    | 0.064 | 1.25 0.99-1.56|
| **Highest educational/vocational qualification**|            |                                    |                     |                   |       |              |
| Primary/Grade 1 to 6                    | 20                | 33.9                               | Ref                 | Ref               |       |              |
| Secondary/Higher Secondary/Grade 7 to 12| 373               | 24.2                               | 0.100               | 1.61 0.91-2.83    | 0.375 | 0.53 0.13-2.14|
| Certificate/Diploma/Trade qualifications| 269               | 30.9                               | 0.605               | 1.16 0.65-2.06    | 0.231 | 0.43 0.11-1.72|
| Bachelor/Masters/PhD                    | 1941              | 32.7                               | 0.848               | 1.06 0.61-1.84    | 0.247 | 0.44 0.11-1.75|
| **Current employment condition**        |                   |                                    |                     |                   |       |              |
| Unemployed/Housewife/Home maker/Home duties (No source of income) | 242               | 37.6                               | Ref                 | Ref               |       |              |
| Jobs affected by COVID-19 (lost job/working hours reduced/afraid of job loss) | 1499              | 36.4                               | 0.481               | 1.06 0.89-1.26    | No estimates due to small number |    |
| Have an income source (employed/Government benefits) | 824               | 24.3                               | <0.001              | 1.88 1.58-2.25    | 0.003 | 1.35 1.10-1.63|
| **Perceived distress due to change of employment status** |            |                                    |                     |                   |       |              |
| A little to none                        | 1735              | 36.8                               | Ref                 | Ref               |       |              |
| Moderate to a great deal                | 582               | 19.9                               | <0.001              | 2.38 2.1-2.61     | <0.001| 1.56 1.29-1.90|
| **Improved working situation due to change of employment status** |            |                                    |                     |                   |       |              |
| A little to none                        | 1373              | 30.6                               | Ref                 | Ref               |       |              |
| Moderate to a great deal                | 357               | 26.5                               | 0.022               | 1.23 1.07-1.41    | 0.723 | 0.97 0.80-1.18|
| **Self-identification as a frontline or essential service worker** |            |                                    |                     |                   |       |              |
| No                                      | 1588              | 31.6                               | Ref                 | Ref               |       |              |
| Yes                                     | 1033              | 30.2                               | 0.084               | 1.07 0.98-1.19    | 0.830 | 0.98 0.79-1.21|
| **Self-identification as a healthcare worker** |            |                                    |                     |                   |       |              |
| No                                      | 1072              | 27.8                               | Ref                 | Ref               |       |              |
| Yes, doctor                            | 261               | 29.4                               | 0.291               | 0.92 0.78-1.08    | 0.028 | 1.43 1.04-1.97|
| Yes, nurse                             | 395               | 38.3                               | <0.001              | 0.63 0.54-0.72    | 0.375 | 1.13 0.86-1.5 |
| Yes, other healthcare worker            | 146               | 27.6                               | 0.893               | 1.01 0.82-1.25    | 0.521 | 1.11 0.81-1.52|
| **COVID-19 impacted financial situation** |            |                                    |                     |                   |       |              |
| No impact                               | 1479              | 39.2                               | Ref                 | Ref               |       |              |
| Yes, impacted positively               | 292               | 28.7                               | <0.001              | 1.59 1.37-1.86    | 0.330 | 1.14 0.88-1.48|
| Yes, impacted negatively               | 863               | 23.4                               | <0.001              | 2.10 1.89-2.32    | 0.770 | 1.03 0.84-1.27|
| **Affected by the change in financial situation** |            |                                    |                     |                   |       |              |
| Not at all                              | 690               | 49.4                               | Ref                 | Ref               |       |              |
| Unsure                                  | 268               | 29.4                               | <0.001              | 2.35 1.96-2.80    | <0.001| 1.69 1.32-2.16|
| Somewhat                                | 710               | 25.6                               | <0.001              | 2.83 2.47-3.24    | <0.001| 1.64 1.32-2.03|
| A great extent                          | 146               | 14                                 | <0.001              | 5.99 4.89-7.35    | <0.001| 2.36 1.72-3.23|
Table 2 Predictors for psychological distress among the study participants (based on the K-10 score) (Continued)

