Psychological Distress, Fear and Coping Strategies among Hong Kong People During the COVID-19 Pandemic

Sek Ying Chair[1] · Wai Tong Chien[1] · Ting Liu[1] · Louisa Lam[2,3] · Wendy Cross[2] · Biswajit Banik[2] · Muhammad Aziz Rahman[2,4]

Abstract

The COVID-19 pandemic contributed to potential adverse effects on the mental health status of a wide range of people. This study aimed to identify factors associated with psychological distress, fear and coping strategies during the COVID-19 pandemic in Hong Kong. A cross-sectional online survey was conducted among general population in Hong Kong. Psychological distress was assessed using the Kessler Psychological Distress Scale; level of fear was evaluated using the Fear of COVID-19 scale; and coping strategies were assessed using the Brief Resilient Coping Scale. Multivariable logistic regression was used to identify key factors associated with these mental health variables. Of the 555 participants, 53.9% experienced moderate to very high levels of psychological distress, 31.2% experienced a high level of fear of COVID-19, and 58.6% showed moderate to high resilient coping. Multivariable logistic regression indicated that living with family members, current alcohol consumption, and higher level of fear were associated with higher levels of psychological distress; perceived stress due to a change in employment condition, being a frontline worker, experiencing 'moderate to very high' distress, and healthcare service use to overcome the COVID-19 related stress in past 6 months were associated with a higher level of fear; and perceived better mental health status was associated with a moderate to high resilient coping. This study identified key factors associated with distress, fear and coping strategies during the pandemic in Hong Kong. Mental health support strategies should be provided continuously to prevent the mental impact of the pandemic from turning into long-term illness.

Keywords COVID-19 · Cross-sectional study · Psychological distress · Fear · Coping

Introduction

The coronavirus disease (COVID-19), caused by a novel strain of coronavirus, was declared a pandemic by World Health Organization (WHO) on 11 March 2020 (World Health Organization, 2020). Centre for Health Protection Department of Health The Government of the Hong Kong Special Administrative Region (2021) stated that the most common incubation period of COVID-19 was around five days, and the case fatality ratio was higher among the older aged population. On 18 June 2021, there were more than 177 million cases and 3.8 million deaths globally (World Health Organization 2021). In Hong Kong, there were 11,885 confirmed cases with 210 deaths (The Government of the Hong Kong Special Administrative Region 2021).

The resultant effects of this pandemic were stressful for the general population in Hong Kong and globally. To limit the spread of COVID-19, in Hong Kong, social distancing was practiced by keeping ≥ 1 m of distance between persons.

✉ Wai Tong Chien
  wtchien@cuhk.edu.hk

[1] The Nethersole School of Nursing, Faculty of Medicine, The Chinese University of Hong Kong, Room 725A, Esther Lee Building, Shatin, NT, Hong Kong

[2] School of Health, Federation University Australia, Berwick, VIC, Australia

[3] School of Public Health and Preventive Medicine, Monash University, Melbourne, VIC, Australia

[4] Australian Institute of Primary Care and Ageing, La Trobe University, Melbourne, VIC, Australia
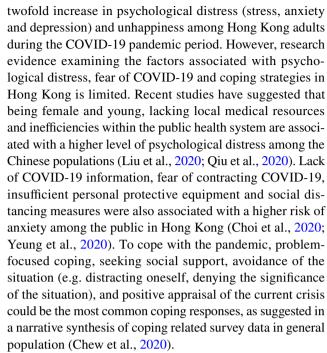
Other protective measures were implemented such as wearing surgical masks, limiting seating capacity at eateries, temporary closure of high risk premises, working from home, and suspension of school classes (Centre for Health Protection, 2021; Fong, et al., 2020a, b; The Government of the Hong Kong Special Administrative Region, 2020). Transmission control efforts were implemented rapidly and were relatively successful in slowing the spread of COVID-19 infection (Kwok et al., 2020). Nevertheless, increased psychological distress among the public adversely affected aspects of life such as school, work and family activities (Brooks et al., 2020; Kwok et al., 2020). Reduced outdoor activities, loss of usual routine, and increased use of electronic devices during the pandemic were positively associated with the development of depressive symptoms (Brooks et al., 2020; Fong, et al., 2020a, b). The increased isolation resulting from social restriction measures has also significantly contributed to social and emotional loneliness, depression, anxiety and insomnia in all walks of life (Tull et al., 2020; Wong et al., 2020).

Furthermore, the ongoing, prolonged COVID-19 pandemic is taking a toll on the global economy, causing a detrimental financial impact (Ashraf, 2020; Sansa, 2020). Census and Statistics Department, The Government of the Hong Kong Special Administrative Region (2021a) announced a 7% seasonally adjusted unemployment rate between November 2020 and January 2021, which was the highest for the past 17 years. Unemployment has resulted in not only loss of income but limitations of capacity of people to plan ahead. This would subsequently increase stress levels and reduced self-esteem and general well-being of general population globally (Voßemer et al., 2018; Yao & Wu, 2021).

Compared with general population, healthcare workers face more mental health challenges as they may have direct contact with infected patients (Gan et al., 2020; Lu et al., 2020; Pappa et al., 2020). Fear of spreading COVID-19, stigmatization by family and friends, and increased workload are significant factors related to the adverse psychological outcomes among healthcare workers (Cai et al., 2020; Lu et al., 2020; Magill et al., 2020). A systematic review of the prevalence of psychological distress amongst frontline healthcare workers caring for COVID-19 patients reported the prevalence of depression, anxiety and stress among frontline healthcare workers as 24%, 26% and 45% respectively (Salari et al., 2020).

In Hong Kong, recent population-based studies examined the impacts of the COVID-19 pandemic on mental health (Choi et al., 2020; Tso & Park, 2020; Zhao et al., 2020). They reported that more than half of the respondents experienced worsened mental health, including clinical levels of anxiety, depression and/or stress (Choi et al., 2020; Tso & Park, 2020). Compared to the public mental health surveys in 2016 and 2017, Zhao et al. (2020) reported an alarming twofold increase in psychological distress (stress, anxiety and depression) and unhappiness among Hong Kong adults during the COVID-19 pandemic period. However, research evidence examining the factors associated with psychological distress, fear of COVID-19 and coping strategies in Hong Kong is limited. Recent studies have suggested that being female and young, lacking local medical resources and inefficiencies within the public health system are associated with a higher level of psychological distress among the Chinese populations (Liu et al., 2020; Qiu et al., 2020). Lack of COVID-19 information, fear of contracting COVID-19, insufficient personal protective equipment and social distancing measures were also associated with a higher risk of anxiety among the public in Hong Kong (Choi et al., 2020; Yeung et al., 2020). To cope with the pandemic, problem-focused coping, seeking social support, avoidance of the situation (e.g. distracting oneself, denying the significance of the situation), and positive appraisal of the current crisis could be the most common coping responses, as suggested in a narrative synthesis of coping related survey data in general population (Chew et al., 2020).

Research evidence exploring factors associated with psychological distress, fear of COVID-19 and coping strategies amongst the general population such as community members, healthcare workers and health care service users in Hong Kong and worldwide is scarce. Since the pandemic shows no sign of ending, understanding the pandemic's impacts on mental health and coping strategies amongst the public, and identifying their predictors, are essential to design psychological support strategies during/after the pandemic, and to prevent long-term mental health problems. Therefore, this study aimed to assess the levels of psychological distress, fear of the COVID-19 infection and main coping strategies used among a wide range of people in Hong Kong, and to identify key factors associated with these mental health conditions/variables.

Methods

Study Design and Participants

A cross-sectional survey study was conducted using an online platform. The survey link was distributed via social media, text messages, emails and word of mouth to reach the general population in Hong Kong. The study population included Hong Kong residents who were aged ≥ 18 years and able to respond to an online questionnaire in English. Participants, including the general public, healthcare workers, health care service users, and university students and staff, were recruited from various community settings and groups via the online platform and social media between December 2020 and mid-January 2021.

Sample Size Estimation

The sample size was calculated by OpenEpi. Considering 7,428,300 as the population of Hong Kong at the end of 2020 (Census and Statistics Department, The Government of the Hong Kong Special Administrative Region, 2021b), the prevalence of worsened mental health among Hong Kong residents during the COVID-19 pandemic ranging from 25.4% to 65.6% (Choi et al., 2020; Tso & Park, 2020), at 95% confidence intervals and 80% power, the estimated minimum sample size was 292. Snowball sampling of friends, university staff and students, and invitation messages in social media were used to recruit participants.

Study Instruments

A structured online survey questionnaire was adopted from an international study led by researchers in Australia (Rahman et al., 2020). Participants first completed a series of questions about socio-demographic information such as age, gender, education level, and employment, and other information related to any perceived stress due to change in employment, being a frontline worker, change in financial situation during the pandemic, and patterns of unhealthy lifestyle (smoking and drinking).

Psychological distress was assessed using the 10-item Kessler Psychological Distress Scale (K10) (Furukawa et al., 2003). The K10 is a reliable and valid scale, with Cronbach's alpha of 0.92 (Rahman et al., 2021). The Cronbach's alpha of K10 was 0.95 in this study. The K10 items were rated on a 5-point Likert scale (1 = none to 5 = all the time), with the possible total score range from 10 to 50. Higher scores indicated higher level of psychological distress.

