Safety attitudes, burnout and well-being among healthcare workers during the COVID-19 pandemic: an Indo-Pacific regional cross-sectional study

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Abstract

Introduction: The coronavirus disease 2019 (COVID-19) pandemic has had an unprecedented impact in Asia and has placed significant burden on already stretched healthcare systems. We examined the impact of COVID-19 on the safety attitudes among healthcare workers (HCWs), as well as their associated demographic and occupational factors, and measures of burnout, depression and anxiety.

Methods: A cross-sectional survey study utilising snowball sampling was performed involving doctors, nurses and allied health professions from 23 hospitals in Singapore, Malaysia, India and Indonesia between 29 May 2020 and 13 July 2020. This survey collated demographic data and workplace conditions and included three validated questionnaires: the Safety Attitudes Questionnaire (SAQ), Oldenburg Burnout Inventory and Hospital Anxiety and Depression Scale. We performed multivariate mixed-model regression to assess independent associations with the SAQ total percentage agree rate (PAR).

Results: We obtained 3,163 responses. The SAQ total PARs were found to be 35.7%, 15.0%, 51.0% and 3.3% among the respondents from Singapore, Malaysia, India and Indonesia, respectively. Burnout scores were highest among respondents from Indonesia and lowest among respondents from India (70.9%–85.4% vs. 56.3%–63.6%, respectively). Multivariate analyses revealed that meeting burnout and depression thresholds and shifts lasting ≥12 h were significantly associated with lower SAQ total PAR.

Conclusion: Addressing the factors contributing to high burnout and depression and placing strict limits on work hours per shift may contribute significantly towards improving safety culture among HCWs and should remain priorities during the pandemic.

Keywords: Burnout, COVID-19, pandemic, safety attitudes, safety culture

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INTRODUCTION

Accessible air travel, high trade volumes and geographical proximity contributed to the rapid spread of coronavirus disease 2019 (COVID-19) throughout Asia in late January 2020. By the end of March 2020, several countries had implemented travel restrictions and various levels of ‘lockdown’ comprising restrictions on unnecessary social movement.1-4 Despite the development of effective vaccines, lack of availability or acceptance5-7 and the emergence of virulent variants such as the delta variant8 have caused several countries to repeatedly re-enter varying degrees of lockdown. Differences in prepandemic healthcare systems [Table 1], critical care capacity9 and government responses have created different operating environments for healthcare workers (HCWs) in Southeast Asia and India. As the pandemic approaches its third year, it is important to address the long-term sustenance of effective healthcare services.

Similar to the severe acute respiratory syndrome outbreak of 2003,10,11 emotional distress among HCWs has been a significant concern despite recommendations to prioritise frontline HCW safety12 with recurring reports of global shortages in personal protective equipment (PPE), inadequate workplace protection for HCWs and overwork.13,14 Also, HCWs have often been redeployed to other departments within their hospitals and externally to community screening and isolation facilities,15,16 often under unfamiliar work environments. Several studies have demonstrated increased burnout17-21 among HCWs, with some citing a prevalence as high as 80%,22 as well as high levels of depressive symptoms emotional distress.23,24 One large study during the early stages of the pandemic25 reported a prevalence of depressive symptoms of 34%, although a meta-analysis26 showed a reduction within the first 12 months from 20.2% to 8.7%. The usage of different assessment tools and unvalidated questionnaires, however, greatly limits comparison between different studies and cohorts.

While emotional distress among HCWs during this pandemic has been well documented, the impacts on safety culture have been poorly understood.27 Safety culture in health care is a key pillar in patient safety28,29 and has been adopted from other industries such as the aviation industry.30 The European Network for Patient Safety defines patient safety culture as ‘an integrated pattern of individual and organizational behaviour, based upon shared beliefs and values that continuously seek to minimise patient harm, and which may result from the processes of care delivery’.31 While there are significant variations in definition of safety culture, several studies have defined a positive safety culture as one that is ‘characterised by communications founded on mutual trust, shared perceptions of the importance of safety and confidence in the efficacy of preventive measures’,32 with poor safety culture being linked to adverse patient outcomes28,33 and HCW burnout.34,35

