

Risk and protective factors of mental health during the COVID-19 pandemic: A cross-sectional study in Singapore

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ABSTRACT

Introduction: The main aims of the study were to: establish the average levels of psychological distress, suicidality and positive mental health (PMH); and examine their associated risk and protective factors in the population of Singapore during the early phase of the COVID-19 pandemic.

Method: Participants from a national psychiatric epidemiological study conducted in the general population of Singapore from 2016 to 2018, who had agreed to be re-contacted, were invited to participate in the study that was conducted from May 2020 to June 2021. Questionnaires assessing psychological distress, causes of stress, resilience and PMH were administered.

Results: A total of 1,129 respondents completed the study. The mean age was 47.7 (standard deviation = 16.5) years. The prevalence of stress, depression and anxiety was 7.1%, 8.0% and 8.4%, respectively. The final pathways model showed that high concerns related to possible COVID-19 infection of family members or friends were significantly associated with higher stress ($\beta = 0.242$, $P < 0.001$), depression ($\beta = 0.152$, $P = 0.001$) and anxiety ($\beta = 0.280$, $P < 0.001$). High resilience was significantly associated with lower stress ($\beta = -0.482$, $P < 0.001$), depression ($\beta = -0.394$, $P < 0.001$) and anxiety ($\beta = -0.516$, $P < 0.001$), and with high PMH ($\beta = 0.498$, $P < 0.001$).

Conclusion: The findings highlight the negative impact of fear of COVID-19 infection, social distancing and isolation on the mental health of the population. Resilience and PMH were associated with lower psychological stress, and interventions to improve these characteristics can enhance mental health and well-being.

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INTRODUCTION

The COVID-19 pandemic has significantly impacted people's well-being globally.¹ Individuals faced several stressors during the pandemic, including fear of contracting the disease, experiencing severe symptoms of COVID-19, losing loved ones to the disease, financial insecurity, and social isolation. Furthermore, children and youths experienced disruption to their usual routine such as schooling, and loss of developmental milestones including graduation and starting on their work life. In addition, domestic violence increased due to the close

living conditions imposed by sheltering at home, and caregivers could not access respite care and other professional services.^{2,3} On the other hand, the pandemic also revealed the emergence of several protective factors. These included personal and socioecological factors such as resilience, social support,⁴ social participation and trust in government^{5,6} that promoted mental health and well-being. However, the presence of these factors, their relative importance and their interaction would likely differ in context, time and place.

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CLINICAL IMPACT

What is New

- To our knowledge, this study is the first to examine the psychological distress and its correlates in the population of Singapore during the early phase of the COVID-19 pandemic.
- Findings highlight the negative impact of fear of COVID-19 infection, social distancing and isolation on the mental health of the population.

Clinical Implications

- Interventions to improve resilience and positive mental health can enhance well-being and outlook on health outcomes.
- The findings can potentially help policymaking and guide efforts for future pandemic preparedness.

Singapore is a multiethnic city-state with a population of about 5.5 million.⁷ Following the epidemic caused by severe acute respiratory syndrome (SARS)-associated coronavirus in 2003, Singapore's healthcare and public health systems had enhanced their preparedness response. However, despite these measures, the country was challenged on several fronts by the COVID-19 pandemic, including surges of panic buying by the populace, widespread transmission among its large migrant worker population, an ageing population at higher risk of complications, and the consequent fear of overwhelming the healthcare system. A nationwide stay-at-home measure (circuit breaker) was imposed on all Singapore residents in April 2020 to control the spread of the infection in a then-unvaccinated population. In addition, public health interventions such as contact tracing, restriction of travel, enhanced surveillance using polymerase chain reaction (PCR) tests, and mandatory masking were introduced progressively to improve case detection and to reduce transmission. As a result, the country moved through several phases before entering the transition phase to COVID-19 resilience on 26 April 2022.⁸

While several studies have examined the impact of the pandemic on healthcare worker's mental well-being during the pandemic in Singapore,^{9,10} few studies have examined the impact of the pandemic on the mental health of the general population. Studies from elsewhere have reported high levels of depression, anxiety and stress in the general population during the pandemic.^{11,12}

A systematic review that examined the impact of COVID-19 on the general population found a high prevalence of symptoms of anxiety (6.33–50.9%), depression (14.6–48.3%), post-traumatic stress disorder (7–53.8%), and stress (8.1–81.9%) across China, Denmark, Iran, Italy, Nepal, Spain, Turkey and the US.¹³ Given that risk and protective factors contributing to an individual's well-being during a pandemic differ across countries, the authors felt that it is essential to examine the mental health status and the contributory factors in Singapore's population. Such information could help inform government policy in terms of ascertaining the impact of social distancing and other restrictive measures on mental health and rationalise resource allocation.