The level of fear of COVID-19 was evaluated using the 7-item Fear of COVID-19 scale (FCV-19S) (Ahorsu et al., 2020). FCV-19S is a reliable and valid scale, with Cronbach's alpha of 0.82–0.87 (Ahorsu et al., 2020; Rahman et al., 2021). The Cronbach's alpha of FCV-19S in this study was 0.91. Responses also used a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The total score ranged from 7 to 35. Higher scores indicated higher level of fear of COVID-19.

Coping strategies were assessed using the 4-item Brief Resilient Coping Scale (BRCS) (Sinclair & Wallston, 2004). BRCS has been widely used during the COVID-19 pandemic with acceptable psychometric properties (Cronbach's alpha ranged from 0.63 to 0.79) (López et al., 2020; Rahman et al., 2021). In this study, Cronbach's alpha was 0.88. It was also assessed with a 5-point Likert scale ranging from 1 (nothing) to 5 (a lot). Responses were summed to create a total score (range = 4–20), with higher scores signifying a higher level of resilient coping.

Data Collection

Ethics approval was obtained from the Survey and Behavioural Research Ethics Committee of The University (SBRE-20–172). After obtaining the ethics approval, an invitation with the information and instructions of the online survey, together with its hyperlink (webpage) and QR code, were shared through different social media platforms (e.g., Facebook, Instagram, LinkedIn, and Twitter), emails and text messages. The plain language information statement and consent form, which provided a thorough explanation of the study including the research aims, procedure, risks and benefits, and voluntary participation, appeared on the first screen-page of the online survey. Only those who provided consent on the first page and admitted to be an adult (aged 18 or above) on the second page, by ticking the button (Yes) at the end of the page(s), would confirm their agreement and their eligibility of participation in this study, respectively. After that, the subsequent webpages contained the full set of study questionnaires for individual participants to complete. All items on each page should be completed before participants could move to the next page. It took 15 to 20 min to complete the survey; and all of their responses were anonymous. No personal identity and information of the participants such as name, residential address and identification number were collected.

Data Analysis

Data entries and statistical analyses were performed by using IBM SPSS 25.0 (IBM Crop., Armonk, NY). Descriptive statistics, such as mean and standard deviation and frequency and percentage, were used to summarize and present the data of participants' sociodemographic characteristics and study variables. To assess mental health conditions and to be consistent with the previous study (Rahman et al., 2020), participants' psychological distress, fear of the COVID infection and coping strategies were grouped into different levels. Psychological distress (K10 score) was defined into low (score 10–15), moderate (score 16–21), high (score 22–29) and very high (score 30–50); fear of COVID-19 (FCV-19S score) was defined into low (score 7–21) and high (score 22–35); and coping strategies (BRCS score) were categories into low (score 4–13) and moderate to high (score 14–20).

Univariate logistic regression analyses were conducted to explore the association between variables. Those factors with $p < 0.25$ were selected as potential confounding variables for multivariate logistic regression to delineate factors associated with the main study variables (psychological distress, fear of COVID-19 and coping strategies). Results of the multivariate logistic regression models for each of those three variables were calculated and presented with adjusted odds ratios (AORs) and 95% confidence intervals

(CIs). Level of significance of all statistical tests used was set at 0.05 (two-sided).

Ethical Considerations

Ethics approval was obtained from the Survey and Behavioural Research Ethics Committee at The Chinese University of Hong Kong (No. SBRE-20–172). The study was conducted following the principles stated in the Declaration of Helsinki. No personal identity and information was collected or reported. Informed consent for participation in the study was obtained on the first page of the survey where study information was provided prior to participants completing the questionnaire.

Results

Characteristics of Participants

In total, 555 individuals completed the survey. Characteristics of the participants are listed in Table 1. The mean age of the participants was 47.7 years ($\pm$ 12.89) and 67.2% were female. The majority of the participants were living with their family members (85.4%) and had a bachelor's degree or above (80.7%). Over one-third of the participants (40.7%) identified themselves as frontline or essential service workers during the COVID-19 pandemic. For mental health measures, K10 scores ranged from 10–40 ($M = 18.8$; $SD = 7.38$); FCV-19S scores ranged from 7–33 ($M = 17.78$; $SD = 6.70$; and BRCS scores ranged from 4–20 ($M = 13.88$, $SD = 3.17$). Of the 555 participants, more than half (53.9%) experienced moderate to very high levels of psychological distress, one-third (31.2%) experienced a high level of fear of COVID-19, and over half (58.6%) showed moderate to high resilient coping (Supplementary Tables 1, 2 and 3, respectively).

Psychological Distress

The univariate analyses (Table 2) showed significant associations between moderate to very high level of psychological distress and other variables. After adjusting for potential confounding variables, the multivariate logistic regression test (Table 2) indicated some factors associated with psychological distress. Living with family members (p = 0.010, AOR: 3.24, 95% CIs: 1.33–7.94), current alcohol consumption (p = 0.034, AOR: 2.07, 95% CIs: 1.06–4.05), and high level of fear of COVID-19 (p < 0.001, AOR: 5.76, 95% CIs: 2.76–12.15) were associated with 'moderate to very high' psychological distress of the participants. Conversely, participants aged 30–59 years (p = 0.031, AOR: 0.30, 95% CIs: 0.10–0.90) and ≥ 60 years (p = 0.001, AOR: 0.13, 95% CIs: 0.04–0.45), perceived good to excellent mental health status (p < 0.001, AOR: 0.13, 95%CIs: 0.06–0.26), and 'moderate to high' resilient coping (p = 0.028, AOR: 0.51, 95%CIs: 0.28–0.93) were associated with low levels of psychological distress.

Fear of COVID-19

Table 3 showed the univariate analyses to identify associations between high level of fear of COVID-19 and other variables. The multivariate logistic regression results (Table 3) showed that perceived moderate to a great deal of stress due to a change in employment conditions (p = 0.002, AOR:4.12, 95%CIs: 1.72–9.88), being a frontline or essential service worker (p = 0.017, AOR: 2.72, 95%CIs: 1.19–6.19), experiencing 'moderate to very high' psychological distress (p < 0.001, AOR: 6.00, 95%CIs: 2.84–12.70), and using healthcare services to overcome COVID-19 related stress in past 6 months (p = 0.002, AOR:6.38, 95%CI: 1.98–20.55), were associated with a high level of fear of the COVID-19 infection. However, a low level of fear of the COVID-19 infection was related to being a nurse (p = 0.032, AOR:0.38, 95%CIs: 0.16–0.92).

Coping Strategies

The univariate analyses identified a number of variables were associated with moderate to high level of resilient coping (Table 4). After adjusting for potential confounding variables, as shown in Table 4, participants who perceived good to excellent mental health status during the COVID-19 pandemic (p = 0.001, AOR:2.76, 95%CIs:1.53–4.95) were more likely to have 'moderate to high' resilient coping. On the contrary, those who perceived a change due to an unsure financial situation (p = 0.015, AOR:0.43, 95%CIs: 0.22–0.85), being tested positive (p = 0.035, AOR:0.10, 95%CIs: 0.01–0.85) or negative on the COVID-19 screening test (p = 0.024, AOR:0.42, 95%CIs: 0.20–0.89), high levels of fear of the COVID-19 infection (p = 0.029, AOR:0.51, 95%CIs: 0.28–0.93), and using healthcare services to overcome the COVID-19 related stress in past 6 months (p = 0.050, AOR:0.36, 95%CI: 0.13–1.00) were associated with a low level of resilient coping.

Discussion

Our findings showed over half (54%) of the participants experienced 'moderate to very high' levels of psychological distress and about one-third (31%) reported a high level of fear of the COVID-19 infection. Despite having moderate to high levels of psychological distress and fear, more than half (60%) demonstrated 'moderate to high' resilient coping. Our

Table 1 Characteristics of the study population

Characteristics	Total n(%)
Total study participants	555
Age (in years)	**553**
Mean (± SD)	47.7 (12.89)
Range	19—76
Age groups	**553**
18–29 years	51 (9.2)
30–59 years	378 (68.4)
≥ 60 years	124 (22.4)
Gender	**551**
Male	181 (32.8)
Female	370 (67.2)
Born in Hong Kong	**551**
Yes	498 (90.4)
No	53 (9.6)
Living status	**549**
Live without family members (on your own/shared house/others)	80 (14.6)
Live with family members	469 (85.4)
Highest educational/vocational qualification	**549**
Secondary/Higher secondary/Intermediate/Grade 7–12	13 (2.4)
Certificate/Diploma/Trade qualification	93 (16.9)
Bachelor/Master/PhD	443 (80.7)
Current employment condition	**550**
Jobs affected by COVID-19 (lost job/working hours reduced/ afraid of job loss)	375 (68.2)
Have an income source (employed/Government benefits)	175 (31.8)
Perceived stress due to change of employment condition	**535**
A little to none	419 (78.3)
Moderate to a great deal	116 (21.7)
Improved working situation due to change of employment	**534**
A little or none	497 (93.1)
Moderate to a great deal	37 (6.9)
Self-identification as a frontline or essential service worker	**555**
No	329 (59.3)
Yes	226 (40.7)
Self-identification as healthcare worker	**555**
No	273 (49.2)
Yes, doctor	3 (0.5)
Yes, nurse	236 (42.5)
Yes, other healthcare worker	43 (7.7)
COVID-19 impacted financial situation	**555**
No impact	420 (75.7)
Yes, impacted positively	28 (5.0)
No, impacted negatively	107 (19.3)
Affected by the change in financial situation	**544**
Not at all	292 (53.7)
Unsure at this time	85 (15.6)
Somewhat	130 (23.9)
A great extent	37 (6.8)
Co-morbidities	**554**
No	336 (60.6)
Psychiatric/Mental health issues	4 (0.7)