| Characteristics | Low (score 10-15) | Moderate to Very High (score 16-50) | Unadjusted analyses | Adjusted analyses |
|-----------------|-------------------|------------------------------------|---------------------|------------------|
|                 | n                 | %                                 | p              | ORs          | 95% CIs | p        | AORs          | 95% CIs |
| Co-morbidities  |                   |                                   |                 |              |         |         |               |         |
| No              | 1926              | 32.3                              | 67.6            | Ref          | Ref     |         |               |         |
| Psychiatric/Mental health problem | 31 | 8.7 | 327 | 91.3 | <0.001 | 5.04 | 3.47-7.32 | 0.019 | 3.02 | 1.20-7.60 |
| Other co-morbidities* | 644 | 31.2 | 1423 | 68.8 | 0.436 | 1.04 | 0.94-1.17 | 0.147 | 1.30 | 0.91-1.82 |
| Co-morbidities  | 2465              | 30.9                              | 69.1            |               |         |         |               |         |
| No              | 1926              | 32.4                              | 67.6            | Ref          | Ref     |         |               |         |
| Single co-morbidity | 411 | 26.6 | 1136 | 73.4 | 0.001 | 1.32 | 1.17-1.50 | 0.859 | 0.97 | 0.67-1.40 |
| Multiple co-morbidities | 128 | 27 | 346 | 73 | 0.114 | 1.30 | 1.05-1.60 | No estimates due to small number |
| Perceived status of own mental health |                   |                                   |                 |              |         |         |               |         |
| Poor to Fair    | 131               | 7.5                               | 92.5            | Ref          | Ref     |         |               |         |
| Good to Excellent | 1743 | 38.4 | 2794 | 61.6 | <0.001 | 0.13 | 0.11-0.16 | <0.001 | 0.17 | 0.13-0.22 |
| Smoking         |                   |                                   |                 |              |         |         |               |         |
| Never smoker    | 2226              | 32.3                              | 67.6            | Ref          | Ref     |         |               |         |
| Ever smoker (Daily/Non-daily/Ex) | 408 | 25.7 | 1178 | 74.3 | <0.001 | 1.38 | 1.22-1.56 | 0.434 | 1.10 | 0.87-1.39 |
| Increased smoking over the last 6 months | 206 | 20.3 | 808 | 79.7 |               |         |         |               |         |
| No              | 151               | 28.2                              | 71.9            | Ref          |         |         | Not included in multivariate model |         |
| Yes             | 55                | 11.5                              | 88.5            | <0.000 | 3.03 | 2.16-4.25 |         |         |
| Current alcohol drinking (last 4 weeks) | 2583 | 30.9 | 5755 | 69.02 |               |         |         |               |         |
| No              | 2314              | 31.2                              | 68.7            | Ref          | Ref     |         |               |         |
| Yes             | 269               | 29.2                              | 70.7            | 0.199 | 1.10 | 0.95-1.28 | 0.069 | 1.29 | 0.99-1.68 |
| Increased alcohol drinking over the last 6 months | 266 | 29.2 | 645 | 70.8 |               |         |         |               |         |
| No              | 235               | 36.9                              | 63.2            | Ref          |         |         | Not included in multivariate model |         |
| Yes             | 31                | 11.4                              | 88.6            | <0.001 | 4.52 | 3.01-6.80 |         |         |
| Contact with known/suspected case of COVID-19 | 2574 | 30.9 | 5743 | 69.1 |               |         |         |               |         |
| No              | 1754              | 35.9                              | 64.1            | Ref          | Ref     |         |               |         |
| Unsure          | 141               | 19.9                              | 80.1            | <0.001 | 2.26 | 1.85-2.73 | <0.001 | 1.80 | 1.36-2.40 |
| Yes, had indirect contact | 223 | 25.4 | 729 | 75.6 | <0.001 | 1.83 | 1.55-2.16 | 0.019 | 1.32 | 1.04-1.67 |
| Yes, provided direct care | 456 | 25.6 | 1320 | 74.3 | <0.001 | 1.63 | 1.44-1.85 | 0.814 | 1.03 | 0.81-1.30 |
| Experience related to COVID-19 pandemic | 2518 | 30.9 | 5631 | 69.1 |               |         |         |               |         |
| No known exposure to COVID-19 | 2095 | 33.2 | 4224 | 66.8 |               |         |         |               |         |
| Tested positive for COVID-19 | 124 | 25.2 | 369 | 74.8 | <0.001 | 1.48 | 1.2-1.82 | 0.988 | 1.00 | 0.72-1.38 |
| Tested negative for COVID-19 by self-isolated | 256 | 22.6 | 876 | 77.3 | <0.001 | 1.69 | 1.45-1.97 | 0.086 | 1.24 | 0.97-1.58 |
| Had recent overseas travel history and was in quarantine | 43 | 20.9 | 162 | 79.02 | 0.002 | 1.87 | 1.32-2.62 | 0.696 | 1.12 | 0.64-1.93 |
| Self-identification as a patient (visited a healthcare provider in the last 6 months) | 2579 | 31.1 | 5719 | 68.9 |               |         |         |               |         |
| No              | 1945              | 35.1                              | 64.9            | Ref          | Ref     |         |               |         |
| Yes             | 634               | 23.1                              | 76.9            | <0.001 | 1.80 | 1.61-2.00 | <0.001 | 1.67 | 1.40-1.99 |
| Healthcare service use in the last 6 months | 646 | 23.7 | 2079 | 76.3 |               |         |         |               |         |
| In-person visit to a healthcare provider | 493 | 26.1 | 1401 | 73.9 |               | Ref |         |               |         |
| Telehealth consultation/Use of national helpline | 120 | 18.9 | 516 | 81.1 | <0.001 | 1.51 | 1.21-1.89 | Not included in multivariate model |         |
| Used both services | 33 | 16.9 | 162 | 83.1 | 0.005 | 1.72 | 1.17-2.54 |         |         |
| Level of fear of COVID-19 (FCV-19S categories) | 2634 | 31.1 | 5845 | 68.9 |               |         |         |               |         |
| Low (score 7-21) | 2328 | 36.3 | 4088 | 63.7 |               | Ref |         |               |         |
| High (score 22-35) | 306 | 14.8 | 1757 | 85.2 | <0.001 | 3.27 | 2.87-3.73 | <0.001 | 3.26 | 2.57-4.13 |
| Level of coping (BRCs categories) | 2633 | 31.1 | 5840 | 68.9 |               |         |         |               |         |
| Low resilient copers (score 4-13) | 1011 | 27.6 | 2648 | 72.4 |               | Ref |         |               |         |
had medium to high resilient coping. Learning from previous successful experiences that enable people to cope better could explain this discrepancy [17]. When participants from the Australian study were faced with COVID-19 at an earlier stage, participants of this study (that included participants who were confronted with both 1st and 2nd waves) might have learned how to cope with all kinds of relevant practices from the 1st wave of the pandemic (such as social distancing, home quarantine, or lockdown, hand hygiene and wearing masks), leading them to high resilient coping and less fear of COVID-19. However, the context was interplayed with distress and fear in this study. It was found that participants who perceived distress due to change of their employment, whose financial situation was affected greatly, and had unsure contact with COVID-19 were more likely to have higher psychological distress and fear.

We found that females had higher psychological distress and fear of COVID-19. This finding is consistent with the Australian study, [9] and studies from elsewhere [18]. They also had a greater chance of loneliness, specifically for young people aged 18-29 years or those 60+ [19]. Such distress and fear could also be related to ‘infodemic’ through the increased use of social media [20]. Having a history of mental illness and experience of family violence was shown to aggravate depression, anxiety and stress amongst women during the pandemic [21]. In addition, concerns of exposure to COVID-19 amongst family members could have accentuated their anxiety and distress. Women tend to have more care giving roles in a family and often prioritise health concerns of family members over their own [9]. That warrants improved awareness amongst women regarding regular health assessment and accessing resources to support their wellbeing.

Interestingly, participants who perceived their mental health as good to excellent, even though their financial situation was impacted negatively, and who had contact with COVID-19 patients indirectly or directly were more likely to have medium to high resilient coping. This was especially true for participants who self-identified themselves as nurses. This is incongruent with the Australian study, though consistent with earlier studies [22]. Our findings reflected that participants perceived mental resiliency could be the internal psychological aid that eases their reality during the pandemic despite having higher psychological distress. Enhancing resilience could be a possible intervention to enable people to cope with the mental health impact of COVID-19. Such a psychological resilience model has been developed and tested for its effectiveness in China and was found to improve the overall mental health of the target population during the COVID-19 pandemic [23].

In our study, doctors had higher psychological distress, but low levels of fear of COVID-19; nurses had medium to high resilient coping. A recent systematic review of 24 studies with 13,731 health and social care workers showed that female nurses, comorbidities, lack of personal protective equipment, concerns about family, fear of infections and close contact with COVID-19 patients were the predictors for poor mental wellbeing amongst healthcare workers [24]. Low levels of fear amongst the frontline healthcare workers in our study were likely due to their prolonged professional exposure with COVID-19 patient management. Due to the heterogeneity of the health systems and varying availability of resources across participating countries, healthcare workers experienced catastrophic situations during the surge of pandemic period, which could have resulted in high resilience amongst the nurses.

