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Influence of Hospital Policies, Family Dynamics, and SARS Experience on Healthcare Workers' Psychological Wellbeing during COVID-19

Khalid M. Al-Saadi[1]*, Fatima R. Al-Balushi[1]

[1]Department of Community Health and Behavioral Sciences, College of Medicine and Health Sciences, Sultan Qaboos University, Muscat, Oman.

***E-mail** ✉ khalid.alsaadi@gmail.com

Abstract

This study investigated the main determinants of perceived stress among healthcare workers (HCWs) and their assessment of the risk of COVID-19 infection for themselves and their family members during the pandemic. An online cross-sectional survey was conducted in Hong Kong between 19 March and 5 April 2020. Participants included HCWs from public hospitals, private dental practitioners, and their family members. A total of 747 HCWs and 245 family members responded. Greater negative changes in family relationships were linked to higher perceived stress among HCWs ($p = 0.025$). Nevertheless, HCWs' stress levels were also positively correlated with stronger family cohesion ($p = 0.033$) and with the stress experienced by family members ($p < 0.001$). Higher satisfaction with hospital policies for COVID-19 was associated with reduced perceived stress and lower perceived risk of infection for both HCWs and their families. Previous frontline involvement during the SARS outbreak was associated with lower perceived infection risk for HCWs and family members. Factors such as hospital policies, prior SARS frontline experience, and family dynamics played a significant role in shaping HCWs' psychological wellbeing during the COVID-19 outbreak.

Keywords: COVID-19, Healthcare workers, Perceived stress, Psychological wellbeing, Hospital policies

Introduction

As of early October 2020, the COVID-19 pandemic caused by SARS-CoV-2 had resulted in more than 34 million confirmed cases and over one million deaths worldwide [1]. HCWs face elevated risks of infection and report concerns about transmitting the virus to household members [2, 3]. These concerns are compounded by a global shortage of personal protective equipment (PPE) [4]. Reports indicate that insufficient PPE exposure while treating patients has led to infections and fatalities among HCWs. Uncertainty and lack of control over the outbreak may further impact HCWs' mental health.

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Research indicates that HCWs are prone to anxiety, psychological distress, post-traumatic stress disorder, sleep problems, and burnout during infectious disease outbreaks [5–7]. Contributing factors include perceived susceptibility to infection, concern for family safety, workload increases, insufficient protective measures, job characteristics, and family structure [8–10]. During the 2003 SARS outbreak, Hong Kong HCWs who survived infection were 2.24 times more likely to develop psychiatric conditions than non-HCW survivors, with effects lasting up to 3.5 years [11]. In China, HCWs during COVID-19 reported high anxiety and stress, low self-efficacy, poor sleep quality, and limited social support [12]. However, there are limited studies exploring both risk and protective factors for HCWs' psychological wellbeing. Understanding these influences is critical for developing interventions to reduce stress during epidemics. Assessing HCWs' mental health and its determinants during COVID-19 is therefore urgent.

This study aimed to evaluate HCWs' perceived stress and perceived infection risk while caring for patients, examining the influence of personal, familial, policy-related factors, and prior SARS frontline experience on these outcomes.

Materials and Methods

Study participants

A cross-sectional online survey was conducted among HCWs and their family members during the peak of COVID-19 in Hong Kong. Eligible participants included HCWs in public hospitals (doctors, dentists, nurses, allied health professionals, pharmacists, and healthcare assistants), private dental practitioners, and family members aged 18 years or older. The survey was distributed through public hospital networks and posted on relevant HCW association websites. After electronic consent, participants completed the questionnaire in English or Chinese. Responses from HCWs and family members were linked using unique ID numbers.

Measurements

The survey collected data on demographics, mental health, family relationships, and perceived risk of COVID-19 infection.

Demographics

Information gathered included job role, experience managing suspected or confirmed COVID-19 cases, cohabitation status, and prior frontline experience during the 2003 SARS outbreak.