Table 1 (continued)

Characteristics	Total n(%)
Other co-morbidity	214 (38.6)
Co-morbidities	**554**
No	336 (60.6)
Single co-morbidity	119 (21.5)
Multi co-morbidities	99 (17.9)
Smoking	**555**
Never smoker	498 (89.7)
Ever smoker (Daily/Non-daily/Ex)	57 (10.3)
Increased smoking over the last 6 months	**26**
No	7 (26.9)
Yes	19 (73.1)
Current alcohol drinking	**552**
No	350 (63.4)
Yes	202 (36.6)
Increased alcohol drinking over the last 6 months	**202**
No	108 (53.5)
Yes	94 (46.5)
Contact with known/suspected cases of COVID-19	**546**
No	412 (75.5)
Unsure	85 (15.6)
Yes, had indirect contact	37 (6.8)
Yes, provided direct care	12 (2.2)
Experience related to COVID-19 pandemic	**546**
No known exposure to COVID-19	452 (82.8)
Tested positive for COVID-19	7 (1.3)
Tested negative for COVID-19 but self-isolating	74 (13.6)
Had recent overseas travel history and was in quarantine	13 (2.4)
Self-identification as a patient (utilised any health care services) in the last 6 months	**546**
No	344 (63.0)
Yes	202 (37.0)
Healthcare service use in the last 6 months	**191**
Visited a healthcare provider in person	178 (93.2)
Telehealth consultation/Used helpline	7 (3.7)
Use both services	6 (3.1)
Perceived mental health status	**555**
Poor to fair	195 (35.1)
Good to excellent	360 (64.9)
Healthcare service use to overcome COVID-19 related stress in the last 6 months	**551**
No	480 (87.1)
Yes	71 (12.9)
Type of healthcare service used to overcome COVID-19 related stress in the last 6 months	**71**
Consulted GP	39 (54.9)
Consulted a Psychologist	4 (5.6)
Used mental health resources	6 (8.5)
Used mental health resources available through media	3 (4.2)
Used mental health support services	1 (1.4)
Used combination of services	18 (25.4)
GP: general practitioner; SD: standard deviation	

Table 2 Factors associated with psychological distress among the study population (based on the K10 score)

Characteristics	Low (score 10–15) n	Low %	Moderate to Very high (score 16–50) n	Mod %	Univariate analyses p	ORs	95% CIs	Multivariate analyses* p	AORs	95% CIs
Total study participants	**256**		**299**							
Age groups	**256**		**297**							
18–29 years	11	4.3	40	13.5		Ref			Ref	
30–59 years	144	56.3	234	78.8	0.024	0.45	0.22–0.90	**0.031**	**0.30**	**0.10–0.90**
≥60 years	101	39.5	23	7.7	<0.001	0.06	0.03–0.14	**0.001**	**0.13**	**0.04–0.45**
Gender	**256**		**294**							
Male	65	25.4	116	39.3		Ref			Ref	
Female	191	74.6	179	60.7	0.001	0.53	0.36–0.76	0.908	0.96	0.47–1.97
Born in Hong Kong	**254**		**297**							
No	28	11.0	25	8.4		Ref		Not included in multivariable analyses		
Yes	226	89.0	272	91.6	0.302	1.35	0.76–2.38			
Living status	**255**		**294**							
Live without family members (on your own/shared house/others)	27	10.6	53	18.0		Ref			Ref	
Live with family members	228	89.4	241	82.0	0.015	0.54	0.33–0.89	**0.010**	**3.24**	**1.33–7.94**
Highest educational/vocational qualification	**252**		**297**							
Secondary/Higher secondary/Intermediate/Grade 7–12	10	4.0	3	1.0		Ref			Ref	
Certificate/Diploma/Trade qualification	40	15.9	53	17.8	0.032	4.12	1.14–17.10	0.863	0.82	0.08–8.18
Bachelor/Master/PhD	202	80.2	241	81.1	0.038	3.98	1.08–14.65	0.298	3.13	0.37–26.83
Current employment condition	**253**		**297**							
Jobs affected by COVID-19 (lost job/working hours reduced/ afraid of job loss)	165	65.2	210	70.7		Ref			Ref	
Have an income source (employed/Government benefits)	88	34.8	87	29.3	0.169	0.78	0.54–1.11	0.752	1.14	0.51–2.56
Perceived stress due to change of employment condition	**244**		**291**							
A little to none	228	93.4	191	65.6		Ref			Ref	
Moderate to a great deal	16	6.6	100	34.4	<0.001	7.46	4.26–13.08	0.373	1.57	0.58–4.20
Improved working situation due to change of employment	**243**		**291**							
A little or none	233	95.9	264	90.7		Ref			Ref	
Moderate to a great deal	10	4.1	27	9.3	0.023	2.38	1.13–5.03	0.725	1.25	0.36–4.39
Self-identification as a frontline or essential service worker	**256**		**299**							
No	173	67.6	156	52.2		Ref			Ref	
Yes	83	32.4	143	47.8	<0.001	1.91	1.35–2.70	0.225	1.58	0.76–3.28

Table 2 (continued)

Characteristics	Low (score 10–15)		Moderate to Very high (score 16–50)		Univariate analyses			Multivariate analyses*		
	n	%	n	%	p	ORs	95% CIs	p	AORs	95% CIs
Self-identification as healthcare worker	**256**		**299**							
No	133	52.0	140	46.8		Ref			Ref	
Yes, doctor	1	0.4	2	0.7	0.602	1.90	0.17–21.2	No estimates due to small number		
Yes, nurse	112	43.8	124	41.5	0.777	1.05	0.74–1.49	0.875	0.94	0.42–2.07
Yes, other healthcare worker	10	3.9	33	11.0	0.003	3.14	1.49–6.12	0.621	0.72	0.20–2.63
COVID-19 impacted finical situation	**256**		**299**							
No impact	226	88.3	194	64.9		Ref			Ref	
Yes, impacted positively	7	2.7	21	7.0	0.005	3.50	1.45–8.40	0.632	1.39	0.36–5.38
Yes, impacted negatively	23	9.0	84	28.1	<0.001	4.26	2.58–7.01	0.237	0.52	0.18–1.54
Affected by the change in financial situation	**249**		**295**							
Not at all	182	73.1	110	37.3		Ref			Ref	
Unsure at this time	26	10.4	59	20.2	<0.001	3.76	2.24–6.31	0.806	0.90	0.41–2.02
Somewhat	36	14.5	94	31.9	<0.001	4.32	2.75–6.78	0.079	2.18	0.91–5.21
A great extent	5	2.0	32	10.8	<0.001	10.59	4.01–27.98	0.090	3.60	0.82–15.80
Co-morbidities	**256**		**298**							
No	166	64.8	170	57.0		Ref			Ref	
Yes	90	35.2	128	43.0	0.061	1.39	0.98–1.96	0.787	0.92	0.50–1.69
Smoking	**256**		**299**							
Never smoker	245	95.7	253	84.6		Ref			Ref	
Ever smoker (Daily/Non-daily/Ex)	11	4.3	46	15.4	<0.001	4.05	2.05–8.00	0.752	1.25	0.31–5.10
Increased smoking over the last 6 months	**2**		**24**							
No	2	100.0	5	20.8	No estimates due to small number			Not included in multivariable analyses		
Yes	0	0.0	19	79.2						
Current alcohol drinking	**254**		**298**							
No	207	81.5	143	48.0		Ref			Ref	
Yes	47	18.5	155	52.0	<0.001	4.77	3.23–7.05	**0.034**	**2.07**	**1.06–4.05**
Increased alcohol drinking over the last 6 months	**47**		**155**							
No	45	95.7	63	40.6		Ref		Not included in the multivariate analyses		
Yes	2	4.3	92	59.4	<0.001	32.86	7.69–140.38			
Contact with known/suspected cases of COVID-19	**252**		**294**							
No	228	90.5	184	62.6		Ref			Ref	
Unsure	7	2.8	78	26.5	<0.001	13.81	6.22–30.65	0.075	2.83	0.90–8.90

Table 2 (continued)