The uncertainty, limited PPE, lack of good curative treatment strategies and evolving understanding of the disease process that characterised the early phases of this pandemic were likely highly detrimental to good safety culture.27,36 The aim of our

Table 1. Background of demographic, health systems and COVID-19 pandemic data in participating countries, Singapore, Indonesia, Malaysia and India.

| Variable                                               | Singapore | Indonesia | Malaysia | India        |
|--------------------------------------------------------|-----------|-----------|----------|--------------|
| Demographic and healthcare systemsa                   |           |           |          |              |
| GDP per capita                                         | 60,913.75 | 3,837.65  | 10,254.23| 1,981.65     |
| World Bank income level                                 | High      | Upper middle | Upper middle | Lower middle |
| Universal Health Coverage Service Coverage Index       | 86        | 57        | 73       | 55           |
| Human Development Indexc                               | 0.93      | 0.70      | 0.80     | 0.647        |
| Total population                                        | 5,612,253 | 264,645,886| 31,105,028| 1,338,658,835|
| Gross healthcare expenditure (per capita)              | 2618.71   | 114.97    | 384.07   | 69.29        |
| Population density per km²                             | 7,915.73  | 146.09    | 94.67    | 450.24       |
| Physician per 1,000 population                          | 2.29a     | 0.38      | 1.54d    | 0.78         |
| Nurse and midwife per 1,000 population                 | 6.24      | 2.05      | 3.47     | 2.11         |
| Hospital bed per 1,000 population                      | 2.4a      | 1.2a      | 1.9a     | 0.7a         |
| Status during the pandemic at the start of study (29 May 2020) d |           |           |          |              |
| No. of cases                                            | 33,294    | 25,216    | 7,629    | 165,799      |
| Cases per 10,000 population                            | 59.32     | 0.95      | 2.45     | 1.24         |
| Deathsc                                                | 23        | 1,520     | 115      | 4,706        |
| Case fatality rate (ratio of confirmed deaths to cases) | 0.07%     | 6.03%     | 1.51%    | 2.84%        |
| Daily tests per 100,000 population                     | 92        | 8.0       | 20       | 2.0          |
| Critical care bed per 100,000 population               | 11.4      | 2.7       | 3.4      | 2.3          |

aAll data were from the World Bank Data Bank 2017, unless otherwise stated. bObtained from the United Nations Development Programme 2018. cObtained from World Bank Data Bank 2016. dObtained from World Bank Data Bank 2015. eObtained from World Bank Data Bank 2011. fAll data under this header from Roser et al., 2020 (https://ourworldindata.org/coronavirus), unless otherwise stated. gObtained from Phua et al., 2020.
study was to understand and compare safety culture among HCWs from India, Indonesia, Malaysia and Singapore. We also aimed to assess the relationship between safety culture and other work conditions such as work hours, redeployment and exposure to COVID-19 patients, as well as mental health aspects, such as burnout, depression and anxiety, assessed via validated well-being tools at the early phase of the pandemic.

METHODS

We conducted a multinational, multicentre, cross-sectional survey study involving doctors, nurses and allied healthcare professionals (AHPs) across private and public hospitals in Singapore, Indonesia, Malaysia and India [Table S1, Supplemental Digital Appendix], collectively referred to as the Indo-Pacific region, for the purpose of this paper. This study was conducted about 4 months after the first cases were reported in Singapore, Malaysia and India from 29 May 2020 to 13 July 2020 [Figure 1].

An anonymous, voluntary questionnaire was circulated through a website link distributed through e-mail, posters or instant messaging means with weekly reminders. The questionnaire was administered using FormSG (GovTech, Singapore) in Singapore and Google Forms (Google, Mountain View, CA, USA) in Malaysia, India and Indonesia. This questionnaire was worded in English. The data and methodology for the Singapore cohort has been published in a study looking into factors affecting burnout among HCWs during a pandemic.[22] For India, Malaysia and Indonesia, a snowball sampling method[37] was used by the national coordinators to disseminate the survey within the various participating hospitals.