Perceived stress

HCWs and their family members reported stress using the 10-item Perceived Stress Scale (PSS-10), validated in Chinese populations [13]. Each item is scored 0–4, with total scores ranging from 0 to 40; higher scores indicate greater perceived stress.

Assessment of perceived family unity and alterations in family dynamics

Healthcare workers (HCWs) and their relatives independently evaluated their sensed family support through the Family APGAR scale (covering Adaptation, Partnership, Growth, Affection, and Resolve), previously validated among Chinese populations [14]. The instrument consists of five items scored on a 3-point scale, yielding a maximum total of 15 points, where elevated scores denote stronger perceived family unity. Participants also assessed any perceived shifts in family bonds amid the COVID-19 pandemic.

Perception of risk

HCWs responded to the question "How severe would it be for you if diagnosed with COVID-19" by rating their perceived likelihood of contracting the virus on a 5-point scale ranging from "not bad at all" to "very bad." This measure captured the degree of distress anticipated if they or their relatives contracted COVID-19, with higher values reflecting greater perceived infection risk.

Level of contentment with institutional measures against the covid-19 pandemic

HCWs rated their contentment with hospital measures addressing the COVID-19 crisis, encompassing supply of personal protective equipment (PPE) for staff in high-risk zones (such as isolation units), PPE availability in lower-risk settings (like outpatient departments), hotel accommodation subsidies for high-risk personnel to avoid transmitting the virus to households, and additional pay bonuses for those in high-risk roles. These four aspects were scored on a 5-point scale from −2 to +2, with the summed score indicating overall contentment. Given that most dentists in Hong Kong operate in private practice, their data were omitted from this evaluation.

Statistical approaches

Student's t-test, chi-square test, and Fisher's exact test were applied as needed to contrast perceived stress and COVID-19 diagnosis risk across subgroups. Associations among variables were investigated via bivariate correlations. Multiple regression analyses were performed to identify predictors of HCWs' sensed stress and infection risk during the COVID-19 period. Initial univariate regressions assessed unadjusted effects of variables such as age, healthcare position, perceived family unity, shifts in family ties during the pandemic, contentment with general and specific institutional policies, HCW precautions, plus stress and family bond ratings from relatives. Adjusted multiple regressions then accounted for confounders, including gender, marital status, healthcare role, age, and years of professional experience. Analyses utilized SPSS version 25.0 (IBM, Armonk, New York, United States), with two-tailed tests and statistical significance set at $p < 0.05$.

Results and Discussion

From 19 March to April 5, 2020, 747 HCWs and 245 relatives submitted completed online surveys. **Table 1** outlines participant characteristics for HCWs and aggregated responses. HCWs had an average age of 39.6 years (SD = 10.9), with 27% male and more than 60% married or cohabiting. Mean professional experience was 13 years (SD = 7.7). Nurses comprised 45.7% and physicians 23.0% of the sample. Around 20% (149/747) operated in high-risk COVID-19 settings, while 10.4% (78/747) had direct exposure to confirmed cases. More than 90% had lived through Hong Kong's SARS epidemic, including 44.2% employed in healthcare at that time. Roughly 15% indicated a colleague, peer, or relative had contracted or died from SARS. Average stress scores were 21.3 for HCWs and 21.1 for relatives. Family unity scores averaged 11.8 among HCWs and 12.0 among relatives. Regarding family ties during COVID-19, 23.0% of HCWs noted improvement, 10.04% reported worsening, and 66.8% observed no change. In general, HCWs expressed discontent with institutional support measures for the outbreak.

Table 1. Demographic profile of healthcare workers and summary responses in Hong Kong, 19 March to April 5, 2020.