Characteristics	Low (score 10–15)		Moderate to Very high (score 16–50)		Univariate analyses			Multivariate analyses*		
	n	%	n	%	p	ORs	95% CIs	p	AORs	95% CIs
Yes, had indirect contact	12	4.8	25	8.5	0.009	2.58	1.26–5.28	0.226	1.87	0.68–5.18
Yes, provided direct care	5	2.0	7	2.4	0.354	1.74	0.54–5.56	0.216	0.32	0.05–1.94
Experience related to COVID-19 pandemic	250		296							
No known exposure to COVID-19	230	92.0	222	75.0		Ref			Ref	
Tested positive for COVID-19	3	1.2	4	1.4	0.675	1.38	0.31–6.24	0.142	0.25	0.04–1.60
Tested negative for COVID-19 but self-isolating	16	6.4	58	19.6	<0.001	3.76	2.10–6.37	0.530	0.74	0.29–1.89
Had recent overseas travel history and was in quarantine	1	0.4	12	4.1	0.016	12.43	1.60–96.41	0.146	6.61	0.52–84.13
Self-identification as a patient (utilised any health care services) in the last 6 months	250		296							
No	173	69.2	171	57.8		Ref			Ref	
Yes	77	30.8	125	42.2	0.006	1.64	1.15–2.34	0.073	1.72	0.95–3.12
Healthcare service use in the last 6 months	72		119							
Visited a healthcare provider in person	72	100.0	106	89.1	No estimates due to small number			Not included in the multivariate analyses		
Telehealth consultation/Used helpline	0	0.0	7	5.9						
Use both services	0	0.0	6	5.0						
Perceived mental health status	256		299							
Poor to fair	19	7.4	176	58.9		Ref			Ref	
Good to excellent	237	92.6	123	41.1	<0.001	0.06	0.03–0.09	**<0.001**	**0.13**	**0.06–0.26**
Level of fear of COVID-19 (FCV-19S categories)	256		299							
Low (score 7–21)	241	94.1	141	47.2		Ref			Ref	
High (score 22–35)	15	5.9	158	52.8	<0.001	18.00	10.19–31.80	**<0.001**	**5.76**	**2.76–12.15**
Level of coping (BRCS categories)	256		299							
Low (score 4–13)	54	21.1	176	58.9		Ref			Ref	
Moderate to high(score 14–20)	202	78.9	123	41.1	<0.001	0.19	0.13–0.27	**0.028**	**0.51**	**0.28–0.93**
Healthcare service use to overcome COVID-19 related stress in the last 6 months	254		297							
No	251	98.8	229	77.1		Ref			Ref	
Yes	3	1.2	68	22.9	<0.001	24.84	7.71–80.05	0.094	4.17	0.78–22.23

AOR: adjusted odds ratio; CI: confidential interval; OR: odds ratio

*: Those factors with $p < 0.25$ in univariate analyses were selected as candidate independent variables for multivariable logistic regression

Table 3 Factors associated with levels of fear among the study population (based on FCV-19S score)

Characteristics	Low (score 7–21)		High (score 22–35)		Univariate analyses			Multivariate analyses*		
	n	%	n	%	ORs	95% CIs	p	AORs	95% CIs	p
Total study participants	382		173							
Age groups	381		172							
18–29 years	27	7.1	24	14.0	Ref			Ref		
30–59 years	244	64.0	134	77.9	0.62	0.34–1.11	0.109	1.24	0.47–3.25	0.660
≥60 years	110	28.9	14	8.1	0.14	0.07–0.31	<0.001	1.58	0.43–5.76	0.487
Gender	379		172							
Male	92	24.3	89	51.7	Ref			Ref		
Female	287	75.7	83	48.3	0.30	0.20–0.44	<0.001	0.84	0.40–1.75	0.635
Born in Hong Kong	379		172					Not included in the multivariate analyses		
No	39	10.2	14	8.1	Ref					
Yes	340	89.7	158	91.9	1.30	0.68–2.45	0.429			
Living status	378		171							
Live without family members (on your own/ shared house/others)	44	11.6	36	21.1	Ref			Ref		
Live with family members	334	88.4	135	78.9	0.49	0.31–0.80	0.004	1.04	0.43–2.51	0.934
Highest educational/vocational qualification	377		172							
Secondary/Higher secondary/Intermediate/ Grade 7–12	10	2.7	3	1.7	Ref			Ref		
Certificate/Diploma/Trade qualification	48	12.7	45	26.2	3.13	0.81–12.09	0.099	0.41	0.05–3.55	0.416
Bachelor/Master/PhD	319	84.6	124	72.1	1.30	0.35–4.79	0.698	0.75	0.10–5.72	0.784
Current employment condition	379		171							
Jobs affected by COVID-19 (lost job/working hours reduced/ afraid of job loss)	272	71.8	103	60.2	Ref			Ref		
Have an income source (employed/Government benefits)	107	28.2	68	39.8	1.68	1.15–2.45	0.007	1.19	0.51–2.80	0.688
Perceived stress due to change of employment condition	367		168							
A little to none	338	92.1	81	48.2	Ref			Ref		
Moderate to a great deal	29	7.9	87	51.8	12.52	7.71–20.34	<0.001	**4.12**	**1.72–9.88**	**0.002**
Improved working situation due to change of employment	365		169							
A little or none	346	94.8	151	89.3	Ref			Ref		
Moderate to a great deal	19	5.2	18	10.7	2.17	1.11–4.25	0.024	1.34	0.39–4.61	0.648
Self-identification as a frontline or essential service worker	382		173							
No	235	61.5	94	54.3	Ref			Ref		
Yes	147	38.5	79	45.7	1.34	0.93–1.93	0.111	**2.72**	**1.19–6.19**	**0.017**

Table 3 (continued)

Characteristics	Low (score 7–21) n	%	High (score 22–35) n	%	Univariate analyses p	ORs	95% CIs	Multivariate analyses* p	AORs	95% CIs
Self-identification as healthcare worker	**382**		**173**							
No	174	45.5	99	57.2	Ref	Ref		Ref	Ref	
Yes, doctor	0	0.0	3	1.7	No estimates due to small number			No estimates due to small number		
Yes, nurse	192	50.3	44	25.4	<0.001	0.40	0.27–0.61	**0.032**	**0.38**	**0.16–0.92**
Yes, other healthcare worker	16	4.2	27	15.6	0.001	2.97	1.52–5.77	0.973	0.98	0.30–3.18
COVID-19 impacted finical situation	**382**		**173**							
No impact	325	85.1	95	54.9	Ref	Ref		Ref	Ref	
Yes, impacted positively	19	5.0	9	5.2	0.252	1.62	0.71–3.70	0.628	0.72	0.19–2.72
Yes, impacted negatively	38	9.9	69	39.9	<0.001	6.21	3.93–9.81	0.099	2.34	0.85–6.45
Affected by the change in financial situation	**373**		**171**							
Not at all	244	65.4	48	28.1	Ref	Ref		Ref	Ref	
Unsure at this time	44	11.9	41	24.0	<0.001	4.74	2.80–8.02	0.383	1.45	0.63–3.32
Somewhat	71	19.0	59	34.5	<0.001	4.22	2.66–6.72	0.762	0.86	0.33–2.25
A great extent	14	3.8	23	13.5	<0.001	8.35	4.01–17.38	0.817	0.87	0.27–2.83
Co-morbidities	**381**		**173**							
No	251	65.9	85	49.1	Ref	Ref		Ref	Ref	
Yes	130	34.1	88	50.9	<0.001	2.00	1.39–2.88	0.218	1.48	0.79–2.79
Smoking	**382**		**173**							
Never smoker	362	94.8	136	78.6	Ref	Ref		Ref	Ref	
Ever smoker (Daily/Non-daily/Ex)	20	5.2	37	21.4	<0.001	4.92	2.76–8.78	0.940	0.96	0.30–3.01
Increased smoking over the last 6 months	**3**		**23**							
No	3	100.0	4	17.4	No estimates due to small number			Not included in the multivariate analyses		
Yes	0	0.0	19	82.6						
Current alcohol drinking	**380**		**172**							
No	288	75.8	62	36.0	Ref	Ref		Ref	Ref	
Yes	92	24.2	110	64.0	<0.001	5.55	3.76–8.20	0.473	1.29	0.64–2.62
Increased alcohol drinking over the last 6 months	**92**		**110**							
No	81	88.0	27	24.5	Ref	Ref		Not included in the multivariate analyses		
Yes	11	12.0	83	75.5	<0.001	22.64	10.53–48.65			
Contact with known/suspected cases of COVID-19	**376**		**170**							
No	321	85.4	91	53.5	Ref	Ref		Ref	Ref	
Unsure	22	5.9	63	37.1	<0.001	10.10	5.90–17.31	0.363	1.47	0.64–3.35
Yes, had indirect contact	25	6.6	12	7.1	0.155	1.69	0.82–3.50	0.371	0.59	0.18–1.89

Table 3 (continued)