Our findings showed that participants who had comorbidities and those who had a mental illness showed higher psychological distress and fear. These groups were more vulnerable under pandemic guidelines (such as social distancing, working from home), which potentially raised the risks of relapse, especially those who were mentally ill and who needed primary caregivers. Generally, evidence from clinical settings and literature indicated that mentally ill persons who lived alone would have more psychotic relapses than those being cared for by primary caregivers [25]. Medication adherence for this group of patients could have been challenging.

### Table 2

| Characteristics | Low (score 10-15) | Moderate to Very High (score 16-50) | Unadjusted analyses | Adjusted analyses |
|-----------------|-------------------|-------------------------------------|---------------------|------------------|
|                  | n     | %     | n     | %     | p     | ORs  95% CIs | p     | AORs  95% CIs |
| Healthcare service use to overcome COVID-19 related stress in the last 6 months | 2560  | 31   | 5697  | 69   | Ref   | Ref | Ref   | Ref |
| No              | 2422  | 33.7 | 4754  | 66.3 | Ref   | 3.48 | 2.89-4.19 | <0.001 | 1.99 | 1.45-2.72 |
| Yes             | 138   | 12.8 | 943   | 69   | <0.001 | 0.75 | 0.69-0.82 | <0.001 | 0.96 | 0.81-1.14 |

Adjusted for: age, gender, smoking, alcohol intake, living status, place of birth, country, education, employment status, employment stress, healthcare worker, financial impact, contact with COVID-19 case, experience due to COVID-19 and self-identification as a patient
Table 3 Predictors for fear of COVID-19 among the study participants (based on the FCV-19S score)