Characteristic	Mean (SD)	N (%)
Age (years)	39.59 (10.87)	—
Duration of professional experience in healthcare (years)	13.00 (7.73)	—
Gender		
Male	—	202 (27.04)
Female	—	544 (72.82)
Partnership status		
Single	—	273 (36.55)
Married or cohabiting	—	474 (63.45%)
Professional position		
Physicians	—	172 (23.03)
Dentists	—	33 (4.42)
Nurses	—	341 (45.65)
Pharmacists	—	20 (2.68)
Allied health staff	—	82 (10.98)
Healthcare assistants / Other roles	—	99 (13.25)
Assigned to high-risk zones	—	149 (19.95)
Residing apart from household during COVID-19 period	—	74 (9.91)
Direct exposure to confirmed COVID-19 cases	—	78 (10.44)
Lived through SARS epidemic in Hong Kong	—	690 (92.37)
Employed in healthcare during SARS epidemic	—	330 (44.18)
Served on frontline during SARS epidemic	—	127 (17.00)
Had colleagues, peers, or family members infected or deceased from SARS	—	111 (14.86)
Perceived stress level among HCWs (Range 0–40)	21.32 (3.38)	—
Perceived family unity among HCWs (Range 5–15)	11.75 (2.78)	—
Perceived shifts in family bonds among HCWs		
Substantially deteriorated	—	5 (0.67)
Deteriorated	—	70 (9.37)
Unchanged	—	499 (66.80)
Improved	—	143 (19.14)
Greatly improved	—	29 (3.88)
Perceived personal risk of COVID-19 contraction among HCWs (Range 1–5)	4.07 (0.90)	—
Perceived risk of COVID-19 contraction for family members among HCWs (Range 1–5)	4.49 (0.77)	—
Overall contentment with institutional support among HCWs (Range −2 – +2)	−0.58 (0.93)	—
Contentment with PPE supply in high-risk zones (Range −2 – +2)	−0.73 (1.08)	—
Contentment with PPE supply in lower-risk zones (Range −2 – +2)	−0.75 (1.06)	—

Contentment with hotel accommodation subsidy (Range −2 – +2)	−0.42 (1.09)	—
Contentment with additional pay bonuses (Range −2 – +2)	−0.40 (1.09)	—
Perceived stress level among family members (Range 0–40)	21.10 (3.38)	—
Perceived family unity among family members (Range 5–15)	11.96 (2.64)	—

COVID-19, coronavirus disease 2019; FMs, family members; HCWs, healthcare workers; PPE, personal protective equipment; SARS, severe acute respiratory syndrome; SD, standard deviation.

Table 2 presents average perceived stress and COVID-19 infection risk levels for HCWs and relatives stratified by characteristics. Intergroup analyses revealed significant differences in mean stress and risk scores (for self and family) according to professional roles (all $p < 0.05$). HCWs with prior healthcare involvement and those who provided frontline SARS care exhibited markedly lower perceived COVID-19 risk for themselves and relatives (all $p < 0.05$). Nonetheless, employment in high-risk zones or choosing separate living arrangements showed no association with stress or perceived infection risk levels.

Table 2. Perceived stress and risk of COVID-19 acquisition among healthcare workers in Hong Kong, 19 March to April 5, 2020.

Characteristic	HCWs' average perceived risk of COVID-19 contraction for family members (SD) [Range 1–5]	p	HCWs' average perceived personal risk of COVID-19 contraction (SD) [Range 1–5]	p	HCWs' average perceived stress (SD) [Range 0–40]	p
Gender		0.633		0.355		0.963
Male	4.47 (0.77)		4.11 (0.89)		21.31 (3.38)	
Female	4.50 (0.77)		4.05 (0.90)		21.32 (3.38)	
Partnership status		0.026		0.991		0.835
Single	4.57 (0.66)		4.07 (0.90)		21.28 (3.37)	
Married or cohabiting	4.44 (0.83)		4.07 (0.90)		21.34 (3.38)	
Professional role		0.003		0.007		<0.001
Physicians	4.52 (0.63)		4.03 (0.86)		21.59 (3.16)	
Dentists	4.76 (0.61)		4.52 (0.71)		21.88 (2.62)	
Nurses	4.50 (0.75)		4.09 (0.85)		21.57 (3.10)	
Pharmacists	4.55 (0.60)		3.90 (1.02)		22.20 (2.55)	
Allied health staff	4.61 (0.73)		4.18 (0.82)		20.87 (4.41)	
Healthcare assistants / Other positions	4.21 (1.07)		3.83 (1.12)		19.95 (3.73)	
Assigned to high-risk zones		0.713		0.159		0.159
Yes	4.47 (0.77)		3.97 (1.01)		21.66 (3.45)	
No	4.50 (0.77)		4.09 (0.86)		21.23 (3.36)	
Residing apart from household during COVID-19 period		0.669		0.079		0.131
Yes	4.53 (0.71)		3.89 (1.01)		21.88 (3.54)	
No	4.49 (0.78)		4.08 (0.88)		21.25 (3.36)	
Direct exposure to confirmed COVID-19 cases		0.726		0.007		0.143
Yes	4.46 (0.77)		3.81 (1.01)		21.85 (3.18)	
No	4.49 (0.77)		4.10 (0.88)		21.25 (3.40)	