Characteristics	Low (score 7–21) n	%	High (score 22–35) n	%	Univariate analyses ORs	95% CIs	p	Multivariate analyses* AORs	95% CIs	p
Yes, provided direct care	8	2.1	4	2.4	1.76	0.52–5.99	0.363	0.43	0.07–2.72	0.369
Experience related to COVID-19 pandemic	**374**		**172**							
No known exposure to COVID-19	334	89.3	118	68.6	Ref			Ref		
Tested positive for COVID-19	6	1.6	1	0.6	0.47	0.06–3.96	0.489	0.14	0.01–2.42	0.178
Tested negative for COVID-19 but self-isolating	29	7.8	45	26.2	4.39	2.63–7.33	<0.001	1.18	0.48–2.92	0.713
Had recent overseas travel history and was in quarantine	5	1.3	8	4.7	4.53	1.45–14.12	0.009	4.94	0.90–27.00	0.065
Self-identification as a patient (utilised any health care services) in the last 6 months	**375**		**171**							
No	244	65.1	100	58.5	Ref			Ref		
Yes	131	34.9	71	41.5	1.32	0.91–1.92	0.140	0.69	0.36–1.49	0.254
Healthcare service use in the last 6 months	**121**		**70**					Not included in the multivariate analyses		
Visited a healthcare provider in person	120	99.2	58	82.9	Ref					
Telehealth consultation/Used helpline	1	0.8	6	8.6	12.41	1.46–105.52	0.021			
Use both services	0	0.0	6	8.6	No estimates due to small number					
Perceived mental health status	**382**		**173**							
Poor to fair	75	19.6	108	62.4	Ref			Ref		
Good to excellent	307	80.4	65	37.6	0.11	0.07–0.16	<0.001	0.76	0.39–1.49	0.430
Level of psychological distress (K10 categories)	**382**		**173**							
Low (score 10–15)	241	63.1	15	8.7	Ref			Ref		
Moderate to Very high (score 16–50)	141	36.9	158	91.3	18.00	10.19–31.80	<0.001	**6.00**	**2.84–12.70**	**<0.001**
Level of coping (BRCS categories)	**382**		**173**							
Low (score 4–13)	109	28.5	121	69.9	Ref			Ref		
Moderate to high (score 14–20)	273	71.5	52	30.1	0.17	0.12–0.25	<0.001	0.57	0.30–1.08	0.084
Healthcare service use to overcome COVID-19 related stress in the last 6 months	**378**		**173**							
No	372	98.4	108	62.4	Ref			Ref		
Yes	6	1.6	65	37.6	37.32	15.74–88.47	<0.001	**6.38**	**1.98–20.55**	**0.002**

AOR: adjusted odds ratio; CI: confidential interval; OR: odds ratio

*: Those factors with $p < 0.25$ in univariate analyses were selected as candidate independent variables for multivariable logistic regression

findings are somewhat consistent with the results of a similar Australian study (Rahman et al., 2020) using the same set of instruments. The Australian study showed that about two-thirds (62.9%) of Australian people experienced 'moderate to very high' levels of psychological distress. This finding was also similar to a recent study conducted in 194 cities in mainland China in which 53.8% of the respondents rated the psychological impact of the COVID-19 outbreak as moderate to severe (Wang et al., 2020). Both the Australian and this Hong Kong study report that about 30% of the participants had a high level of fear of the COVID-19 infection (Hong Kong: 31.2% and Australia: 31.9%). However, the Australian participants demonstrated low resilient coping (97.3%) versus a much lower percentage (about 40%) in this Hong Kong study (Rahman et al., 2020). Resilience refers to the ability to withstand setbacks, adapt positively and rebound from adversity (Luthar & Cicchetti, 2000). A tendency to effectively use cognitive appraisal skills in a flexible, committed approach to active problem solving despite stressful circumstances is described as "resilient coping behavior". People with high levels of resilient coping tend to believe in their abilities to address adverse circumstances and usually succeed at challenges (Sinclair & Wallston, 2004). Moreover, those with higher resilience coping abilities showed less difficulty coping with the emotional challenges of the pandemic crisis (Killgore et al., 2020). Given that the Australian study (June 2020) was conducted six months before this study (December 2020 to Mid-January 2021), the participants in this study might have a better understanding of the COVID-19 infection and related information, the use of relevant preventive measures such as quarantine, social distancing and wearing masks, and successful stress management and coping strategies and experience sharing. As a result, people in Hong Kong during the later stage of the pandemic could show better coping through self-learning and resilience.

Psychological Distress

Living with family members, current alcohol consumption and a high level of fear of COVID-19 were associated with moderate to very high levels of psychological distress. Conversely, being older (30–59 years, ≥ 60 years), perceived good to excellent mental health, and moderate to high resilient coping were associated with low levels of psychological distress.

Living with family members was associated with moderate to very high levels of psychological distress in this study while the Australian study reported no association (Rahman et al, 2020). Hong Kong is well known as a city with high-density housing and many are living in micro flats. Smaller residential size is associated with an increased risk of psychological distress among the general population (Wong et al., 2016). During this COVID-19 pandemic, the public has been advised to practice physical distancing, avoid crowded areas, and to work from home. Within a limited space in a small flat, living with family members may be equivalent to living with poorer personal space, leading to a higher level of psychological distress. For participants who have children, because children must study at home, working from home may mean heavier parental responsibilities, for example, dealing with parent–child relationships and monitoring children's study, therefore increasing their emotional burden (Wu et al., 2020).

Our study and Rahman et al. (2020) showed that current alcohol consumption was associated with moderate to very high levels of psychological distress. Increased alcohol consumption over the last six months was also related to a higher level of psychological distress and fear of COVID-19, and lower levels of coping strategies in univariate analyses. However, this variable was not included in the multivariate logistic regression due to limited responses. During the COVID-19 pandemic, adverse changes in health behaviours, mainly alcohol intake, were also associated with higher depression, anxiety and stress symptoms (Callinan et al., 2021; Stanton et al., 2020). Social isolation, quarantine, changes in employment status or uncertainty about the future, and any pandemic-related psychological distress may serve as significant triggers for increased alcohol intake (Ramalho, 2020; Stanton et al., 2020). Increased alcohol consumption might also be explained as a strategy to cope with perceived distress (Callinan et al., 2021; Stanton et al., 2020).

Being younger may be another potential risk factor for distress related to COVID-19 (Qiu et al., 2020; Yu et al., 2020). A nationwide study among 52,730 respondents in China showed that the young adult group, 18–30 years, reported the highest distress level during the pandemic (Qiu et al., 2020), which was consistent with the findings from our study and Australian (Rahman et al., 2020). The potential explanation might be that young participants are more likely to obtain pandemic-related information, including negative and inaccurate news from various social media and thus trigger stress (Qiu et al., 2020; Rahman et al., 2020). In addition, young people have the primary responsibility for social productivity and their family, and therefore bear more psychological pressure (Liu et al., 2020).

Fear of COVID-19

A high level of fear of COVID-19 was associated with the use of healthcare services to overcome COVID-19 related stress, moderate to a great deal of perceived stress due to change of employment conditions, self-identification as frontline or essential service worker, and moderate to very high psychological distress. Interestingly, our study

Table 4 Factors associated with coping strategies among the study population (based on BRCS score)

Characteristics	Low (score 4–13) n	%	Moderate to high (score 14–20) n	%	Univariate analyses p	ORs	95% CIs	Multivariate analyses* p	AORs	95% CIs
Total study participants	230		325							
Age groups	229		324							
18–29 years	25	10.9	26	8.0		Ref			Ref	
30–59 years	185	80.8	193	59.6	0.992	1.00	0.56–1.80	0.634	0.82	0.35–1.89
≥60 years	19	8.3	105	32.4	<0.001	5.31	2.55–11.08	0.173	2.10	0.72–6.12
Gender	230		325							
Male	91	39.6	90	27.7		Ref			Ref	
Female	135	58.7	235	72.3	0.002	1.76	1.23–2.52	0.147	0.62	0.32–1.18
Born in Hong Kong	228		323							
No	17	7.5	36	11.1		Ref			Ref	
Yes	211	92.5	287	88.9	0.151	0.64	0.35–1.18	0.746	0.88	0.40–1.94
Living status	225		324							
Live without family members (on your own/shared house/others)	44	19.6	36	11.1		Ref			Ref	
Live with family members	181	80.4	288	88.9	0.006	1.95	1.21–3.14	0.268	1.49	0.73–3.03
Highest educational/vocational qualification	228		321							
Secondary/Higher secondary/Intermediate/Grade 7–12	8	3.5	5	1.6		Ref			Ref	
Certificate/Diploma/Trade qualification	57	25.0	36	11.2	0.986	1.01	0.31–3.33	0.924	1.09	0.20–5.97
Bachelor/Master/PhD	163	71.5	280	87.2	0.081	2.75	0.88–8.54	0.086	4.00	0.82–19.47
Current employment condition	227		323							
Jobs affected by COVID-19 (lost job/working hours reduced/ afraid of job loss)	153	67.4	222	68.7		Ref		Not included in the multivariate analyses		
Have an income source (employed/Government benefits)	74	32.6	101	31.3	0.742	0.94	0.65–1.35			
Perceived stress due to change of employment condition	221		314							
A little to none	138	62.4	281	89.5		Ref			Ref	
Moderate to a great deal	83	37.6	33	10.5	<0.001	0.20	0.12–0.31	0.734	0.87	0.39–1.94
Improved working situation due to change of employment	221		313							
A little or none	201	91.0	296	94.6		Ref			Ref	
Moderate to a great deal	20	9.0	17	5.4	0.108	0.58	0.30–1.13	0.181	2.18	0.70–6.84
Self-identification as a frontline or essential service worker	230		325							
No	121	52.6	208	64.0		Ref			Ref	
Yes	109	47.4	117	36.0	0.007	0.62	0.44–0.88	0.938	0.98	0.52–1.82
Self-identification as healthcare worker	230		325							
No	114	49.6	159	48.9		Ref			Ref	

Table 4 (continued)