Mental health is a complex and multidimensional construct. Current research suggests that mental distress and mental health coexist and interact. Positive emotions and relationships diminish psychological distress during periods of crisis, and maintain mental health despite the upheaval.¹⁴ Keeping this broader perspective of mental health as the guiding principle, the main aims of our study were to: establish the average levels of psychological distress, suicidality and positive mental health (PMH); and examine their associated risk and protective factors in the population of Singapore during the early phase of the pandemic.

METHOD

Sample size estimation

To estimate the sample size of the study, we used previously estimated prevalence rates of mental disorders from a low prevalence of 1.6% (generalised anxiety disorder) to a high prevalence of 6.3% (major depressive disorder) ascertained in the Singapore Mental Health Study, which was conducted in 2016 (SMHS 2016).¹⁵ If the margin of error of parameter estimates was assumed to be 1% across disorders, while the Type 1 error rate was controlled at 5%, the final adjusted sample size required to achieve this level of precision with an allowance of 30% incomplete data, would range from 1,269 to 1,663.¹⁶

Survey population and subjects

Participants from the SMHS 2016,¹⁵ a national psychiatric epidemiological study conducted in the general population of Singapore, had agreed to be re-contacted (n=3370) for future studies. They were followed up using phone calls or emails during the acute phase of the pandemic, and face-to-face interviews in the later stages. The inclusion criteria for this study reflected the criteria of the SMHS 2016 study. Those who participated were

Singapore citizens or permanent residents, aged 21 years and above, able to speak in English, Chinese or Malay, and available for a Zoom platform (Zoom Video Communications) or face-to-face interview. All participants provided written informed consent either using online software or in person. Interviews were conducted on the Zoom platform or in person, and data was captured using QuestionPro (QuestionPro, Austin, US). A total of 1,129 participants agreed to participate in the study conducted from May 2020 to June 2021, giving a response rate of 54.8% (after excluding those whose contact details were invalid).

The ethical approval for the study was obtained from the National Healthcare Group Domain Specific Review Board. All participants provided written informed consent.

Questionnaires

General Anxiety Disorder-7 (GAD-7)

The GAD-7 was designed to identify probable cases of generalised anxiety disorder and to assess symptom severity. The items describe the most prominent diagnostic features of generalised anxiety disorder. GAD-7 scores range from 0 to 21.¹⁷ A cut-off score of ≥ 10 was used to determine caseness, or case definition.

Patient Health Questionnaire-9 (PHQ-9)

The PHQ-9 is a 9-item instrument used to identify depression and functional outcomes of participants.¹⁸ A PHQ-9 sum score of ≥ 10 was used for the definition of caseness for depression. The last item of PHQ-9 was used for determining suicidality.

Stress

The Depression Anxiety and Stress Scales (DASS) was used to capture stress.¹⁹ The stress subscale assesses tension, agitation, and negative affect. A cut-off score of ≥ 15 was used to determine stress.

Social support

Social support was measured by the 6-item Medical Outcomes Study Social Support Survey.²⁰ Respondents were asked a stem question about the level of social support they receive from various sources. Mean scores across the 6 items were calculated, with higher scores indicating greater levels of social support.

Resilience

Resilience was measured using the Brief Resilience Scale (BRS), a 6-item instrument that assesses the ability of individuals to bounce back or recover from

stress.²¹ Participants indicate the extent to which they agree with each statement on a 5-point scale (1 = “strongly disagree”, 5 = “strongly agree”).

Positive mental health (PMH)

The Rapid-Positive Mental Health Instrument (R-PMHI) is a 6-item unidimensional measure of PMH or mental well-being.²² The R-PMHI comprises 5 positively worded items. The total PMH score is obtained by the sum of item scores divided by 6. A higher score indicates better PMH.