| Characteristics                              | Low (score 7-21) | High (score 22-35) | Unadjusted analyses | Adjusted analyses |
|----------------------------------------------|------------------|--------------------|---------------------|-------------------|
|                                              | n %              | n %                | p ORs 95% CIs       | p AORs 95% CIs    |
| **Age groups**                               |                  |                    |                     |                   |
| 18-29 years                                  | 2777 75.8        | 883 24.1           | Ref                 | Ref               |
| 30-59 years                                  | 2661 73.8        | 942 26.1           | 0.047 1.11 1.00-1.24| 0.004 1.35 1.10-1.64|
| ≥60 years                                    | 272 81.6         | 61 18.3            | 0.017 0.71 0.53-0.94| 0.184 1.40 0.86-2.30|
| **Gender**                                   |                  |                    |                     |                   |
| Male                                         | 2305 76.8        | 695 23.2           | Ref                 | Ref               |
| Female                                       | 4078 74.9        | 1360 25.1          | 0.059 1.11 0.99-1.23| 0.001 1.51 1.25-1.83|
| **Born in the same country of residence**    |                  |                    |                     |                   |
| No                                           | 933 72.4         | 355 27.6           | Ref                 | Ref               |
| Yes                                          | 5432 76.1        | 1704 23.8          | 0.005 0.82 0.72-0.94| 0.001 0.66 0.51-0.85|
| **Living status**                            |                  |                    |                     |                   |
| Live without family members                   | 1322 79.6        | 577 20.3           | Ref                 | Ref               |
| Live with family members                      | 5032 76.1        | 1704 23.8          | <0.001 0.67 0.6-0.75| 0.431 1.10 0.86-1.41|
| **Highest educational/vocational qualification** |                  |                    |                     |                   |
| Primary/Grade 1 to 6                          | 47 79.6          | 12 20.3            | Ref                 | Ref               |
| Secondary/Higher Secondary/Grade 7 to 12      | 1176 76.3        | 366 23.7           | 0.547 1.22 0.64-2.32| 0.569 1.41 0.44-4.55|
| Certificate/Diploma/Trade qualifications      | 626 71.8         | 245 28.1           | 0.198 1.53 0.8-2.93 | 0.298 1.87 0.57-6.09|
| Bachelor/Masters/PhD                          | 4510 75.9        | 1429 24.1          | 0.506 1.24 0.66-2.35| 0.689 1.27 0.40-4.05|
| **Current employment condition**              |                  |                    |                     |                   |
| Unemployed/Housewife/Home maker/Home duties  | 433 67.3         | 210 32.6           | Ref                 | Ref               |
| No source of income                           | 3304 80.1        | 821 19.9           | <0.001 0.51 0.42-0.61| No estimate due to small number|
| Jobs affected by COVID-19 (lost job/working hours reduced/afraid of job loss) | 2437 71.7 | 963 28.3 | 0.026 0.81 0.68-0.98 | 0.588 1.05 0.87-1.27 |
| Have an income source (employed/Government benefits) | 5772 75.7 | 1847 24.2 | 0.001 1.82 1.63-2.02 | <0.001 1.52 1.27-1.82 |
| **Perceived distress due to change of employment status** | 4570 78.5 | 1251 21.5 | <0.001 1.35 1.17-1.56 | 0.401 1.08 0.9-1.32 |
| A little to none                              | 3767 80.1        | 939 19.9           | Ref                 | Ref               |
| Moderate to a great deal                      | 2005 68.8        | 908 31.2           | <0.001 1.82 1.63-2.02| <0.001 1.52 1.27-1.82|
| **Improved working situation due to change of employment status** | 4570 78.5 | 1251 21.5 | <0.001 1.35 1.17-1.56 | 0.401 1.08 0.9-1.32 |
| A little to none                              | 3566 79.7        | 906 20.3           | Ref                 | Ref               |
| Moderate to a great deal                      | 1004 74.4        | 345 25.6           | <0.001 1.35 1.17-1.56| 0.401 1.08 0.9-1.32|
| Self-identification as a frontline or essential service worker | 6398 75.7 | 2052 24.3 | 0.001 1.47 1.20-1.82 | 0.001 1.47 1.20-1.82 |
| No                                           | 3839 76.3        | 1191 23.7          | Ref                 | Ref               |
| Yes                                          | 2559 74.8        | 861 25.2           | 0.115 1.08 0.99-1.2 | 0.001 1.47 1.20-1.82|
| Self-identification as a healthcare worker    | 4950 78.7        | 1339 21.3          | Ref                 | Ref               |
| No                                           | 2990 77.8        | 853 22.2           | Ref                 | Ref               |
| Yes, doctor                                  | 712 80.4         | 174 19.6           | 0.096 0.86 0.71-1.03| <0.001 0.55 0.41-0.76|
| Yes, nurse                                   | 838 81.2         | 194 18.8           | 0.018 0.81 0.68-0.97| 0.053 0.75 0.56-1.01|
| Yes, other healthcare worker                  | 410 77.6         | 118 22.4           | 0.037 1.01 0.81-1.26| 0.131 0.79 0.58-1.07|
| COVID-19 impacted financial situation        |                  |                    |                     |                   |
| No impact                                    | 3053 80.8        | 725 19.2           | Ref                 | Ref               |
| Yes, impacted positively                     | 768 75.5         | 249 24.5           | <0.001 1.37 1.16-1.61| 0.075 1.29 0.98-1.70|
| Yes, impacted negatively                     | 2597 70.4        | 1092 29.6          | <0.001 1.77 1.61-1.97| 0.004 1.36 1.11-1.68|
| Affected by the change in financial situation|                  |                    |                     |                   |
| Not at all                                   | 1201 85.9        | 196 14             | Ref                 | Ref               |
| Unsure                                       | 724 79.4         | 188 20.6           | <0.001 1.59 1.28-1.98| 0.149 1.23 0.93-1.64|
| Somewhat                                     | 2169 78.3        | 600 21.7           | <0.001 1.69 1.42-2.02| 0.033 1.32 1.02-1.08|
| A great extent                               | 719 68.9         | 324 31.1           | <0.001 2.76 2.26-3.37| 0.021 1.44 1.06-1.96|
| Characteristics                                | Low (score 7-21) | High (score 22-35) | Unadjusted analyses | Adjusted analyses |
|-----------------------------------------------|------------------|--------------------|---------------------|------------------|
|                                               | n    | %    | n    | %    | p   | ORs     | 95% CIs | p   | AORs     | 95% CIs |
| Co-morbidities                                |      |      |      |      |     |         |         |     |         |         |
| No                                            | 6345 | 75.7 | 2032 | 24.3 | Ref | Ref     |         |     |         |         |
| Psychiatric/Mental health problem             | 4645 | 78.1 | 1303 | 21.9 |     | 0.001  | 1.62    | 1.29-2.05 | 0.984 | 1.00    | 0.64-1.60 |
| Other co-morbidities*                         | 1452 | 70.2 | 616  | 29.8 | <0.001 | 1.51 | 1.35-1.7 | 0.001 | 1.71    | 1.25-2.32 |
| Co-morbidities                                |      |      |      |      |     |         |         |     |         |         |
| No                                            | 6059 | 76.1 | 1910 | 23.9 |     | Ref     |         |     |         |         |
| Single co-morbidity                           | 1096 | 70.9 | 451  | 29.2 | <0.001 | 1.47 | 1.29-1.66 | 0.021 | 0.69    | 0.51-0.95 |
| Multiple co-morbidities                       | 318  | 67.1 | 156  | 32.9 | <0.001 | 1.75 | 1.43-2.14 | No estimate due to small number |
| Perceived status of own mental health         |      |      |      |      |     |         |         |     |         |         |
| Poor to Fair                                  | 4950 | 78.7 | 1339 | 21.3 |     |         |         |     |         |         |
| Good to Excellent                             | 1190 | 67.9 | 563  | 32.1 |     |         |         |     |         |         |
| Smoking                                       |      |      |      |      |     |         |         |     |         |         |
| Never smoker                                  | 6420 | 75.6 | 2065 | 24.3 |     |         |         |     |         |         |
| Ever smoker (Daily/Non-daily/Ex)              | 1169 | 73.6 | 418  | 26.3 | 0.039 | 1.14 | 1.01-1.30 | 0.708 | 1.04    | 0.84-1.31 |
| Increased smoking over the last 6 months      |      |      |      |      |     |         |         |     |         |         |
| No                                            | 758  | 74.7 | 256  | 25.3 |     |         |         |     |         |         |
| Yes                                           | 418  | 78.1 | 117  | 21.9 |     |         |         |     |         |         |
| Current alcohol drinking (last 4 weeks)       |      |      |      |      |     |         |         |     |         |         |
| No                                            | 6309 | 75.6 | 2035 | 24.4 |     |     |         |         |     |         |         |
| Yes                                           | 5646 | 76.1 | 1776 | 23.9 |     |     |         |         |     |         |         |
| Increased alcohol drinking over the last 6 months |      |      |      |      |     |     |         |         |     |         |         |
| No                                            | 658  | 72.1 | 255  | 27.9 |     |     |         |         |     |         |         |
| Yes                                           | 511  | 79.7 | 130  | 20.3 |     |     |         |         |     |         |         |
| Contact with known/suspected case of COVID-19 |      |      |      |      |     |     |         |         |     |         |         |
| No                                            | 6292 | 75.6 | 2031 | 24.4 |     |     |         |         |     |         |         |
| Yes                                           | 3769 | 771  | 1117 | 22.9 |     |     |         |         |     |         |         |
| Experience related to COVID-19 pandemic       |      |      |      |      |     |     |         |         |     |         |         |
| No known exposure to COVID-19                 | 6155 | 75.5 | 2000 | 24.5 |     |     |         |         |     |         |         |
| Tested positive for COVID-19                  | 4833 | 76.4 | 1490 | 23.6 |     |     |         |         |     |         |         |
| Tested negative for COVID-19 by self-isolated | 391  | 79.2 | 103  | 20.8 | 0.170 | 1.38 | 1.09-1.72 | 0.175 | 0.80    | 0.57-1.11 |
| Had recent overseas travel history and was in quarantine | 791 | 69.8 | 342 | 30.2 | <0.001 | 1.40 | 1.22-1.61 | 0.396 | 1.12    | 0.89-1.41 |
| Self-identification as a patient (visited a healthcare provider in the last 6 months) | 6273 | 75.5 | 2031 | 24.5 |     |     |         |         |     |         |         |
| No                                            | 4247 | 76.5 | 1308 | 23.6 |     |     |         |         |     |         |         |
| Yes                                           | 2026 | 73.7 | 723  | 26.3 | 0.006 | 1.16 | 1.04-1.29 | 0.217 | 0.90    | 0.76-1.06 |
| Healthcare service use in the last 6 months   |      |      |      |      |     |     |         |         |     |         |         |
| In-person visit to a healthcare provider      | 1973 | 72.4 | 754  | 27.6 |     |     |         |         |     |         |         |
| Telehealth consultation/Use of national helpline | 1413 | 74.5 | 483  | 25.5 |     |     |         |         |     |         |         |
| Used both services                            | 426  | 66.9 | 210  | 33   | <0.001 | 1.44 | 1.19-1.75 | Not included in multivariate model |
| Level of psychological distress (K10 categories) |      |      |      |      |     |     |         |         |     |         |         |
| Low (score 10-15)                             | 6416 | 75.7 | 2063 | 24.3 |     |     |         |         |     |         |         |
| Moderate to Very High (score 16-50)           | 2328 | 88.4 | 306  | 11.6 |     |     |         |         |     |         |         |
| Level of coping (BRCS categories)             |      |      |      |      |     |     |         |         |     |         |         |
| Low resilient copers (score 4-13)             | 6418 | 75.7 | 2061 | 24.3 |     |     |         |         |     |         |         |
| Low resilient copers (score 4-13)             | 2647 | 72.2 | 1018 | 27.8 |     |     |         |         |     |         |         |
Accessibility to the health care system was more difficult because most healthcare workers were overloaded with COVID-19 infected patients and the related tasks, therefore, managing chronic diseases was not a priority. In addition, lockdown policies impacted transportation and public facilities were closed in many instances. Previous evidence also suggested that people with stressful situations and pre-existing medical problems had higher levels of depression and anxiety [27]. Telemedicine to replace face-to-face consultations had been established in many countries including Australia during COVID-19. The effect of such an alternative healthcare delivery system needs to be evaluated further, especially its impact on people with non-communicable diseases and/or mental illness who need continuing care.