Characteristics	Low (score 4–13) n	%	Moderate to high (score 14–20) n	%	Univariate analyses p	ORs	95% CIs	Multivariate analyses* p	AORs	95% CIs
Yes, doctor	1	0.4	2	0.6	0.770	1.43	0.13–16.00	No estimates due to small number		
Yes, nurse	87	37.8	149	45.8	0.260	1.23	0.86–1.76	0.495	0.79	0.40–1.55
Yes, other healthcare worker	28	12.2	15	4.6	0.005	0.38	0.20–0.75	0.831	1.12	0.40–3.11
COVID-19 impacted finical situation	**230**		**325**							
No impact	141	61.3	279	85.8		Ref			Ref	
Yes, impacted positively	19	8.3	9	2.8	0.001	0.24	0.11–0.54	0.494	0.67	0.21–2.10
Yes, impacted negatively	70	30.4	37	11.4	<0.001	0.27	0.17–0.42	0.521	1.31	0.57–3.03
Affected by the change in financial situation	**224**		**320**							
Not at all	70	31.3	222	69.4		Ref			Ref	
Unsure at this time	56	25.0	29	9.1	<0.001	4.65	2.29–9.45	**0.015**	**0.43**	**0.22–0.85**
Somewhat	76	33.9	54	16.9	0.498	0.76	0.34–1.68	0.235	0.64	0.30–1.34
A great extent	22	9.8	15	4.7	0.913	1.04	0.50–2.19	0.909	1.06	0.37–3.03
Co-morbidities	**229**		**325**							
No	125	54.6	211	64.9		Ref			Ref	
Yes	104	45.4	114	35.1	0.014	0.65	0.46–0.92	0.499	0.83	0.48–1.43
Smoking	**230**		**325**							
Never smoker	190	82.6	308	94.8		Ref			Ref	
Ever smoker (Daily/Non-daily/Ex)	40	17.4	17	5.2	<0.001	0.26	0.15–0.48	0.577	0.75	0.27–2.05
Increased smoking over the last 6 months	**20**		**6**							
No	3	15.0	4	66.7		Ref		Not included in the multivariate analyses		
Yes	17	85.0	2	33.3	0.023	0.09	0.01–0.72			
Current alcohol drinking	**229**		**323**							
No	110	48.0	240	74.3		Ref			Ref	
Yes	119	52.0	83	25.7	<0.001	0.32	0.22–0.46	0.826	1.07	0.59–1.95
Increased alcohol drinking over the last 6 months	**119**		**83**							
No	36	30.3	72	86.7		Ref		Not included in the multivariate analyses		
Yes	83	69.7	11	13.3	<0.001	0.07	0.03–0.14			
Contact with known/suspected cases of COVID-19	**225**		**321**							
No	134	59.6	278	86.6		Ref			Ref	
Unsure	67	29.8	18	5.6	<0.001	0.13	0.07–0.23	0.100	0.53	0.25–1.13
Yes, had indirect contact	17	7.6	20	6.2	0.101	0.57	0.29–1.12	0.704	1.20	0.47–3.07
Yes, provided direct care	7	3.1	5	1.6	0.073	0.34	0.11–1.11	0.595	0.67	0.15–2.92
Experience related to COVID-19 pandemic	**222**		**324**							

Table 4 (continued)

Characteristics	Low (score 4–13)		Moderate to high (score 14–20)		Univariate analyses			Multivariate analyses*		
	n	%	n	%	p	ORs	95% CIs	p	AORs	95% CIs
No known exposure to COVID-19	156	70.3	296	91.4		Ref			Ref	
Tested positive for COVID-19	5	2.3	2	0.6	0.065	0.21	0.04–1.10	**0.035**	**0.10**	**0.01–0.85**
Tested negative for COVID-19 but self-isolating	54	24.3	20	6.2	<0.001	0.20	0.11–0.34	**0.024**	**0.42**	**0.20–0.89**
Had recent overseas travel history and was in quarantine	7	3.2	6	1.9	0.160	0.15	0.15–1.37	0.476	1.70	0.40–7.28
Self-identification as a patient (utilised any health care services) in the last 6 months	**230**		**323**							
No	129	57.8	215	66.6		Ref			Ref	
Yes	94	42.2	108	33.4	0.038	0.69	0.49–0.98	0.657	1.13	0.66–1.94
Healthcare service use in the last 6 months	**87**		**104**					Not included in the multivariate analyses		
Visited a healthcare provider in person	77	88.5	101	97.1		Ref				
Telehealth consultation/Used helpline	6	6.9	1	1.0	0.059	0.13	0.02–1.08			
Use both services	4	4.6	2	1.9	0.273	0.38	0.07–2.14			
Perceived mental health status	**230**		**325**							
Poor to fair	139	60.4	56	17.2		Ref			Ref	
Good to excellent	91	39.6	269	82.8	<0.001	7.34	4.96–10.85	**0.001**	**2.76**	**1.53–4.95**
Level of psychological distress (K10 categories)	**230**		**325**							
Low (score 10–15)	54	23.5	202	62.2		Ref			Ref	
Moderate to Very high (score 16–50)	176	76.5	123	37.8	<0.001	0.19	0.13–0.27	0.068	0.59	0.33–1.04
Level of fear of COVID-19 (FCV-19S categories)	**230**		**325**							
Low (score 7–21)	109	47.4	273	84.0		Ref			Ref	
High (score 22–35)	121	52.6	52	16.0	<0.001	0.17	0.12–0.25	**0.029**	**0.51**	**0.28–0.93**
Healthcare service use to overcome COVID-19 related stress in the last 6 months	**227**		**324**							
No	165	72.7	315	97.2		Ref			Ref	
Yes	62	27.3	9	2.8	<0.001	0.08	0.04–0.16	**0.050**	**0.36**	**0.13–1.00**

AOR: adjusted odds ratio; CI: confidential interval; OR: odds ratio

*: Those factors with p < 0.25 in univariate analyses were selected as candidate independent variables for multivariable logistic regression

wwindicated that self-identification as a nurse was associated with a low level of fear of COVID-19.

Those who used healthcare services to overcome COVID-19 related stress tended to report high levels of fear, probably because these participants had heightened self-awareness of their health. Moderate to a great deal of perceived stress due to a change in employment conditions was associated with higher levels of fear. The COVID-19 pandemic pushed millions of people into unemployment, underemployment and working poverty. According to the International Labour Organization (2020), almost 25 million jobs could be lost worldwide due to COVID-19. Among our participants, more than half (68.2%) reported that their jobs were affected by COVID-19, such as job loss and reduced working hours. Approximately 20% of participants reported negatively impacted financial situation as a result of the pandemic. Therefore, it is important for the Hong Kong government to take effective strategies in time to reduce and improve the economic impacts.

Being a frontline or an essential service worker was associated with a high level of fear in this study. Such results are inconsistent with the Australian study, which reported that frontline or essential workers were less fearful than their counterparts (Rahman et al., 2020). However, our findings are in line with other studies which demonstrated a higher level of fear and psychological disorders among frontline healthcare workers than non-frontline workers (Cai et al., 2020; Lu et al., 2020). Likewise recent systematic reviews, have shown a considerable proportion of healthcare workers experienced various mental health problems during this outbreak (Magill et al., 2020; Pappa et al., 2020).

Compared with non-frontline workers or the general population, frontline healthcare workers may be more fearful and stressed. They may face a higher risk of exposure to COVID-19 as they need to spend more time in hospital wards, providing direct care to infected patients and some are responsible for virus detection as laboratory health workers. They may also be afraid of bringing the virus home to families and lack of ability to manage when facing critically ill patients. Due to their closer contact with patients, they may be more exposed to injury, suffering, and death (Cai et al., 2020; Lu et al., 2020; Pappa et al., 2020). In previous studies regarding frontline healthcare workers, nurses expressed a high level of fear of COVID-19 (Hu et al., 2020; Labrague & de los Santos., 2021) and exhibited a higher prevalence of mental health problems than other healthcare workers (Pappa et al., 2020). However, in this study, the nurses who were mainly not frontline workers providing direct patient care reported a lower level of fear than non-healthcare workers. Nonetheless, with more timely COVID-19 information, knowledge about its prevention and control and availability of personal protective equipment, frontline healthcare workers could be less fearful than that in early stage of pandemic, and the general population who might not have adequate knowledge and resources for understanding and control of the COVID-19 pandemic (Zhang et al., 2020).

Coping Strategies

Good to excellent perceived mental health was associated with a moderate to high level of resilient coping. Change in financial situation, testing positive/negative for COVID-19, high levels of fear of COVID-19 and using healthcare services to overcome COVID-19 related stress in the last six months were associated with low resilient coping. Interestingly, compared with the participants who had no known exposure to COVID-19, those who tested positive or negative for COVID-19 had lower levels of resilient coping. This could be explained where these participants, either being tested as positive or negative for COVID-19, having known exposure or possible contact with an infected person, and their perceived uncertainties about their own health status, might cause them to adopt maladaptive or avoidance coping responses, therefore lowering their resilience.

Our study found that the level of psychological distress was interrelated with the level of fear of COVID-19, indicating a positive mutual influence relationship. Moreover, in line with previous studies, our study found that resilience and psychological distress/fear are negatively associated (Killgore et al., 2020; Yasien et al., 2016), indicating that high resilience may help the public to adapt to the new norm during the pandemic, despite dealing with a fearful and stressful situation. Such psychological resilience-related interventions have also been applied in China during the pandemic and was shown to be to improve overall mental health among the general population (He et al., 2020).