The study examined sources of stress, including the risk of contracting COVID-19 by self or family, employability, and financial concerns. We also examined social distancing and preventive measures employed by people to avoid infections, and other COVID-19-related factors like exposure to COVID-19 cases in their neighbourhood, and whether they had been placed under quarantine. Lastly, sociodemographic data were captured using a structured questionnaire.

Data analysis

Statistical analyses were carried out using STATA software version 15 (Stata Corporation, College Station, Texas, US) and Mplus version 8.2 Muthén & Muthén. A weighted analysis was used to ensure that the survey findings were representative of the Singapore adult population. Mean and standard errors were calculated for continuous variables, and frequencies and percentages for categorical variables. Structural Equation Modelling (SEM) with latent variables was applied to examine how sociodemographic factors and COVID-19-related factors influence each other and subsequently lead to psychological distress. Fig. 1 presents the initial hypothesised pathways model of the relationship between sociodemographic factors, COVID-19-related factors, and psychological distress derived from the literature.

Before estimating the structural models, measurement models were estimated using confirmatory factor analysis followed by exploratory factor analysis if the original factor structure did not fit. In the case of a variable measured with a single item, the variable was included as an observed variable. In the structural model, the hypothesised pathways model was fitted with the adult general population sample by adding pathways from each potential sociodemographic and COVID-19-related factor to each psychological distress as a latent outcome variable. The misspecification of the model was examined using modification indices. The decision to explore and keep new pathways also followed their theoretical meaningfulness. The indirect effect was

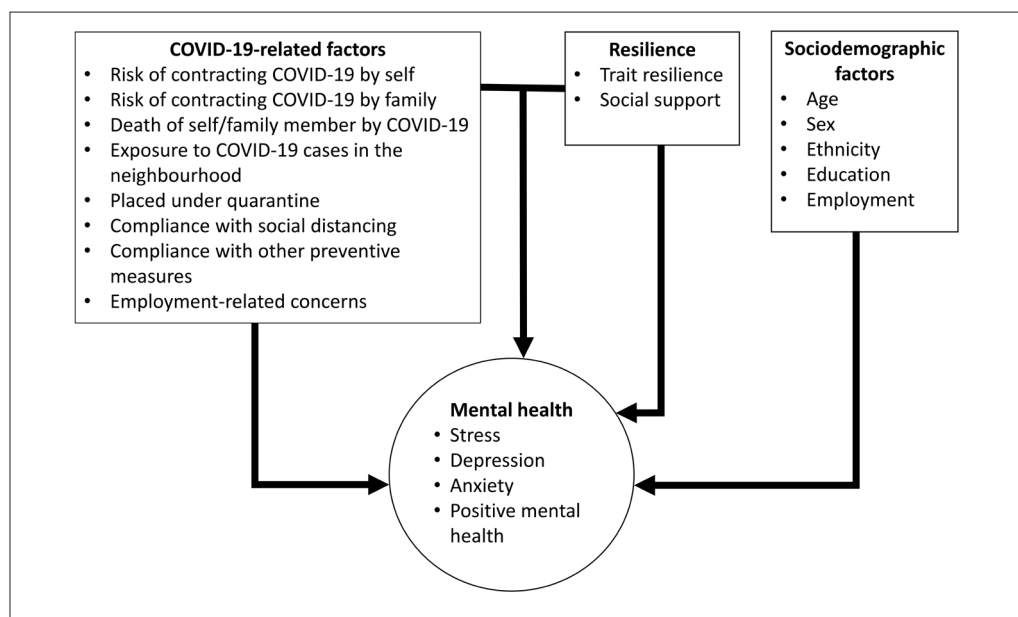


Fig. 1. Graphical representation of the effects of potential risk factors on psychological distress and direct, indirect and moderating effects of potential resilience factors.