Three internationally validated questionnaires were utilised — the Safety Attitudes Questionnaire (SAQ), Oldenburg Burnout Inventory (OLBI) and Hospital Anxiety and Depression Scale (HADS). Respondents were categorised by country, ethnicity, HCW roles, gender, redeployment status, testing status for COVID-19, type of healthcare institution, educational status, average duration of shift, average number of days of work in a week and number of COVID-19 cases in their hospital for multivariate analysis. Redeployment referred to being posted out of one’s usual workplace to either internally within one’s hospital to an area in need of more manpower, or outside to areas such as community screening or isolation facilities. As each country had multiethnic populations, respondents were further grouped according to the majority ethnicities of their respective countries. Waiver of consent and ethics approval was obtained from the National Healthcare Group’s Domain Specific Review Board.

![Figure 1](https://example.com/figure1.png)

**Figure 1:** Graphs show the cumulative COVID-19 cases per 10,000 population in the four countries. [Source: WHO coronavirus disease (COVID-19) dashboard. Geneva: World Health Organization, 2020. Available from: https://covid19.who.int/. Last accessed on 17 Jan 2021].
Safety Attitudes Questionnaire
The SAQ has been adapted for use in hospital settings\[29\] from the Flight Management Attitudes Questionnaire,\[30\] which was designed to assess safety attitudes among flight crew. Encompassing six patient safety domains — safety climate, perceptions of management, teamwork climate, working conditions, job satisfaction and stress recognition — SAQ has been validated across various HCW roles, work environments and languages\[33,38\] and is one of the most widely used tools to assess safety attitudes. In addition to the core 30 questions that are constant in each variation of SAQ, we selected an additional six questions that we deemed were relevant from the original bank of 60 questions [Table S2, Supplemental Digital Appendix]. Each closed-ended question was rated on a 5-point Likert scale ranging from strongly disagree (1 point) to strongly agree (5 points). Higher scores referred to better safety attitudes. The safety culture score for each domain was calculated as follows: (mean value of item scores within a domain – 1) × 25.\[35\] The ‘percentage agree rate’ (PAR) is a primary metric for SAQ\[29,39\] and refers to the proportion of respondents achieving a score of 75 or more. The total SAQ PAR was calculated by (a) calculating the mean score for all the items for each respondent and (b) determining the percentage of respondents with a score ≥75.

Oldenburg Burnout Inventory
The OLBI is a validated tool to assess burnout [Table S3, Supplemental Digital Appendix] with eight positively and negatively framed items for each of its two constituent dimensions: exhaustion (emptiness and need for rest); and disengagement (distancing from aspects of one’s own work).\[40\] Each item was rated on a 4-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’, where the highest burnout response was awarded 4 points. A score ≥2.5 for exhaustion or ≥2.10 for disengagement correlates with physical symptoms\[41\] and has been used as a cut-off to define burnout.\[42\] The OLBI has been validated in a variety of populations and settings\[43,44\] and has convergent validity with the more well-known Maslach Burnout Inventory, while possessing superior psychometric scale properties\[40\] due to the inclusion of both positively and negatively framed questions in each domain.

Hospital Anxiety and Depression Scale
The HADS\[45\] is a self-reported questionnaire to screen for depression and anxiety, with seven items in each respective subscale for depression and anxiety [Table S4, Supplemental Digital Appendix]. Each item was measured on a 4-point Likert scale with scores between 0 and 3, with a higher score referring to higher levels of depression or anxiety. A score ≥8\[45\] in either of the subscale was deemed as being at risk for depression or anxiety.

Outcomes
Our primary outcome measure was the total SAQ PAR. The secondary outcomes were individual SAQ domain PAR, OLBI mean scores and burnout rates, as well as the percentage of respondents with HADS_anxiety or HADS_depressions scores ≥8.