Eighty-one percent of the study population were never smokers. Those who smoked and drank alcohol, reported increased use of tobacco and alcohol (47% and 30% respectively) in the last six months. Moreover, drinking behavior was also associated with higher levels of fear of COVID-19. The findings were consistent with the previous Australian study and that risky behavior was associated with a higher impact on psychological distress [16]. A study conducted in China also found that participants who had a history of smoking could escalate the severe symptoms of COVID-19 once hospitalized and possibly required ventilator equipment [28]. A Polish study also revealed that current alcohol drinkers were less able to find positives about the pandemic (positive reframing) and coping [29]. An effective coping strategy needs to be developed and implemented to target populations using social media to prevent unhealthy coping behaviors.

The change of employment status and an uncertain financial situation were associated with higher psychological distress and fear. In our study, 51% participants reported that their jobs were affected by COVID-19, due to losing jobs, reduced working hours, or being afraid of job loss. That was probably one of the significant indicators of mental wellbeing, impacted by COVID-19 on people’s socioeconomic status around the globe and consistent with a study conducted among Israeli youths (20-35 years old) [30]. The need for urgent action to support and elevate economic assistance, especially for those whose job was impacted negatively from the pandemic, is critical. While business enterprises were freezing around the globe due to restrictions related to controlling the spread of coronavirus, basic needs are essential, specifically for vulnerable groups to prevent psychological crisis which could potentially lead to suicidal attempts or even suicide.

The impact of COVID-19 on the psychological wellbeing was unprecedented and was different from country to country. Therefore, findings from 17 countries were found to be diverse. In our study, country specific results on psychological distress showed a specific trend. For example, more than two-thirds of the participants reported moderate to very high level of psychological distress who were living in countries with war/conflict (Syria, Palestine, Libya and the Middle East [Saudi Arabia, UAE, Jordan and Kuwait]) followed by South Asia (Pakistan, Nepal and Bangladesh) and least by the participants from South-East Asian countries (Thailand, Hong Kong and Indonesia). However, participants from Oman, Australia and Egypt could not be fitted into any of those categories. It can be assumed that such disparities could be related to geography, access to healthcare, having comorbidities, living in war-torn and conflicting countries [31]. It can be also assumed that uncertainties about COVID-19, its progression and rapid mutation, availability and access to varied range of evidence could also contribute to the report of diverse country-wise findings of moderate to high level of psychological distress. Similar higher levels of anxiety were reported in Hong Kong during the SARS epidemic amongst medicine students and students.
| Characteristics                                  | Low (score 4-13) | Medium to High (score 14-20) | Unadjusted analyses | Adjusted analyses |
|------------------------------------------------|------------------|-----------------------------|---------------------|------------------|
| Characteristic                                 | n    | %    | n    | %     | p    | ORs (95% CIs) | p    | AORs (95% CIs) |
| Age groups                                     |      |      |      |       |      |               |      |                |
| 18-29 years                                    | 1581 | 43.3 | 2074 | 56.7  | 0.71 | 1.02 (0.93-1.12) | 0.08 | 0.92 (0.82-1.03) |
| 30-59 years                                    | 1543 | 42.8 | 2060 | 57.2  | 0.026 | 1.30 (1.03-1.64) | 0.011 | 1.66 (1.28-2.44) |
| ≥ 60 years                                     | 123  | 36.9 | 210  | 63.1  |      |               |      |                |
| Gender                                         |      |      |      |       |      |               |      |                |
| Male                                           | 1323 | 44.1 | 1675 | 55.9  |      |               |      |                |
| Female                                         | 2317 | 46.2 | 3117 | 53.8  |      |               |      |                |
| Born in the same country of residence          |      |      |      |       |      |               |      |                |
| No                                             | 649  | 50.4 | 639  | 49.6  |      |               |      |                |
| Yes                                            | 2986 | 41.8 | 4144 | 58.2  |      |               |      |                |
| Living status                                  |      |      |      |       |      |               |      |                |
| Live without family members                    | 812  | 42.7 | 1087 | 57.2  | 0.78 | 1.09 (0.96-1.24) | 0.08 | 0.92 (0.81-1.04) |
| Live with family members                       | 2802 | 43.1 | 3428 | 56.9  | 0.27 | 1.08 (0.86-1.37) | 0.10 | 0.85 (0.70-1.02) |
| Highest educational/vocational qualification   |      |      |      |       |      |               |      |                |
| Primary/Grade 1 to 6                           | 30   | 50.8 | 29   | 49.2  |      |               |      |                |
| Secondary/Higher Secondary/Grade 7 to 12        | 673  | 43.7 | 868  | 56.3  | 0.21 | 1.05 (0.93-1.17) | 0.19 | 0.91 (0.80-1.04) |
| Certificate/Diploma/Trade qualifications        | 409  | 47.2 | 458  | 52.8  |      |               |      |                |
| Bachelor/Masters/PhD                           | 2510 | 42.3 | 3428 | 57.7  | 0.58 | 1.07 (0.86-1.32) | 0.53 | 1.04 (0.79-1.39) |
| Current employment condition                   |      |      |      |       |      |               |      |                |
| Unemployed/Housewife/Home maker/Home duties (No source of income) | 629  | 40.4 | 383  | 59.6  |      |               |      |                |
| Jobs affected by COVID-19 (lost job/working hours reduced/afraid of job loss) | 1734 | 43.1 | 1794 | 56.9  |      |               |      |                |
| Have an income source (employed/Government benefits) | 1529 | 45.1 | 1865 | 54.9  | 0.031 | 0.84 (0.69-0.99) | 0.35 | 0.93 (0.81-1.09) |
| Perceived distress due to change of employment status |      |      |      |       |      |               |      |                |
| A little to none                               | 1815 | 38.6 | 2889 | 61.4  |      |               |      |                |
| Moderate to a great deal                       | 1280 | 43.9 | 1633 | 56.1  |      |               |      |                |
| Improved working situation due to change of employment status |      |      |      |       |      |               |      |                |
| A little to none                               | 2291 | 39.4 | 3528 | 60.6  |      |               |      |                |
| Moderate to a great deal                       | 1753 | 39.2 | 2717 | 60.8  |      |               |      |                |
| Self-identification as a frontline or essential service worker |      |      |      |       |      |               |      |                |
| No                                             | 2155 | 42.9 | 2869 | 57.1  |      |               |      |                |
| Yes                                            | 1491 | 43.6 | 1929 | 56.4  | 0.52 | 0.97 (0.87-1.06) | 0.52 | 0.94 (0.85-1.03) |
| Self-identification as a healthcare worker     |      |      |      |       |      |               |      |                |
| No                                             | 2482 | 39.5 | 3801 | 60.5  |      |               |      |                |
| Yes, doctor                                    | 1578 | 41.1 | 2299 | 58.9  |      |               |      |                |
| Yes, nurse                                     | 331  | 37.4 | 555  | 62.6  | 0.040 | 1.17 (1.01-1.36) | 0.417 | 0.90 (0.70-1.16) |
| Yes, other healthcare worker                   | 371  | 35.9 | 661  | 64.1  | 0.003 | 1.24 (1.08-1.44) | 0.029 | 1.30 (1.03-1.65) |
| COVID-19 impacted financial situation         |      |      |      |       |      |               |      |                |
| No impact                                      | 1613 | 42.8 | 2160 | 57.3  |      |               |      |                |
| Yes, impacted positively                       | 413  | 40.7 | 603  | 59.3  | 0.229 | 1.10 (0.95-1.26) | 0.851 | 0.98 (0.80-1.23) |
| Yes, impacted negatively                      | 1637 | 44.4 | 2052 | 55.6  | 0.157 | 0.94 (0.85-1.03) |      |                |
| Affected by the change in financial situation  |      |      |      |       |      |               |      |                |
| Not at all                                     | 523  | 37.4 | 874  | 62.6  |      |               |      |                |
| Unsure                                         | 385  | 42.4 | 523  | 57.6  | 0.017 | 0.81 (0.69-0.96) | 0.004 | 0.74 (0.60-0.90) |
| Somewhat                                       | 1051 | 37.9 | 1716 | 62.1  | 0.732 | 0.98 (0.86-1.12) | 0.398 | 0.92 (0.78-1.14) |
| A great extent                                 | 444  | 42.6 | 599  | 57.4  | 0.010 | 0.81 (0.69-0.95) | 0.151 | 0.83 (0.66-1.07) |
Table 4 Predictors for coping among the study participants (based on the BRCS score) (Continued)