tested using the model indirect procedure. Potential interaction effects between latent resilience, PMH and COVID-19-related factors were tested using latent moderated structural (LMS) equations with XWITH command.²³ Simple slopes were further estimated using model constraint command if a significant interaction was found between the variables. Given that LMS is computationally intensive, a series of smaller models with a single outcome, predictor, and moderator variable were tested one at a time. The robust maximum likelihood estimator with robust standard error was used. The goodness-of-fit of the SEM model was mainly evaluated using 3 indices. The root mean square error of approximation (RMSEA) incorporates a penalty function for poor model parsimony; values under 0.06 suggest close approximate (adequate) fit, whereas values above 0.10 indicate poor fit and that the model should be rejected.²⁴ The comparative fit index (CFI) and the Tucker-Lewis index (TLI) represent the incremental fit indices, with values >0.95 indicating adequate fit.²⁴

RESULTS

Sociodemographic characteristics of the sample

A total of 1,129 respondents completed the study, with a mean age of 47.7 (standard deviation = 16.5) years. The sample comprised 50.9% female and 49.1% male respondents. The majority were of Chinese ethnicity (74.6%), and currently married (62.5%) (Table 1).

The prevalence of stress was 7.1%, while that of depression and anxiety was 8.0% and 8.4%,

respectively. The prevalence of suicidal thoughts was 4.8%. The mean scores of BRS and R-PMHI were 3.6 (0.6) and 3.7 (0.7), respectively. Prevalence of depression, anxiety, stress and suicidal ideation, mean resilience and PMH by sociodemographic factors is shown in Table 2.

Final pathways model

Fig. 2 shows significant pathways of the final model and their goodness-of-fit indices. The measures of model fit were as follows: chi-square of model fit = 2093.03 (degree of freedom = 1443), TLI = 0.953, CFI = 0.955, and RMSEA = 0.022. The indices suggest that the final model fits the data well. The final model shows that high concerns related to possible COVID-19 infection of family members or friends were significantly associated with higher stress (beta coefficient (β) = 0.242, $P < 0.001$), depression (β = 0.152, $P = 0.001$), and anxiety (β = 0.280, $P < 0.001$). Living in a neighbourhood with COVID-19 cases was significantly associated with higher stress (β = 0.468, $P = 0.041$), while social distancing and preventive measures were significantly associated with depression (β = 0.136, $P = 0.003$). High resilience was significantly associated with lower stress (β = -0.482, $P < 0.001$), depression (β = -0.394, $P < 0.001$), anxiety (β = -0.516, $P < 0.001$), and significantly associated with high PMH (β = 0.498, $P < 0.001$). In comparison, high PMH was significantly associated with lower stress (β = -0.280, $P < 0.001$), depression (β = -0.335,

Table 1. Sociodemographic characteristics of the sample.

		Singapore Census 2020		Cohen's h effect
		No.	% ^a	Size ^b
Age group	21–34	426	27.5	0.1
	35–49	361	26.9	0.04
	50–64	219	26.1	0.04
	65+	123	19.5	0.01
Sex	Female	527	50.9	0.02
	Male	602	49.1	0.02
Ethnicity	Chinese	398	74.6	0.03
	Malay	278	13.0	0.02
	Indian	324	9.0	0.02
	Others	129	3.3	0.02
Marital Status	Never married	363	27.4	0.01
	Married	681	62.5	0.01
	Divorced/separated/widowed	85	10.2	0.003
Education	Primary and below	51	13.8	0.1
	Secondary	151	24.6	0.01
	Post-secondary	398	28.3	0.03
	Degree and above	529	33.3	0.02
Employment	Employed	309	71.5	0.2
	Economically inactive	570	21.6	0.24
	Unemployed	235	6.9	0.13

^a Weighted percentage^b Columns for Census % and Cohen's h effect sizes have been added to show the differences between the weighted sample and the Census. Cohen's h effect size = small 0.2; medium 0.5; large 0.8

Due to limited data, marital and education percentages were extracted from the Census of Population and General Household Survey in 2020 among Singapore resident population aged 20 years and above, while employment percentages were extracted from the Census of Population and General Household Survey in 2000 among Singapore resident population aged 20 years and above.