Statistical analysis
Analyses were performed using IBM SPSS Statistics version 26.0 (IBM Corp, Armonk, NY, USA) with statistical significance set as \(P < 0.05\). Confirmatory factor analysis via root mean square error of approximation (RMSEA < 0.06), comparative fit indices (CFI ≥ 0.90) and standardised root mean square residual (SRMSR < 0.08)\[46\] demonstrated a good fit of the instruments to the data of different samples [Table S5, Supplemental Digital Appendix]. One-way analysis of variance was used to evaluate differences in SAQ, OLBI and HADS scores between the countries. Univariate and multivariate logistic regression analyses were performed as mixed-effects analyses using total SAQ PAR as the outcome variable and institution as a random effect.

RESULTS
We obtained a total of 3,163 valid questionnaires with completed SAQ scoring in all six domains. Respondent characteristics are shown in Table 2. Males constituted 26.3% of responses. Doctors, nurses, allied health professionals (including dental staff and healthcare students) comprised 30.8%, 52.4% and 16.7% of the respondents, respectively. Public or community hospitals were the declared site of work by 96.6% of respondents, with the remainder belonging to a private hospital. Among the respondents, 18.1% had been redeployed from their primary site of work to other locations, 30.6% worked more than 5 days a week, 12.0% worked ≥12 h per shift and 18.1% had been redeployed from their primary site of work to other locations, 30.6% worked more than 5 days a week, 12.0% worked ≥12 h per shift and 18.0% stated that they had treated known COVID-19-positive patients. Among the respondents from Singapore, Malaysia, Indonesia and India, the majority ethnicity was Chinese (53.1%), Malay (78.2%), Javanese (88.7%) and Indian (99.3%), respectively.

Table 3 and Figure 2 show the SAQ scores and other measures of well-being. We found statistically significant differences \(P < 0.001\) in SAQ mean scores and PAR between the countries in all six domains [Table 3]. India had the highest overall total SAQ PAR (49.0%), with the highest PAR observed for the teamwork climate, safety climate, perceptions of management and working conditions domains, while Singapore had the highest PAR for stress recognition (53.3%) and Malaysia for job satisfaction (81.5%). The OLBI scores also showed statistically significant differences between the countries \(P < 0.001\). Indonesia had the highest percentage of respondents meeting thresholds for OLBI-disengagement (85.4%) and HADS-anxiety (58.3%),
Malaysia for OLBI-exhaustion (79.2%) and India for HADS-depression (39.5%).

**Multivariate analysis**

Explanatory variables for total SAQ PAR included HADS and OLBI scores, country, being in the majority ethnicity, healthcare role, workplace, workdays per week, work hours per shift, number of COVID-19 patients in the hospital, redeployment and having done COVID-19 testing. Variables found to be significant on univariate analysis were included in multivariate analysis. Indonesia and Malaysia had significantly lower SAQ total PAR than Singapore (odds ratio [OR] 0.27 and 0.05, respectively, both \( P < 0.001 \)). Factors associated with a lower SAQ total PAR included positive OLBI-disengagement (OR 0.40, \( P < 0.001 \), OLBI-exhaustion (OR 0.58, \( P < 0.001 \)), HADS-depression (OR 0.54, \( P < 0.001 \)) and working \( \geq 12 \) h per shift (OR 0.70, \( P = 0.019 \)) [Table 4].

### DISCUSSION

While prepandemic studies have been done in Asia to evaluate safety attitudes and validate assessment tools among HCWs,[38,47-50] few studies have been conducted to determine intra-regional differences[51] using the same tool and even fewer studies have evaluated intra-regional differences during a surge period such as during the COVID-19 pandemic.[22]
Table 3. Safety Attitudes Questionnaire PAR* and other baseline measures of well-being.