| Characteristics                                      | Low (score 4-13) | Medium to High (score 14-20) | Unadjusted analyses | Adjusted analyses |
|-------------------------------------------------------|------------------|-------------------------------|---------------------|-------------------|
| Co-morbidities                                        | n                | %                             | n                  | %                 | p       | ORs 95% CIs | p     | AORs 95% CIs |
| Co-morbidities                                        | 3630             | 43.4                          | 4741               | 56.6              |         |           |       |            |
| No                                                   | 2458             | 41.4                          | 3488               | 58.7              | Ref     |           |       |            |
| Psychiatric/Mental health problem                     | 223              | 62.5                          | 134                | 37.5              | <0.001  | 0.42 0.33-0.52 | 0.431 | 0.85 0.57-1.27 |
| Other co-morbidities*                                 | 949              | 45.9                          | 1119               | 54.1              | <0.001  | 0.82 0.73-0.91 | 0.324 | 1.15 0.88-1.50 |
| Co-morbidities                                        | 3321             | 41.7                          | 4642               | 58.3              |         |           |       |            |
| No                                                   | 2458             | 41.3                          | 3488               | 58.7              | Ref     |           |       |            |
| Single co-morbidity                                   | 674              | 43.6                          | 873                | 56.4              | 0.113   | 0.91 0.81-1.02 | 0.149 | 0.82 0.62-1.09 |
| Multiple co-morbidities                               | 189              | 40.2                          | 281                | 59.8              | 0.633   | 1.05 0.87-1.27 |       |            |
| Perceived status of own mental health                 | 2282             | 39.5                          | 3801               | 60.5              |         |           |       |            |
| Poor to Fair                                          | 913              | 52.1                          | 839                | 47.8              | Ref     |           |       |            |
| Good to Excellent                                     | 1569             | 34.6                          | 2962               | 65.4              | <0.001  | 2.05 1.83-2.3 | <0.001 | 1.97 1.70-2.30 |
| Smoking                                               | 3665             | 43.2                          | 4814               | 56.8              |         |           |       |            |
| Never smoker                                          | 2912             | 42.2                          | 3982               | 57.8              | Ref     |           |       |            |
| Ever smoker (Daily/Non-daily/Ex)                      | 753              | 47.5                          | 832                | 52.5              | <0.001  | 0.81 0.72-0.90 | 0.533 | 1.06 0.88-1.28 |
| Increased smoking over the last 6 months              | 447              | 44.2                          | 565                | 55.8              |         |           |       |            |
| No                                                   | 234              | 43.7                          | 301                | 56.3              | Ref     |           |       |            |
| Yes                                                  | 213              | 44.6                          | 264                | 55.4              | 0.770   | 0.96 0.75-1.23 |       |            |
| Current alcohol drinking (last 4 weeks)               | 3595             | 43.1                          | 4743               | 56.8              |         |           |       |            |
| No                                                   | 3089             | 41.6                          | 4328               | 58.4              | Ref     |           |       |            |
| Yes                                                  | 506              | 54.9                          | 415                | 45.1              | <0.001  | 0.59 0.50-0.66 | 0.532 | 0.93 0.74-1.17 |
| Increased alcohol drinking over the last 6 months      | 499              | 54.7                          | 413                | 45.3              |         |           |       |            |
| No                                                   | 310              | 48.4                          | 330                | 51.7              | Ref     |           |       |            |
| Yes                                                  | 189              | 69.5                          | 83                 | 30.5              | <0.001  | 0.40 0.31-0.56 |       |            |
| Contact with known/suspected case of COVID-19         | 3578             | 43                             | 4739               | 56.9              |         |           |       |            |
| No                                                   | 2223             | 45.5                          | 2662               | 54.5              | Ref     |           |       |            |
| Unsure                                               | 333              | 46.9                          | 376                | 53                | 0.470   | 0.94 0.81-1.1 | 0.297 | 0.90 0.73-1.1 |
| Yes, had indirect contact                            | 353              | 37.3                          | 594                | 62.7              | <0.001  | 1.41 1.21-1.63 | 0.004 | 1.33 1.10-1.62 |
| Yes, provided direct care                            | 669              | 37.7                          | 1107               | 62.3              | <0.001  | 1.37 1.22-1.53 | <0.001 | 1.45 1.19-1.77 |
| Experience related to COVID-19 pandemic               | 3497             | 42.9                          | 4652               | 57.1              |         |           |       |            |
| No known exposure to COVID-19                        | 2739             | 43.4                          | 3580               | 56.6              | Ref     |           |       |            |
| Tested positive for COVID-19                         | 184              | 37.3                          | 310                | 62.7              | 0.008   | 1.29 1.07-1.56 | 0.259 | 0.86 0.65-1.12 |
| Tested negative for COVID-19 by self-isolated         | 480              | 42.4                          | 651                | 57.6              | 0.571   | 1.03 0.91-1.18 | 0.012 | 0.78 0.64-0.95 |
| Had recent overseas travel history and was in quarantine | 94              | 45.8                          | 111                | 54.2              | 0.476   | 0.90 0.68-1.2 | 0.312 | 0.80 0.51-1.24 |
| Self-identification as a patient (visited a healthcare provider in the last 6 months) | 3564             | 42.9                          | 4734               | 57.1              |         |           |       |            |
| No                                                   | 2466             | 44.4                          | 3089               | 55.6              | Ref     |           |       |            |
| Yes                                                  | 1098             | 40.1                          | 1645               | 59.9              | 0.001   | 1.20 1.09-1.31 | 0.012 | 1.20 1.04-1.28 |
| Healthcare service use in the last 6 months           | 1089             | 40                             | 1633               | 59.9              |         |           |       |            |
| In-person visit to a healthcare provider              | 730              | 38.5                          | 1165               | 61.5              | Ref     |           |       |            |
| Telehealth consultation/Use of national helpline     | 277              | 43.5                          | 359                | 56.5              | 0.025   | 0.82 0.67-0.97 | Not included in multivariate model |
| Used both services                                    | 82               | 42.9                          | 109                | 57.1              | 0.234   | 0.83 0.62-1.13 |       |            |
| Level of psychological distress (K10 categories)      | 3659             | 43.2                          | 4814               | 56.8              |         |           |       |            |
| Low (score 10-15)                                     | 1011             | 38.4                          | 1622               | 61.6              | Ref     |           |       |            |
| Moderate to Very High (score 16-50)                   | 2648             | 45.4                          | 3192               | 54.6              | <0.001  | 0.74 0.67-0.81 | 0.498 | 0.95 0.81-1.11 |
living in the area where there was a rapid spread of infection [32]. Participants from the Middle East and war-torn countries reported less fear compared to the participants from South-East Asian countries and South Asia. The exact reasons for this could not be elicited from our study, however the reasons can be explained by two factors, firstly, high standard care and public health in Saudi Arabia, Kuwait and Oman, and success of early interventions, such as early lockdown reducing the transmission of COVID-19. It can be further emphasized that participants from war-torn countries already have experienced high levels of fear for prolonged periods which might cause an idiosyncratic response to the pandemic [33]. Further study on war-torn counties could provide more insights. Higher levels of fear of COVID-19 among participants from South-East Asian countries could be explained by their previous traumatic experience from SARS and H1N1 pandemics, which disproportionately affected South-East Asian countries [32].