$P < 0.001$), and anxiety ($\beta = -0.252$, $P < 0.001$). In addition, those who were quarantined for COVID-19 were significantly associated with higher resilience ($\beta = 0.314$, $P = 0.041$). Several sociodemographic and clinical factors were significantly associated with psychological distress, resilience and PMH. For example, younger age was significantly associated with higher stress ($\beta = -0.015$, $P < 0.001$), depression ($\beta = -0.018$, $P < 0.001$), and anxiety ($\beta = -0.013$, $P < 0.001$). All significant associations are shown in Supplementary Table S1. The final model explained 42.9%, 56.3% and 48.9% of the variance in stress, depression, and anxiety levels, respectively.

Moderation and mediation effects

As shown in Table 3, most interaction effects were not significant. We found only one significant interaction between living in a neighbourhood with COVID-19 cases and resilience on stress. The effect of living in a neighbourhood with COVID-19 cases on stress was significant and positive at all values of resilience (i.e. detrimental effect). We also found that the negative association between resilience, stress, anxiety and depression was mediated by PMH. The proportion of total effect of resilience on stress, depression and anxiety levels that was mediated by PMH was 22.4%, 29.8% and 19.5%, respectively.

Table 2. Prevalence of depression, anxiety, stress and suicidal ideation; mean resilience and positive mental health by sociodemographic factors

	Depression			Anxiety			Stress			Suicidal thoughts		Resilience		Positive mental health	
	N	%	N	%	N	%	N	%	N	%	N	Mean	SD	Mean	SD
Age, years	21–34	57	12.7	55	13.1	12.7	55	12.7	26	7.8	3.02	3.02	0.36	4.52	0.91
	35–49	26	8.9	32	8.8	6.7	32	6.7	16	3.4	3.04	3.04	0.34	4.48	0.91
	50–64	10	3.7	13	4.8	4.7	11	4.7	9	3.1	3.00	3.00	0.25	4.57	0.83
	65+	5	5.8	8	6.1	3.0	4	3.0	3	4.9	3.04	3.04	0.26	4.39	0.79
Sex	Male	46	5.7	44	6.1	6.7	46	6.7	30	5.4	3.03	3.03	0.34	4.41	0.98
	Female	52	10.2	64	10.6	7.5	56	7.5	24	4.2	3.02	3.02	0.29	4.58	0.83
Ethnicity	Chinese	29	7.7	32	7.7	6.4	27	6.4	18	4.8	3.02	3.02	0.20	4.41	0.64
	Malay	35	11.0	35	11.2	9.1	31	9.1	16	5.5	3.01	3.01	0.56	4.80	0.99
	Indian	25	6.4	29	9.3	8.2	32	8.2	16	4.3	3.07	3.07	0.65	4.66	1.46
	Others	9	7.6	12	10.6	10.8	12	10.8	4	3.6	3.05	3.05	0.53	4.77	1.31
Marital status	Never married	57	14.9	50	14.8	12.3	47	12.3	25	7.1	3.00	3.00	0.32	4.40	1.00
	Married	31	4.1	51	5.7	5.4	49	5.4	25	3.7	3.04	3.04	0.31	4.53	0.90
Education	Divorced/separated/widowed	10	13.1	7	8.0	6	3.4	3.4	4	5.7	3.01	3.01	0.29	4.53	0.67
	Primary	4	12.4	2	6.2	2	6.2	6.2	3	6.9	2.96	2.96	0.22	4.04	0.67
	Secondary	11	6.2	16	7.8	10	5.4	5.4	7	5.0	3.03	3.03	0.22	4.68	0.63
	Post-secondary	49	10.2	46	11.6	10.0	42	10.0	24	6.3	3.04	3.04	0.35	4.50	0.99
Employment	Degree and above	34	5.6	44	7.1	48	6.2	6.2	20	2.6	3.04	3.04	0.35	4.55	0.89
	Employed	71	7.6	84	8.4	8.5	85	6.8	36	3.5	3.03	3.03	0.32	4.54	0.86
	Economically inactive	17	7.2	15	6.8	10	5.5	5.5	12	8.4	3.04	3.04	0.28	4.47	0.92
	Unemployed	10	14.1	9	13.4	7	15.5	15.5	6	7.1	2.94	2.94	0.29	4.12	1.06