| Variable                          | Valid n | Singapore | Malaysia | India | Indonesia | P      |
|----------------------------------|---------|-----------|----------|-------|-----------|--------|
| Safety Attitudes Questionnaire   |         |           |          |       |           |        |
| PAR                              | 2,741   | 70.3±13.9 | 70.4±8.0 | 73.0±16.6 | 64.1±9.1 | <0.001* |
|                                  | 1,023 (48.0) | 180 (41.3) | 88 (58.7) | 18 (11.9) |          |        |
| Safety climate                   | 2,745   | 69.4±14.4 | 67.8±8.9 | 76.8±15.8 | 63.3±9.7 | <0.001* |
| PAR                              | 876 (43.6) | 118 (27.1) | 103 (68.7) | 21 (13.9) |          |        |
| Stress recognition               | 2,743   | 69.3±25.6 | 65.4±22.5 | 50.3±31.2 | 56.9±20.0 | <0.001* |
| PAR                              | 1,056 (52.5) | 232 (53.5) | 36 (24.5) | 40 (26.5) |          |        |
| Job satisfaction                 | 2,750   | 73.7±22.4 | 75.9±14.9 | 85.0±19.3 | 73.5±15.3 | <0.001* |
| PAR                              | 1,147 (57.0) | 341 (78.4) | 120 (80.0) | 88 (58.3) |          |        |
| Perception of management         | 2,746   | 63.4±20.2 | 62.9±13.9 | 72.7±18.8 | 57.0±9.9  | <0.001* |
| PAR                              | 684 (34.0) | 143 (32.9) | 80 (53.3) | 8 (5.3) |          |        |
| Working conditions               | 2,748   | 65.5±21.2 | 64.8±15.1 | 76.5±19.3 | 62.8±13.7 | <0.001* |
| PAR                              | 828 (41.2) | 206 (47.4) | 90 (60.0) | 54 (35.8) |          |        |
| Total score                      | 2,732   | 69.0±12.8 | 68.5±7.3  | 73.7±13.5 | 63.3±7.6  | <0.001* |
| PAR                              | 713 (35.7) | 65 (15.0) | 75 (51.0) | 5 (3.3) |          |        |
| Oldenburg Burnout Inventory (OLBI) |    |           |          |       |           |        |
| OLBI-disengagement               | 2,772   | 2.40±0.46 | 2.36±0.32 | 2.15±0.32 | 2.31±0.26 | <0.001* |
| Positive*                        | 1,625 (80.5) | 386 (85.6) | 96 (63.6) | 129 (85.4) |          |        |
| OLBI-exhaustion                  | 2,772   | 2.52±0.48 | 2.46±0.36 | 2.24±0.42 | 2.34±0.32 | <0.001* |
| Positive                         | 1,553 (76.9) | 358 (79.4) | 85 (56.3) | 107 (70.9) |          |        |
| Both OLBI-disengagement and -exhaustion positive | 2,772   | 1,423 (70.5) | 328 (72.7) | 77 (51.0) | 98 (64.9) | <0.001* |
| Hospital Anxiety and Depression Scale (HADS) | | | | | | |
| HADS-anxiety                     | 2,772   | 7.00±3.99 | 7.03±3.51 | 6.77±3.66 | 8.31±4.13 | 0.001* |
| Positive*                        | 855 (42.3) | 200 (44.3) | 65 (43.0) | 88 (58.3) |          | 0.002* |
| HADS-depression                  | 2,772   | 5.65±3.88 | 5.45±3.37 | 6.13±3.54 | 5.52±3.51 | 0.286 |
| Positive                         | 636 (31.5) | 133 (29.5) | 59 (39.1) | 47 (31.1) |          | 0.183 |
| Both HADS-anxiety and -depression positive | 2,772   | 492 (24.4) | 101 (22.4) | 38 (25.2) | 39 (25.8) | 0.771 |

*PAR refers to the proportion of respondents who scored ≥75% for the safety culture score in each domain. *Thresholds for deeming burnout for (a) OLBI-disengagement ≥2.10 and (b) OLBI-exhaustion ≥2.25. *Thresholds for deeming risk of anxiety or depression for HADS was ≥8 in either subscale. *Statistically significant. PAR: percentage agree rate, SD: standard deviation

**Figure 2:** Safety Attitudes Questionnaire (percentage agree rate) between different countries.

Our study highlighted that working for 12 h or more per shift was significantly associated with a low total SAQ PAR. Of note, the number of workdays per week was not significantly correlated with total SAQ PAR, although it did approach statistical significance. Prepandemic studies have shown a similar inverse relationship between shift durations and patient safety outcomes.52–55 During surge periods when the work hours per week may need to be increased due to redeployment, segregation and increased patient loads, our study suggests the importance of proper work–rest cycles where the number of workdays per week cannot be reduced. Nevertheless, work hours per week are also correlated with poorer patient safety outcomes and off-days per week should be supported.