Limitations

There are several limitations of this study. First, selection bias may occur due to using online platforms and only including those who were able to respond to the questionnaire in English. Therefore, the generalizability of the findings could be reduced by selection bias; and caution would be warranted when interpreting the study results. However, a remote data collection approach during the COVID-19 pandemic was deemed as a safe and effective way to collect survey data. Second, causal relationships could not be drawn due to the nature of cross-sectional design. In future, a prospective longitudinal study with larger-sized samples can be employed to examine the predictive relationships of wider varieties of important internal (personal) and external factors with psychological distress, fear and coping of different community groups during and after the pandemic.

Implications for Research and Practice

Our study findings identified key factors associated with psychological distress, fear and coping. Local policymakers may consider necessary steps to reduce the effects of COVID-19. First, mental health services for different kinds of population, such as frontline healthcare workers, parents and young adults, can be delivered through eHealth such as video call consultations and hotlines to improve psychological well-being, and can be considered as precautionary measures for COVID-19 as well as physical distancing. Second, strategies aimed at adopting or maintaining heath behaviours should be promoted to avoid subsequent potential alcohol misuse and alcohol-related social harm and to address increase in psychological distress during the pandemic. Third, efforts by policymakers are needed to ensure proper, transparent, and timely dissemination of information related to COVID-19. The government, media and news organisations may need conjoint efforts to curb the spread of inaccurate media-fuelled infodemics that generate fear and panic. Resources for coping strategies during this pandemic are urgently needed to alleviate psychological distress. Despite more than half of the participants demonstrating moderate to high levels of resilient coping, 41.4% were demonstrated low resilient coping. Therefore, the development of series of resilience training activities is strongly recommended to reduce adverse mental health outcomes in a sudden public health epidemic.

Conclusion

The present study explored the key factors associated with psychological distress, fear of COVID-19 and coping strategies among the diverse population in Hong Kong. Mental health support strategies should be provided continuously to prevent the mental impact of the COVID-19 epidemic from turning into long-term illness.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s12144-021-02338-7.
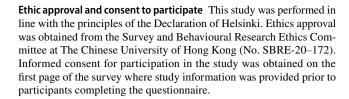
Funding The authors did not receive support from any organization for the submitted work.

Data Availability The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Code Availability Not applicable.

Declarations

Competing Interests The authors have no conflicts of interest to declare that are relevant to the content of this article.

Ethic approval and consent to participate This study was performed in line with the principles of the Declaration of Helsinki. Ethics approval was obtained from the Survey and Behavioural Research Ethics Committee at The Chinese University of Hong Kong (No. SBRE-20–172). Informed consent for participation in the study was obtained on the first page of the survey where study information was provided prior to participants completing the questionnaire.

Consent for publication Not applicable.

References

Ahorsu, D. K., Lin, C. Y., Imani, V., Saffari, M., Griffiths, M. D., & Pakpour, A. H. (2020). The fear of COVID-19 scale: Development and initial validation. *International Journal of Mental Health and Addiction*, 1–9. Advance online publication. https://doi.org/10.1007/s11469-020-00270-8

Ashraf, B. N. (2020). Economic impact of government interventions during the COVID-19 pandemic: International evidence from financial markets. *Journal of Behavioral and Experimental Finance, 27*, 100371. https://doi.org/10.1016/j.jbef.2020.100371

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. *The Lancet, 395*(10227), 912–920. https://doi.org/10.1016/S0140-6736(20)30460-8

Cai, Q., Feng, H., Huang, J., Wang, M., Wang, Q., Lu, X., Xie, Y., Wang, X., Liu, Z., Hou, B., Ouyang, K., Pan, J., Li, Q., Fu, B., Deng, Y., & Liu, Y. (2020). The mental health of frontline and non-frontline medical workers during the coronavirus disease 2019 (COVID-19) outbreak in China: A case-control study. *Journal of Affective Disorders, 275*, 210–215. https://doi.org/10.1016/j.jad.2020.06.031

Callinan, S., Mojica-Perez, Y., Wright, C. J., Livingston, M., Kuntsche, S., Laslett, A. M., Room, R., & Kuntsche, E. (2021). Purchasing, consumption, demographic and socioeconomic variables associated with shifts in alcohol consumption during the COVID-19 pandemic. *Drug and Alcohol Review, 40*(2), 183–191. https://doi.org/10.1111/dar.13200

Centre for Health Protection, Department of Health, The Government of the Hong Kong Special Administrative Region. (2021, May 21). *Coronavirus disease 2019 [COVID-19].* Retrieved January 30, 2021, from https://www.chp.gov.hk/files/pdf/severe_respiratory_disease_leaflet_en.pdf. Accessed 30 June 2021

Census and Statistics Department. The Government of the Hong Kong Special Administrative Region. (2021a, February 18). *Table E016: Detailed statistical tables on labour force, employment, unemployment and underemployment (November 2020 to January 2021).* Retrieved May 31, 2021, from https://www.chp.gov.hk/files/pdf/severe_respiratory_disease_leaflet_en.pdf

Census and Statistics Department, The Government of the Hong Kong Special Administrative Region. (2021b) *Population estimates.* Retrieved May 31, 2021, from https://www.censtatd.gov.hk/en/scode150.html

Chew, Q. H., Wei, K. C., Vasoo, S., Chua, H. C., & Sim, K. (2020). Narrative synthesis of psychological and coping responses towards emerging infectious disease outbreaks in the general population: Practical considerations for the COVID-19 pandemic. *Tropical Journal of Pharmaceutical Research, 61*(7), 350–356. https://doi.org/10.11622/smedj.2020046

Choi, E., Hui, B., & Wan, E. (2020). Depression and anxiety in Hong Kong during COVID-19. *International Journal of Environmental Research and Public Health, 17*(10), 3740. https://doi.org/10.3390/ijerph17103740

Fong, B. Y. F., Wong, M. C. S., Law, V. T. S., Lo, M. F., Ng, T. K. C., Yee, H. H. L., Leung, T. C. H., & Ho, P. W. T. (2020a). Relationships between physical and social behavioural changes and the mental status of homebound residents in Hong Kong during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health, 17*(18), 6653. https://doi.org/10.3390/ijerph17186653

Fong, M. W., Gao, H., Wong, J. Y., Xiao, J., Shiu, E. Y., Ryu, S., & Cowling, B. J. (2020b). Nonpharmaceutical measures for pandemic influenza in nonhealthcare settings social distancing measures. Emerging Infectious Diseases, 26(5), 976–984. https://doi.org/10.3201/eid2605.190995

Furukawa, T. A., Kessler, R. C., Slade, T., & Andrews, G. (2003). The performance of the K6 and K10 screening scales for psychological distress in the Australian national survey of mental health and well-being. *Psychological Medicine, 33*(2), 357–362. https://doi.org/10.1017/S0033291702006700

Gan, X., Shi, Z., Chair, S. Y., Cao, X., & Wang, Q. (2020). Willingness of Chinese nurses to practice in Hubei combating the coronavirus disease 2019 epidemic: A cross-sectional study. *Journal of Advanced Nursing, 76*(8), 2137–2150. https://doi.org/10.1111/jan.14434

He, Z., Chen, J., Pan, K., Yue, Y., Cheung, T., Yuan, Y., Du, N., Zhao, Y., Feng, Y., Zhou, D., Zhou, Y., Lu, F., Chen, Y., He, M., & Xiang, Y. T. (2020). The development of the 'COVID-19 Psychological Resilience Model' and its efficacy during the COVID-19 pandemic in China. *International Journal of Biological Sciences, 16*(15), 2828–2834. https://doi.org/10.7150/ijbs.50127

Hu, D., Kong, Y., Li, W., Han, Q., Zhang, X., Zhu, L. X., Wan, S. W., Liu, Z., Shen, Q., Yang, J., He, H. G., & Zhu, J. (2020). Frontline nurses' burnout, anxiety, depression, and fear statuses and their associated factors during the COVID-19 outbreak in Wuhan, China: A large-scale cross-sectional study. *EClinicalMedicine, 24*, 100424. https://doi.org/10.1016/j.eclinm.2020.100424

International Labour Organization. (2020, March 18). *Almost 25 million jobs could be lost worldwide as a result of COVID-19, says ILO*. Retrieved March 31, 2021, from https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_738742/lang--en/index.htm

Killgore, W. D., Taylor, E. C., Cloonan, S. A., & Dailey, N. S. (2020). Psychological resilience during the COVID-19 lockdown. *Psychiatry Research, 291*, 113216. https://doi.org/10.1016/j.psychres.2020.113216

Kwok, K. O., Li, K. K., Chan, H. H. H., Yi, Y. Y., Tang, A., Wei, W. I., & Wong, S. Y. S. (2020). Community responses during early phase of COVID-19 epidemic. *Hong Kong. Emerging Infectious Diseases, 26*(7), 1575–1579. https://doi.org/10.1101/2020.02.26.20028217

Labrague, L. J., & de los Santos, J. A. A. . (2021). Fear of COVID-19, psychological distress, work satisfaction and turnover intention among frontline nurses. *Journal of Nursing Management, 29*(3), 395–403. https://doi.org/10.1111/jonm.13168