SD: standard deviation

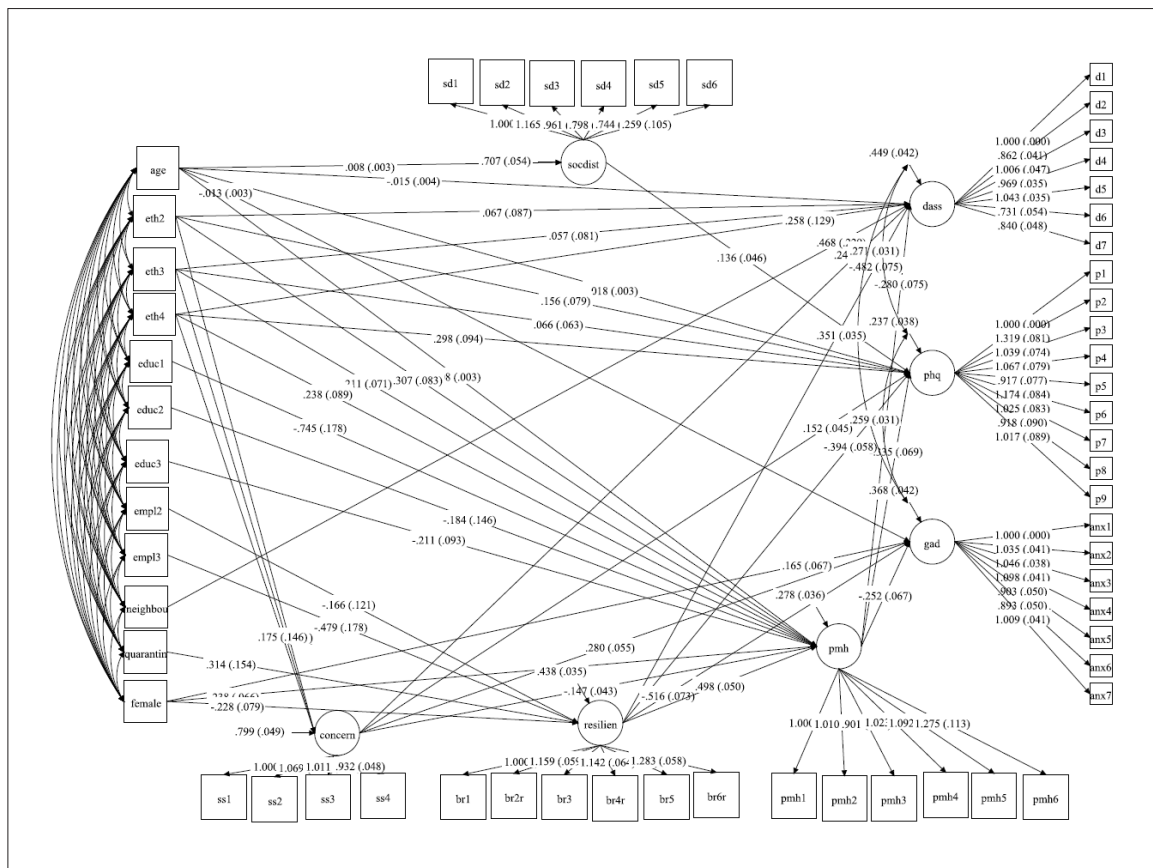


Fig. 2. Final model of the pathways between sociodemographic factors, COVID-19-related factors, resilience and psychological factors. anx1–anx7: the 7 items of GAD-7 scale; br1–br6: the items of the Brief Resilience Scale (resilience) (“r” after the item refers to reverse coding); BRS: Brief Resilience Scale; DASS: Depression, Anxiety and Stress Scale; d1–d7: the 7 items of the DASS stress subscale; educ1: primary or less; educ2: secondary; educ3: post-secondary; empl2: economically inactive; empl3: unemployed; eth2: Malay, eth3: Indian, eth4: Others; GAD-7: General Anxiety Disorder-7 scale; neighbour: exposure to COVID-19 in their neighbourhood; p1–p9: the 9 items of PHQ-9; PHQ-9: Patient Health Questionnaire-9; pmh1–pmh6: the 6 items of the R-PMHI scale; quarantine: placed under quarantine; R-PMHI: Rapid-Positive Mental Health Instrument; sd1–sd6: the items of the social distancing and preventive measures (“socdist”); ss1–ss4: the items of COVID-19-related stress/concerns