Lived through SARS epidemic in Hong Kong	0.726	0.673	0.072	
Yes	4.49 (0.76)	4.07 (0.88)	21.38 (3.17)	
No	4.46 (0.89)	4.01 (1.04)	20.54 (5.26)	
Employed in healthcare during SARS epidemic	<0.001	0.001	0.462	
Yes	4.36 (0.83)	3.95 (0.88)	21.42 (3.26)	
No	4.59 (0.71)	4.16 (0.90)	21.24 (3.46)	
Served on frontline during SARS epidemic	0.001	0.015	0.642	
Yes	4.29 (0.86)	3.89 (0.89)	21.19 (3.45)	
No	4.53 (0.75)	4.10 (0.89)	21.34 (3.36)	
Had colleagues, peers, or relatives infected or deceased due to SARS	0.553	0.793	0.926	
Yes	4.45 (0.76)	4.05 (0.84)	21.29 (3.81)	
No	4.50 (0.77)	4.07 (0.91)	21.32 (3.30)	

COVID-19, coronavirus disease 2019; FMs, family members; HCWs, healthcare workers; PPE, personal protective equipment; SARS, severe acute respiratory syndrome; SD, standard deviation.

Analyses of associations **(Table 3)** indicated that healthcare workers' (HCWs') reported stress showed positive links with their own assessed COVID-19 infection likelihood (r = 0.218), the assessed infection likelihood for relatives (r = 0.199), and relatives' reported stress (r = 0.237) (all $p < 0.001$). Conversely, the assessed COVID-19 infection likelihood by HCWs—for both personal and familial—was inversely linked to their level of contentment regarding institutional measures (r = −0.219 to −0.278, $p < 0.001$). Advanced age and extended duration of professional practice also displayed inverse associations with assessed infection likelihood for oneself and household members.

Table 3. Matrix of Pearson correlations for ongoing variables related to healthcare worker attributes in Hong Kong, 19 March to April 5, 2020.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Age	—	0.763***	0.471***	−0.012	0.028	−0.159***	−0.218***	0.383***	0.334***	0.034***	0.327***	0.318***	0.025	−0.036
2. Duration of employment in healthcare sector			0.508***	0.001	0.072*	−0.112**	−0.169***	0.324***	0.295***	0.293***	0.258***	0.269***	−0.033	0.017

3. Number of children	—	−0.033	0.136***	−0.022	−0.009	0.112**	0.013***	0.139***	0.064	0.053	0.095	−0.002
4. Perceived stress level among HCWs	—		0.079*	0.218***	0.199***	−0.054	−0.015	−0.053	−0.057	−0.061	0.237***	0.094
5. Perceived family unity among HCWs	—			−0.009	−0.042	0.071	0.095**	0.074*	0.041	0.035	0.018	0.328***
6. Perceived personal risk of COVID-19 contraction among HCWs	—				0.648***	−0.278***	−0.219***	−0.224***	−0.263***	−0.249***	0.066	−0.116
7. Perceived COVID-19 contraction risk for family members among HCWs	—					−0.201***	−0.175***	−0.168***	−0.018***	−0.017***	0.083	−0.079