In our study, we found that more than half of the participants (57%) showed medium to high resilience towards the pandemic. Interestingly, participants from Australia found to struggle most, despite reports of very low levels of community transmission compared to the other 16 countries included in this study. This could be explained by the fact that Australian participants were predominantly from Victoria, the only state in Australia which was affected by the second wave of COVID-19 during the study period, which caused statewide strict lockdown, social isolation, job loss [16]. Nonetheless, despite potential lack of capacity and resources to manage pandemics, participants from war-torn countries like Palestine and Syria were found to have higher coping compared to the participants from Australia. It was beyond the scope of our study to examine the reasons for such findings. Research from Syria reported strategies to contain COVID-19, such as effective use of social media tools, community engagement, bottom-up approach from the local government, and coordinated support by the international donor communities [34].

**Limitations**
We had some limitations in our study. The use of online surveys potentially introduced selection bias, as participants were limited to those who could access the internet only; therefore, the generalizability of the findings needs to be interpreted with caution. Drawing predictive conclusions based on the differences is difficult and is a limitation of a cross sectional study design. Nevertheless, under the circumstances of movement restriction and social distancing, an online survey was the most robust available option during the pandemic to fulfill our research objectives. From the perspective of multi-country study (17 countries), the multicultural background, the difference of policies and compliance of public health actions that varied across participating countries, might also impact on the examined variables (psychological distress, fear, and ways of coping). We, therefore, adjusted the variable ‘country’ during the multivariate analyses to control potential confounding effects. Furthermore, the collaboration from researchers across 17 countries and the achievement of the target sample size during the crisis period of COVID-19 showed significant power to test our hypotheses and provided key information to plan interventions as needed.

**Conclusions**
Our study examined the extent and identified factors associated with psychological distress, fear of COVID-19 and coping amongst diverse community members across 17 countries. Females and people with existing mental health issues were the most vulnerable group of populations for adverse psychological impact of COVID-19. There is an urgent need to prioritise

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**Table 4** Predictors for coping among the study participants (based on the BRCS score) (Continued)

| Characteristics | Low (score 4-13) | Medium to High (score 14-20) | Unadjusted analyses | Adjusted analyses |
|-----------------|------------------|-----------------------------|---------------------|------------------|
|                 | n    | %    | n    | %    | p    | ORs   | 95% CIs | p    | AORs   | 95% CIs |
| Level of fear of COVID-19 (FCV-19S categories) | 3665 | 43.2 | 4814 | 56.7 |
| Low (score 7-21) | 2647 | 41.2 | 3771 | 58.8 | Ref | Ref |
| High (score 22-35) | 1018 | 49.4 | 1043 | 50.6 | <0.001 | 0.71 | 0.64-0.78 | <0.001 | 0.72 | 0.61-0.85 |
| Healthcare service use to overcome COVID-19 related stress in the last 6 months | 3546 | 42.9 | 4718 | 57.1 |
| No | 3049 | 42.4 | 4134 | 57.6 | Ref | Ref |
| Yes | 497 | 45.9 | 584 | 54.1 | 0.030 | 0.87 | 0.76-0.99 | 0.375 | 0.91 | 0.75-1.12 |