DISCUSSION

In all 15.3% (n=197) of the population of Singapore experienced depression, anxiety, stress or suicidality during the acute phase of the pandemic. The prevalence of stress was 7.1%, while that of depression and anxiety was 8.0% and 8.4%, respectively. The prevalence of psychological distress was not significantly different from that identified in other Asian studies conducted during the pandemic. For example, the Japan COVID-19 and Society Internet Survey (JACSIS), a large-scale, internet-based, self-reported questionnaire survey, was conducted between 25 August and 30 September 2020. The study found that severe psychological distress (defined as Kessler 6 Scale score ≥ 13) was prevalent in 10.0% of the respondents.²⁵ Using the same questionnaires as the current study, a web-based cross-sectional survey targeting adults in Chungnam Province, South Korea, found that 18.8%

of the participants had symptoms of depression, 10.6% had symptoms of anxiety, and 5.1% had a high level of perceived stress during the COVID-19 pandemic.²⁶

Prevalence of suicidal thoughts in our study was 4.8%. The number of suicides released in Singapore’s Report on Registration of Births and Deaths in 2020 was 452, which is a 13% increase from 2019.²⁷ Several studies have highlighted the role of COVID-19 as a risk factor for higher levels of suicidal behaviours during the pandemic.²⁸ A systematic review that examined the potential factors for suicidal behaviours in the context of the COVID-19 outbreak, identified significant associations with both personal and contextual factors including financial difficulties, psychological distress, social isolation, and fears related to contracting COVID-19.²⁹

The mean value of resilience as determined by the BRS was 3.6. The mean resilience in a sample of

Table 3. Moderation analysis testing the interaction between selected predictor (IV) and moderator (M) on the dependent variable (DV).

	Dependent variables		
	Stress	Anxiety	Depression
IV: Concern	0.236 ^a	0.336 ^a	0.123 ^b
M: PMH	-0.329 ^a	-0.315 ^b	-0.358 ^a
Interaction term	0.011	-0.009	-0.006
IV: Concern	0.200 ^a	0.245 ^a	0.088 ^c
M: Resilience	-0.472 ^a	-0.557 ^a	-0.462 ^a
Interaction term	0.020	0.007	-0.001
IV: Neighbourhood	1.249 ^a	1.306	0.554
M: PMH	-0.390 ^c	-0.485	-0.342 ^a
Interaction term	0.035	-0.325	-0.491
IV: Neighbourhood	1.205 ^b	1.114	0.561
M: Resilience	-0.574 ^a	-0.780 ^a	-0.519 ^a
Interaction term	0.607 ^c	0.613	0.058
IV: Social distance			0.048
M: Resilience			-0.488 ^a
Interaction term			-0.003

PMH: positive mental health

^a $P < 0.001$, ^b $P < 0.01$, ^c $P < 0.05$: not tested due to non-significant pathways presented in Fig. 2.

healthcare workers in Singapore as measured by the BRS before the pandemic was no different.³⁰ This suggests that the population was largely resilient and adapted well to the adverse impacts. Another protective factor may be the effective handling of the COVID-19 pandemic by the Singapore government. The steps include an effective and rapid public health response to the crises, incremental deployment of Singapore's resources, and open communication with the public.

The study also identified several potential risk factors related to lower mental health and well-being. High concerns related to possible COVID-19 infection of family members or friends were significantly associated with higher stress, depression and anxiety, while living in a neighbourhood with COVID-19 cases was significantly associated with higher stress.

Infectious diseases tend to be associated with fear. This fear is the accrual consequences of experiences and memories of prior epidemics, and to fictional accounts of such threats in popular movies or books that tend to depict apocalyptic scenarios.³¹ This fear is typically widespread and acutely felt during the early stages of a pandemic wherein the infectious agent has

a rapid transmission rate, the mode of infection is not well established, where there is no effective vaccine, and the epidemic is associated with high morbidity and mortality. Extant literature shows that those who feared COVID-19 were more likely to have psychological distress.^{12,32,33}