8. Overall contentment with institutional special support measures	—			0.851***	0.834***	0.883***	0.875***
9. Contentment with PPE allocation in high-risk zones	—				0.765***	0.589***	0.058***
10. Contentment with PPE allocation in lower-risk zones	—					0.566***	0.055***
11. Contentment with hotel accommodation subsidy	—						0.877***
12. Contentment with additional salary bonuses	—						

8. Overall contentment with institutional special support measures	−0.026	0.008					
9. Contentment with PPE allocation in high-risk zones	−0.006	0.003					
10. Contentment with PPE allocation in lower-risk zones	−0.025	0.085					
11. Contentment with hotel accommodation subsidy	−0.001	0.094					
12. Contentment with additional salary bonuses	−0.008	0.098					

13. Perceived stress level among family members	—	0.073
14. Perceived family unity among family members	—	

*p < 0.05, **p < 0.01, ***p < 0.001.
COVID-19, coronavirus disease 2019; FMs, family members; HCWs, healthcare workers; PPE, personal protective equipment.

Table 4 illustrates the controlled links between diverse elements and HCWs' reported stress, along with assessed COVID-19 infection likelihood for personal and familial contexts. Physicians, nurses, and dentists displayed notably greater stress relative to allied health personnel, support staff in healthcare, and additional categories (p = 0.001). Increased stress in HCWs corresponded to more pronounced worsening of household bonds (p = 0.025). Furthermore, stress reported by HCWs exhibited positive ties to their evaluated household unity (p = 0.033) and to stress reported by household members (p < 0.001). Levels of contentment toward comprehensive and particular institutional responses to the COVID-19 crisis demonstrated negative ties with reported stress in HCWs (all p < 0.05, with the exception of PPE allocation in elevated-risk zones) and with assessed infection likelihood for personal and familial (all p < 0.001). Those HCWs possessing prior employment in healthcare or direct involvement during the SARS crisis showed markedly reduced assessed COVID-19 infection likelihood for personal and household contexts (all p < 0.01).

Table 4. Controlled links of personal, household, and institutional elements with outcome variables in healthcare workers in Hong Kong, 19 March to April 5, 2020.

Predictor	HCWs' perceived risk of COVID-19 contraction for family members β (95% CI)	p	HCWs' perceived personal risk of COVID-19 contraction β (95% CI)	p	HCWs' perceived stress level β (95% CI)	p
Age[a]	−0.02 (−0.03, −0.01)	0.002	−0.02 (−0.03, −0.004)	0.006	0.003 (−0.01, 0.01)	0.591
Professional role						
Physicians/dentists/nurses[a]	0.10 (−0.06, 0.27)	0.212	0.09 (−0.07, 0.26)	0.267	0.29 (0.12, 0.46)	0.001
Allied health professionals/healthcare assistants/others	Ref	—	Ref	—	Ref	—