Safety culture scores were significantly different between each of the four countries, with India and Indonesia having the highest and lowest total SAQ PAR, respectively. The HCWs from India showed markedly higher SAQ scores in all parameters compared to Indonesia, except for stress recognition (PAR 24.5% and 26.5%, respectively). This disparity was seen despite both Indonesia and India having a similarly accelerating COVID-19 case trajectory [Figure 1], higher case fatality rate (6.03% and 2.84%, respectively) and a lower daily test rate (8.0 and 2.0 per 100,000 population, respectively).
respectively) [Table 1] compared to Singapore and Malaysia. Furthermore, while shift work ≥12 h was a significant contributor to low total SAQ PAR on multivariate analysis, a greater proportion of HCWs from India did so compared to Indonesia (27.8% vs. 10.6%), indicating that other factors were in play. These may have included factors that were overall not significantly correlated with total SAQ PAR but markedly different between HCWs from India and Indonesia, which may have affected perceptions of safety culture. More HCWs from India than Indonesia were not involved in the care of COVID-19 patients, worked in private hospitals and comprised nurses (71.3% vs. 54.3%, 31.1% vs. 0.0% and 43.0% vs. 25.8%, respectively). More studies are needed to explore these as well as other factors.

Our study also demonstrated a relatively high level of burnout in each country, with disengagement and exhaustion scores exceeding thresholds among more than 70% of respondents in each country except India, which showed the lowest burnout rates at 63.6% and 56.3% for OLBI-exhaustion and -disengagement, respectively. While comparisons with prepandemic studies are challenging due to different burnout assessment tools and limited size or scope, high burnout levels have also been reported among the healthcare workforce in Asia. A systematic review of HCWs in India demonstrated a prevalence of burnout in 23%–27% of HCWs. A single-centre study in Indonesia reported a prevalence of 70%–88.3%, while another study comprising five hospitals in Sabah, Malaysia, reported a prevalence of 30.4%–57.1%. These studies used the Maslach Burnout Inventory. This indicates that a significant component of burnout existed prepandemic and may have continued. An interval assessment with similar tools and scope would allow for meaningful comparisons. The significant correlation between lower total SAQ PAR and meeting thresholds for OLBI-disengagement

### Table 4. Multivariate analysis of total safety attitudes questionnaire percentage agree rate.

| Variable                  | Univariate | Multivariate |
|---------------------------|------------|--------------|
|                           | OR (95% CI) | P            | OR (95% CI) | P            |
| **Country**               |            |              |            |              |
| Singapore (Ref)           |            |              |            |              |
| Malaysia                  | 0.31 (0.24–0.42) | <0.001*      | 0.27 (0.19–0.38) | <0.001*      |
| India                     | 1.88 (1.34–2.63) | <0.001*      | 1.40 (0.91–2.13) | 0.125          |
| Indonesia                 | 0.06 (0.03–0.15) | <0.001*      | 0.05 (0.02–0.11) | <0.001*      |
| Being in the majority ethnicity | 0.80 (0.68–0.95) | 0.009*     | 1.03 (0.85–1.25) | 0.789          |
| **Healthcare role**       |            |              |            |              |
| Doctor (Ref)              |            |              |            |              |
| Nurse                     | 1.01 (0.84–1.21) | 0.953      |            |              |
| AHP and others            | 1.14 (0.89–1.47) | 0.298      |            |              |
| **Workplace**             |            |              |            |              |
| Public hospital (Ref)     |            |              |            |              |
| Private hospital          | 1.38 (0.90–2.12) | 0.142      |            |              |
| **Workdays per week**     |            |              |            |              |
| <5 (Ref)                  | 0.86 (0.69–1.06) | 0.151      |            |              |
| >5                       | 0.74 (0.59–0.94) | 0.012*     | 1.23 (0.98–1.55) | 0.068          |
| **Work hours per shift**  |            |              |            |              |
| <8 (Ref)                  | 0.94 (0.72–1.21) | 0.612      |            |              |
| ≥12                       | 0.67 (0.47–0.95) | 0.024*     | 0.70 (0.52–0.94) | 0.019*          |
| **No. of COVID-19 patients** |            |              |            |              |
| ≤25 (Ref)                 |            |              |            |              |
| >25                       | 1.20 (1.02–1.42) | 0.030*     | 0.92 (0.75–1.14) | 0.456          |
| Redeployment              | 0.99 (0.80–1.23) | 0.908      |            |              |
| COVID-19 testing done for self | 0.87 (0.70–1.08) | 0.198      |            |              |
| **OLBI and HADS**         |            |              |            |              |
| OLBI-disengagement positive | 0.25 (0.20–0.30) | <0.001      | 0.40 (0.32–0.52) | <0.001*      |
| OLBI-exhaustion positive  | 0.31 (0.26–0.38) | <0.001      | 0.58 (0.45–0.73) | <0.001*      |
| HADS-anxiety positive     | 0.44 (0.37–0.52) | <0.001      | 0.85 (0.69–1.06) | 0.148          |
| HADS-depression positive  | 0.39 (0.33–0.48) | <0.001      | 0.54 (0.42–0.68) | <0.001*      |