Liu, X., Luo, W. T., Li, Y., Li, C. N., Hong, Z. S., Chen, H. L., Xiao, F., & Xia, J. Y. (2020). Psychological status and behavior changes of the public during the COVID-19 epidemic in China. *Infectious Diseases of Poverty, 9*, 1–11. https://doi.org/10.1186/s40249-020-00678-3

López, J., Perez-Rojo, G., Noriega, C., Carretero, I., Velasco, C., Martinez-Huertas, J. A., López-Frutos, P., & Galarraga, L. (2020). Psychological well-being among older adults during the COVID-19 outbreak: A comparative study of the young–old and the old–old adults. *International Psychogeriatrics, 32*(11), 1365–1370. https://doi.org/10.1017/S1041610220000964

Lu, W., Wang, H., Lin, Y., & Li, L. (2020). Psychological status of medical workforce during the COVID-19 pandemic: A cross-sectional study. *Psychiatry Research, 288*, 112936. https://doi.org/10.1016/j.psychres.2020.112936

Luthar, S. S., & Cicchetti, D. (2000). The construct of resilience: Implications for interventions and social policies. *Development and Psychopathology, 12*(4), 857–885. https://doi.org/10.1017/s0954579400004156

Magill, E., Siegel, Z., & Pike, K. M. (2020). The mental health of frontline health care providers during pandemics: A rapid review of the literature. *Psychiatric Services, 71*(12), 1260–1269. https://doi.org/10.1176/appi.ps.202000274

Pappa, S., Ntella, V., Giannakas, T., Giannakoulis, V. G., Papoutsi, E., & Katsaounou, P. (2020). Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *Brain, Behavior, and Immunity, 88*, 901–907. https://doi.org/10.1016/j.bbi.2020.05.026

Qiu, J., Shen, B., Zhao, M., Wang, Z., Xie, B., & Xu, Y. (2020). A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: Implications and policy recommendations. *General Psychiatry, 33*(2), e100213. https://doi.org/10.1136/gpsych-2020-100213

Ramalho, R. (2020). Alcohol consumption and alcohol-related problems during the COVID-19 pandemic: A narrative review. *Australasian Psychiatry, 28*(5), 524–526. https://doi.org/10.1177/1039856220943024

Rahman, M. A., Hoque, N., Alif, S. M., Salehin, M., Islam, S. M. S., Banik, B., Sharif, A., Nazim, N. B., Sultana, F., & Cross, W. (2020). Factors associated with psychological distress, fear and coping strategies during the COVID-19 pandemic in Australia. *Globalization and Health, 16*(1), 1–15. https://doi.org/10.1186/s12992-020-00624-w

Rahman, M. A., Salehin, M., Islam, S. M. S., Alif, S. M., Sultana, F., Sharif, A., Hoque, N., Nazim, N. B., & Cross, W. M. (2021). Reliability of the tools used to examine psychological distress, fear of COVID-19 and coping amongst migrants and non-migrants in Australia. *International Journal of Mental Health Nursing, 30*, 745–756. https://doi.org/10.1111/inm.12845

Salari, N., Khazaei, H., Hosseinian Far, A., Khaledi-Paveh, B., Kazeminia, M., Mohammadi, M., Shohaimi, S., Daneshkhah, A., & Eskandari, S. (2020). The prevalence of stress, anxiety and depression within front-line healthcare workers caring for COVID 19 patients: A systematic review and meta-regression. *Human Resources for Health, 18*(1), 100. https://doi.org/10.1186/s12960-020-00544-1

Sansa, N. A. (2020). The Impact of the COVID-19 on the financial markets: Evidence from China and USA. *Electronic Research Journal of Social Sciences and Humanities, 2*(II), 29–39. https://doi.org/10.2139/ssrn.3567901

Sinclair, V. G., & Wallston, K. A. (2004). The development and psychometric evaluation of the Brief Resilient Coping Scale. *Assessment, 11*(1), 94–101. https://doi.org/10.1177/1073191103258144

Stanton, R., To, Q. G., Khalesi, S., Williams, S. L., Alley, S. J., Thwaite, T. L., Fenning, A. S., & Vandelanotte, C. (2020). Depression, anxiety and stress during COVID-19: Associations with changes in physical activity, sleep, tobacco and alcohol use in Australian adults. *International Journal of Environmental Research and Public Health, 17*(11), 4065. https://doi.org/10.3390/ijerph17114065

The Government of the Hong Kong Special Administrative Region (2020, March). *Hong Kong's multi-pronged response to COVID-19 2020*. Retrieved January 15, 2021, from https://www.hketojakarta.gov.hk/doc/pdf/Factsheet_coronavirus_Mar_17_E.pdf

The Government of the Hong Kong Special Administrative Region. (2021, June 21). *Together, We Fight the Virus!* Retrieved June 30, 2021, from https://www.coronavirus.gov.hk/eng/index.html

Tso, I. F., & Park, S. (2020). Alarming levels of psychiatric symptoms and the role of loneliness during the COVID-19 epidemic: A case study of Hong Kong. *Psychiatry Research, 293*, 113423. https://doi.org/10.1016/j.psychres.2020.113423

Tull, M. T., Edmonds, K. A., Scamaldo, K. M., Richmond, J. R., Rose, J. P., & Gratz, K. L. (2020). Psychological outcomes associated with stay-at-home orders and the perceived impact of COVID-19 on daily life. *Psychiatry Research, 289*, 113098. https://doi.org/10.1016/j.psychres.2020.113098

Voßemer, J., Gebel, M., Täht, K., Unt, M., Högberg, B., & Strandh, M. (2018). The effects of unemployment and insecure jobs on well-being and health: The moderating role of labor market policies. *Social Indicators Research, 138*(3), 1229–1257. https://doi.org/10.1007/s11205-017-1697-y

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health, 17*(5), 1729. https://doi.org/10.3390/ijerph17051729

Wong, C. S. M., Chan, W. C., Lam, L. C. W., Law, W. Y., Tang, W. Y., Wong, T. Y., & Chen, E. Y. H. (2016). Living environment and psychological distress in the general population of Hong Kong. *Procedia Environmental Sciences, 36*, 78–81. https://doi.org/10.1016/j.proenv.2016.09.016

Wong, S. Y. S., Zhang, D., Sit, R. W. S., Yip, B. H. K., Chung, R. Y., Wong, C. K. M., Chan, D. C. C., Sun, W., Kwok, K. O., & Mercer, S. W. (2020). Impact of COVID-19 on loneliness, mental health, and health service utilisation: A prospective cohort study of older adults with multimorbidity in primary care. *British Journal of General Practice, 70*(700), e817–e824. https://doi.org/10.3399/bjgp20X713021

World Health Organization (2020, March 11). *WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020*. Retrieved May 15, 2021, from https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

World Health Organization. (2021, June 21). *WHO Coronavirus disease (COVID-19) Dashboard*. Retrieved July 31, 2021, from https://covid19.who.int/

Wu, M., Xu, W., Yao, Y., Zhang, L., Guo, L., Fan, J., & Chen, J. (2020). Mental health status of students' parents during COVID-19 pandemic and its influence factors. *General Psychiatry, 33*(4), e100250. https://doi.org/10.1136/gpsych-2020-100250

Yao, R., & Wu, W. (2021). Mental disorders associated with COVID-19 related unemployment. *Applied Research in Quality of Life*. Published in Advance [5 May]. https://doi.org/10.1007/s11482-021-09950-6

Yasien Abdul, S., Nasir, J., & Shaheen, T. (2016). Relationship between psychological distress and resilience in rescue workers. *Saudi Medical Journal, 37*(7), 778–782. https://doi.org/10.15537/smj.2016.7.15004

Yeung, N. C. Y., Huang, B., Lau, C. Y. K., & Lau, J. T. F. (2020). Feeling anxious amid the COVID-19 pandemic: Psychosocial correlates of anxiety symptoms among Filipina domestic helpers in Hong Kong. *International Journal of Environmental Research and Public Health, 17*(21), 8102. https://doi.org/10.3390/ijerph17218102

Yu, H., Li, M., Li, Z., Xiang, W., Yuan, Y., Liu, Y., Li, Z., & Xiong, Z. (2020). Coping style, social support and psychological distress in the general Chinese population in the early stages of the COVID-19 epidemic. *BMC Psychiatry, 20*(1), 1–11. https://doi.org/10.1186/s12888-020-02826-3

Zhang, Y., Wang, C., Pan, W., Zheng, J., Gao, J., Huang, X., Cai, S., Zhai, Y., Latour, J. M., & Zhu, C. (2020). Stress, burnout, and coping strategies of frontline nurses during the COVID-19 epidemic in Wuhan and Shanghai. *China. Frontiers in Psychiatry, 11*, 565520. https://doi.org/10.3389/fpsyt.2020.565520

Zhao, S. Z., Wong, J. Y. H., Luk, T. T., Wai, A. K. C., Lam, T. H., & Wang, M. P. (2020). Mental health crisis under COVID-19 pandemic in Hong Kong, China. *International Journal of Infectious Diseases, 100*, 431–433. https://doi.org/10.1016/j.ijid.2020.09.030