Shifts in family bonds during the COVID-19 period[a]	−0.11 (−0.22, −0.01)	0.038	−0.09 (−0.20, 0.02)	0.120	−0.12 (−0.23, −0.02)	0.025
Perceived family unity (HCWs)[a]	−0.02 (−0.05, 0.01)	0.159	−0.01 (−0.04, 0.02)	0.543	0.03 (0.002, 0.05)	0.033
Overall contentment with institutional special measures[a]	−0.19 (−0.27, −0.10)	<0.001	−0.31 (−0.39, −0.23)	<0.001	−0.10 (−0.19, −0.02)	0.020
Contentment with PPE supply in high-risk zones[a]	−0.13 (−0.21, −0.06)	<0.001	−0.21 (−0.28, −0.14)	<0.001	−0.04 (−0.11, 0.03)	0.258
Contentment with PPE supply in lower-risk zones[a]	−0.13 (−0.20, −0.05)	<0.001	−0.21 (−0.29, −0.14)	<0.001	−0.08 (−0.16, −0.01)	0.028
Contentment with hotel accommodation subsidy[a]	−0.13 (−0.20, −0.06)	<0.001	−0.23 (−0.30, −0.16)	<0.001	−0.08 (−0.15, 0.00)	0.036
Contentment with additional salary bonuses[a]	−0.13 (−0.20, −0.06)	<0.001	−0.22 (−0.29, −0.15)	<0.001	−0.09 (−0.16, −0.02)	0.017
Employed in healthcare during SARS epidemic[b]	−0.31 (−0.46, −0.15)	<0.001	−0.27 (−0.43, −0.12)	<0.001	0.01 (−0.14, 0.17)	0.879
Frontline involvement during SARS epidemic[b]	−0.31 (−0.51, −0.12)	0.002	−0.26 (−0.46, −0.07)	0.009	−0.10 (−0.29, 0.09)	0.314
Colleagues/peers/relatives infected or deceased from SARS[b]	−0.07 (−0.27, 0.14)	0.512	−0.05 (−0.25, 0.16)	0.656	−0.07 (−0.27, 0.13)	0.496
Perceived stress level among family members[a]	0.02 (−0.02, 0.05)	0.387	0.02 (−0.02, 0.06)	0.399	0.07 (0.03, 0.10)	<0.001
Perceived family unity among family members[a]	−0.03 (−0.08, 0.01)	0.163	−0.05 (−0.11, −0.002)	0.044	0.03 (−0.01, 0.08)	0.140

a Model controlled for gender, partnership status, healthcare position, age, and duration of employment in the healthcare field.
b Age and duration of employment in the healthcare field were excluded.
COVID-19, coronavirus disease 2019; FMs, family members; HCWs, healthcare workers; PPE, personal protective equipment; SARS, severe acute respiratory syndrome; SD, standard deviation.

This research was carried out during the peak of the COVID-19 outbreak in Hong Kong [15]. To our knowledge, it is among the first studies to assess healthcare workers' (HCWs) perceived stress and their perception of the risk of COVID-19 infection for themselves and their family members while governmental measures were in place to safeguard the public. It is also the first to explore the association between previous frontline experience during the SARS outbreak and family-related factors with HCWs' psychological wellbeing in the context of COVID-19.

The SARS outbreak affected Hong Kong uniquely, as many regions worldwide were less severely impacted. Our findings suggest that HCWs who had frontline experience during SARS perceived a lower risk of COVID-19 infection for both themselves and their families, even after controlling for sex, marital status, and healthcare role. Age and years of work experience were not included in the adjusted model, as HCWs who had experienced SARS were generally senior staff. This may be explained by similarities between SARS-CoV and SARS-CoV-2 in genomic sequence and viral characteristics [16], and it implies that frontline experience during COVID-19 could similarly prepare HCWs for future infectious disease outbreaks.

The average stress scores among HCWs and their family members indicated moderate stress levels, comparable to findings from other regions, including China, Singapore, North America, the Middle East, and Europe [17–21]. HCWs' perceived stress was significantly and inversely associated with changes in family relationships over the course of the outbreak. Family support is recognized as a buffer against psychological distress in HCWs, particularly under the intense demands posed by COVID-19 [22]. Additionally, the stress experienced by family members themselves may act as a further source of strain. Family members, like the general population, also face mental health challenges during the pandemic due to fear

of infection, disruptions to daily life, social and political changes, and economic instability [23, 24]. The interplay of stress between HCWs and their families may thus create a feedback loop that negatively affects each other's wellbeing.

We observed a positive correlation between HCWs' perceived risk for themselves and for their family members, suggesting that worry about personal infection can amplify concern for family members. Fear for family health and the potential of transmitting the virus are notable sources of stress [9, 25, 26]. In countries like Canada and the United States, some HCWs chose to live separately from their families, utilizing hotels or donated vehicles [27, 28]. In Hong Kong, satisfaction with accommodation support was linked to reduced stress and perceived risk of infecting family members. The Hospital Authority provided salary increments and rental allowances, coordinating with local hotels to enable HCWs in high-risk areas to isolate from family members [29, 30]. Our study showed that 55.4% of HCWs who had direct contact with COVID-19 patients opted to live away from their families, highlighting the importance of such accommodation support. This aligns with evidence from Saudi Arabia indicating that cohabitation during a pandemic predicts higher concern among HCWs [21].