Adjusted for: age, gender, smoking, alcohol intake, living status, place of birth, country, education, employment status, employment stress, healthcare worker, financial impact, contact with COVID-19 case, experience due to COVID-19 and self-identification as a patient.
| Characteristics | K-10 Score | Unadjusted analyses | Adjusted analyses |
|-----------------|------------|---------------------|------------------|
|                  | Low (score 10-15) | Moderate to Very High (score 16-50) |                  |
|                  | n %        | n %                 | p ORs 95% CIs    | p AORs 95% CIs |
| Country of residence | 2634 5846 |                      |                  |
| Thailand         | 269 54.1  | 229 45.9            | 0.011 1.37 1.08-1.75 <0.001 1.93 1.37-2.73 |
| Hong Kong        | 256 46.1  | 299 53.9            | <0.001 1.68 1.31-2.14 0.071 1.44 0.97-2.15 |
| Indonesia        | 223 41.2  | 318 58.8            | <0.001 1.68 1.30-2.17 <0.001 2.20 1.50-3.25 |
| Oman             | 180 41.2  | 257 58.8            | <0.001 1.90 1.42-2.52 0.253 1.28 0.84-1.95 |
| Nepal            | 119 38.3  | 192 61.7            | <0.001 1.68 1.31-2.14 0.071 1.44 0.97-2.15 |
| Malaysia         | 273 37.9  | 447 62.1            | <0.001 1.92 1.53-2.42 Not included in multivariate model |
| Australia        | 203 37.5  | 339 62.5            | <0.001 1.96 1.53-2.51 Not included in multivariate model |
| Libya            | 38 33.3   | 76 66.7             | <0.001 2.35 1.53-3.60 <0.001 3.54 1.91-6.56 |
| Kuwait           | 132 31.6  | 285 68.4            | <0.001 2.54 1.93-3.33 <0.001 3.06 2.05-4.58 |
| Bangladesh       | 284 30.1  | 644 69.4            | <0.001 2.67 2.12-3.31 Not included in multivariate model |
| Pakistan         | 121 28.9  | 297 71.1            | <0.001 2.88 2.19-3.80 0.105 1.40 0.93-2.11 |
| Saudi Arabia     | 225 28    | 578 71.9            | <0.001 3.02 2.38-3.81 <0.001 2.82 1.99-4.01 |
| UAE              | 89 21.3   | 328 78.6            | <0.001 4.32 3.23-5.80 <0.001 3.68 2.31-5.86 |
| Jordan           | 80 14.9   | 458 85.1            | <0.001 6.72 5.01-9.04 <0.001 6.83 4.05-11.5 |
| Syria            | 53 13     | 355 87.0            | <0.001 7.87 5.61-11.0 <0.001 6.05 3.59-10.2 |
| Palestine        | 50 12     | 367 88.0            | <0.001 8.62 6.11-12.2 <0.001 4.80 2.87-8.02 |
| Egypt            | 39 9.4    | 377 90.6            | <0.001 11.4 7.81-16.5 <0.001 9.43 5.33-16.7 |

| Characteristics | FCV-19S Score | Unadjusted analyses | Adjusted analyses |
|-----------------|---------------|---------------------|------------------|
|                  | Low (score 7-21) | High (score 22-35) |                  |
|                  | n %        | n %                 | p ORs 95% CIs    | p AORs 95% CIs |
| Country of residence | 6420 | 2066 | |
| Libya            | 104 91.2    | 10 8.8              | 0.458 1.30 0.65-2.57 0.669 0.85 0.40-1.82 |
| Saudi Arabia     | 714 88.9    | 89 11.1             | 0.123 1.73 0.86-3.46 0.937 1.03 0.47-2.28 |
| Thailand         | 427 85.7    | 71 14.3             | 0.037 2.1 1.04-4.22 0.395 1.40 0.64-3.07 |
| Kuwait           | 347 83.2    | 70 16.8             | 0.008 2.55 1.28-5.08 0.044 2.23 1.02-4.88 |
| Oman             | 351 80.3    | 86 19.7             | 0.005 2.64 1.34-5.23 0.477 0.74 0.33-1.70 |
| Jordan           | 429 79.7    | 109 20.3            | 0.007 2.64 1.31-5.35 0.057 2.16 0.98-4.80 |
| Nepal            | 248 79.7    | 63 20.3             | 0.006 2.67 1.33-5.32 0.455 1.35 0.62-2.93 |
| Syria            | 324 79.6    | 83 20.4             | 0.004 2.74 1.37-5.47 0.844 1.09 0.49-2.42 |
| Palestine        | 330 79.1    | 87 20.8             | 0.001 3.15 1.59-6.27 0.561 1.27 0.58-2.81 |
| UAE              | 320 76.7    | 97 23.3             | <0.001 3.50 1.77-6.88 0.006 2.86 1.35-6.08 |
| Indonesia        | 405 74.8    | 136 25.1            | <0.001 3.87 1.98-7.54 Not included in multivariate model |
| Malaysia         | 525 72.9    | 195 27.1            | <0.001 4.62 2.34-9.14 0.055 2.13 0.98-4.62 |
| Egypt            | 288 69.2    | 128 30.8            | <0.001 4.71 2.40-9.24 0.003 3.21 1.47-7.01 |
| Hong Kong        | 382 68.8    | 173 31.2            | <0.001 4.87 2.49-9.54 Not included in multivariate model |
| Australia        | 374 68.1    | 175 31.8            | <0.001 5.07 2.57-10.0 0.002 3.41 1.58-7.33 |
| Pakistan         | 281 67.2    | 137 32.8            | <0.001 6.50 3.35-12.6 Not included in multivariate model |
these vulnerable population; adequate medical and social support along with specific health promotion policies should be considered within the strategic response to the ongoing pandemic and future crises. Future studies should focus on developing strategies to enhance resilience and examining effectiveness of such interventions. Besides global strategies to address psychological impact, policy makers in each country should revisit existing support structures and enhance them during this critical period. Innovative approaches are needed to enhance effective coping and social support to alleviate impact and prevent emotional crisis for vulnerable people in the longer term.

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Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12992-021-00768-3.

Additional file 1: Table S1. Levels of psychological distress among the study participants (based on K-10 scoring). Table S2. Levels of fear of COVID-19 among the study participants (based on the FCV-19S scoring). Table S3. Coping during COVID-19 pandemic among the study participants.

Table 5 Country-wise analyses for high psychological distress, fear of COVID-19 and coping among the study participants (Continued)
Declaration

Ethics approval and consent to participate

Ethics approval was obtained from the Human Research Ethics Committee from each participating country: Australia (Federation University Australia, Ref: 2020-036), Bangladesh (Enam Medical College, Ref: MEC/ERC/2020/08-2), Egypt (Ain Shams University, Ref: FMASU R 121/2020), Hong Kong (The Chinese University of Hong Kong, Ref: SBRE-20-172), Indonesia (Universitas Indonesia, Ref: KET-1425/UN2.F1/ETIK/PP2.00.02/2020), Jordan (The Hashemite University), Kuwait (Kuwait University, Ref: VDR/EC/3639), Libya (Al-Brega General Hospital), Malaysia (Universitas Sains Malaysia, Ref: USM/JEpMeH/CVID-19-40), Nepal (Kathmandu Medical College Public Ltd., Ref: 2611/202004), Oman (Ministry of Health, Ref: MoH/CSR/20/24012), Pakistan (Lahore Garrison University), Saudi Arabia (Ministry of Health, Ref: 20-605E), Syria (University of Aleppo), Thailand (Chiang Mai University, Ref: AF 04-021), United Arab Emirates (Abu Dhabi University, Ref: CoH-S-20-00024). Each study participant read the consent form along with plain language summary and ticked their consent in the online form prior to accessing the study questionnaire.

Consent for publication

Data were collected anonymously, therefore, no identifying information were collected from the study participants.

Competing interests

The authors confirm that there are no known conflicts of interest associated with this publication.

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