On the other hand, social distancing and preventive measures were significantly associated with depression. Social distancing and preventive measures put in place to prevent the transmission may have resulted in isolation and loneliness, especially among singles, which in turn is associated with poor mental health outcomes.³⁴ It is also possible that the closure of workplaces and schools as part of the social distancing measures may have led to uncertainty about employment and education progression, which could have resulted in psychological distress.³⁵

Lastly, our study, like several others, identified younger age to be significantly associated with stress, depression and anxiety.^{12,36} The greater disruption and uncertainty in terms of study and employment, loss of sense of belonging, disruption of structure, and loneliness have been proposed to explain this association.³⁷ Resilience that usually comes with life experiences, lack of exposure to prior pandemics, and a greater sense of deprivation and isolation as younger people tend to be more physically and socially active, are all likely to have contributed to psychological distress in younger adults.

Resilience and PMH were associated with lower distress. Studies have identified individual resilience as a protective factor against psychological distress during the pandemic.³⁸ The relationship between resilience and mental health could be explained through the “biopsychosocial model of resilience”, which posits a multilevel process that protects in stressful situations and disturbances to the norms in individuals.³⁹ This model describes a range of individual (e.g. immune system and mental health) and group (e.g. lineage, geographical or social) level resources and mechanisms that offer protection against distress. PMH encompasses positive emotions, feelings and functioning. A study from Pakistan found that PMH mitigated the fear of COVID-19 and reduced anxiety.⁴⁰ Other elements of PMH, such as altruism and a sense of calm, may have also helped individuals with high PMH to flourish in the face of adversity and consequently have lower psychological distress.

Our study is one of the few that identified PMH as mediating the negative association between resilience and psychological distress. Previous research has similarly found PMH to be a significant mediator of the relationship between mental disorders and quality of

life,²² indicating its likely role in reducing the impact of harmful exposures on health outcomes in individuals. Having high resilience can improve aspects of PMH such as positive affect and positive outlook towards health outcomes; and offer behavioural memory and coping efficiency to deal with adversity, which in turn reduces distress. On the other hand, research also shows that positive emotions and mental health lead to increased resilience, allowing individuals to rebound from stressful situations.⁴¹

This study has several limitations. One is the cross-sectional design, which does not allow for causal interpretations. Furthermore, the data collected from May 2020 to June 2021 included the lockdown period and the subsequent lowering of restrictions. This may have resulted in a mixed sample. However, analysing the data by splitting into 2 halves did not show much variation in the results. While every effort was made to contact respondents and encourage their participation in the study, there was a significant non-response rate of about 50%. The study did not collect information on whether the participants had tested positive for COVID-19 at any point before the interview. The frequency of clinically significant depression and/or severe depressive symptoms following COVID-19 infection can range from 3 to 12%; thus, infection itself could be a contributing factor of the psychological distress in the population.⁴² Lastly, there may have been possible response bias by the respondents in answering the questions about psychological distress and PMH though researchers emphasised the confidential nature of the study.

On the other hand, the strengths of the study included the use of a random, representative sample interviewed by trained researchers using validated questionnaires on Zoom or face-to-face, which ensured the reliability of the data. The use of English and local languages to conduct the interview allowed the inclusion of all ethnic and age groups in the sample.

CONCLUSION

The findings of our study advance the current knowledge about the impact of the COVID-19 crisis on the Singapore population and provide insights about the risk and protective factors that influence individuals' mental health and well-being. In particular, the results highlight the negative impact of fear of COVID-19 infection, social distancing and isolation on the mental health of the population, while resilience and PMH were associated with lower psychological stress. Research has shown that resilience can be enhanced by several psychological interventions, based on

cognitive behavioural therapy⁴³ and mindfulness.⁴⁴ These interventions can be delivered online using interactive modes, making them more accessible and cost-effective. Thus, public health initiatives to build resilience must be considered at the community and national level as an essential component of pandemic preparedness. Furthermore, rapid identification of groups that are at high risk of developing psychological distress is important. Identification can be done through rapid epidemiological and qualitative studies, by leveraging community providers of mental health and telepsychiatry. The timely dissemination of evidence-based information on the pandemic and preventive measures that can counter the spread of the infection and mitigate psychological distress is equally important. Going forward, these methods for identification of high-risk groups and rapid dissemination of health information must be incorporated as part of Singapore's Total Defence strategy against pandemics.⁴⁵

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