Stress levels were also associated with job role. Doctors, nurses, and dentists with frequent patient contact experienced higher stress than other supporting staff. Standard precautions, including masks, face shields, and disposable gowns, remain effective in preventing airborne infections, as evidenced by zero workplace COVID-19 infections among HCWs in Hong Kong [31–33]. Our findings confirm that satisfaction with hospital-provided PPE reduces stress and perceived infection risk for HCWs and their families. Globally, PPE shortages and limited governmental support have heightened perceived infection risks, with some HCWs threatening to stop working due to insufficient protection [34]. These reports underscore the critical impact of PPE scarcity on HCWs' mental health during the pandemic.

To address this, the Hong Kong government established PPE stockpiles to protect frontline HCWs during infectious outbreaks. During SARS, many HCWs in intensive care units were infected while performing high-risk procedures, including nebulization, endotracheal suction, and intubation [35, 36]. Lessons learned from SARS prompted the government to continuously update guidelines for triage and protective measures for frontline staff [37]. Post-SARS, hospital wards were upgraded, contingency plans ensured three-month PPE reserves, and portable HEPA filters were deployed where permanent installations were impractical [38]. These proactive measures likely contributed to mitigating psychological impacts on HCWs during COVID-19. Consistent with a recent Hong Kong study of over 1,000 non-HCWs, workplace infection control policies and perceived infection risk were shown to directly influence employee health outcomes, partially mediating the relationship between policy and wellbeing [39].

Recent investigations have turned attention to strategies aimed at mitigating the psychological burden faced by healthcare workers (HCWs) during the COVID-19 pandemic. In the United States, a peer-support system called "Battle Buddies" was introduced, providing a multidisciplinary approach to help healthcare providers manage stress in disaster scenarios [40]. Similarly, in China, the National Health Commission collaborated with psychiatrists and mental health experts to design emergency mental health policies targeting six high-risk groups, including HCWs, confirmed COVID-19 patients, their close contacts, and other vulnerable populations [41]. In the United Kingdom, digital interventions have been implemented to deliver structured, evidence-based support to HCWs, as well as their peers and family members, with the goal of promoting psychological wellbeing [42]. Given the potential for further waves of COVID-19, continuous monitoring and timely interventions to protect the mental health of HCWs and their families remain a global necessity.

Several limitations of this study should be noted. First, this cross-sectional survey was conducted during the outbreak in Hong Kong and did not include pre-pandemic measurements, so baseline stress levels among HCWs could not be established. Second, psychological stress is inherently dynamic, and a single-time-point survey may not capture fluctuations over the course of the pandemic. However, conducting the survey during the peak of COVID-19 [15], the period of highest reported stress, likely reduced recall bias. Third, the survey was distributed via professional HCW networks and associations, which may have introduced sampling or volunteer bias. Respondents accounted for 2.7% of doctors and 1.2% of nurses employed by the Hong Kong Hospital Authority. Participants represented both high-risk and low-risk work areas and had a wide range of experience (mean 13 years, SD = 7.73). The average age of respondents was approximately 40 years, closely matching the overall age distribution of HCWs in the

Hospital Authority. Most participants were nurses, and 72.8% were female, reflecting the gender composition of nurses within the system. Therefore, despite the limitations, the sample can be considered broadly representative.

The findings highlight critical factors at individual, family, and policy levels that shape HCWs' perceived stress and perceived risk of COVID-19 infection for themselves and their family members. Factors identified include the type of work, changes in family relationships during the outbreak, hospital policy measures, and prior experience during the SARS outbreak. Interventions such as ensuring sufficient PPE supply and providing special allowances show significant potential in supporting HCWs' mental health and resilience in the face of pandemic challenges.

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