AHP: allied healthcare professional, CI: confidence interval, HADS: Hospital Anxiety and Depression Scale, OLBI: Oldenburg Burnout Inventory, OR: odds ratio, SD: standard deviation
and -exhaustion and HADS-depression seen in this study is consistent with the findings of several other studies,[35,59,60] and indicates that well-being among HCWs is an important factor in ensuring good patient safety outcomes through a positive safety culture.

An additional factor that warrants further study is the role of ethnic minorities in the well-being and perceptions of safety culture. Ethnic minority HCWs from the Singapore, Malaysia and Indonesia cohorts (multiethnic countries) and India cohort comprised 11.3%–46.9% and 99.3% of all respondents, respectively. An inverse relationship between ethnic minorities and burnout has been shown in several studies[61-64] and was thought to be due to increased resilience related to life experiences.[61] In a previously published study, Singapore HCWs of Indian ethnicity had significantly lower burnout scores compared to HCWs of Chinese ethnicity.[22] While being of a major ethnic group was found to be a significant contributor to lower total SAQ PAR on univariate analysis, it was not so on multivariate analysis after correcting for other covariates such as OLBI scores. Few studies have evaluated the unique and complex interplay between minority ethnicity in the healthcare workforce and its effects on emotional well-being.[65]

To our knowledge, no studies have been conducted to evaluate its effects on safety attitudes.

The main limitation of our study pertains to representation of each country’s health workforce. While snowball sampling is cost-effective, it is non-random. Persons embedded in larger social networks are more likely to be referred and as individuals are more likely to forward a questionnaire within their social networks.[37] This may have contributed to the markedly different proportions of the workforce captured in our study, with a higher proportion of respondents from Singapore being nurses (62%) as compared to other countries (25%–45%). Also, AHPs were poorly represented among respondents from Malaysia and Indonesia (0% and 2.4%, respectively). A large proportion of respondents were from Singapore (72.8%); while we corrected for this in multivariate analysis, this could have led to sampling errors when comparing with the other smaller cohorts. As the hospitals selected were mainly in urban centres, this study may not have reflected the working conditions among HCWs rural areas, especially in larger countries[66,67] where worse working conditions and HCW mental well-being have been reported[34,68] Due to the multilingual nature of participating countries and the lack of validated language-specific versions of these questionnaires, the study participants might have been HCWs with good English proficiency, which may, in turn, have selection biases for seniority, nature of work, roles and associated workload. Finally, a lack of prepandemic studies on safety attitudes in each of these countries makes it difficult to determine the extent of change that can be attributed to changes in work conditions due to the COVID-19 pandemic.

Nevertheless, the comparative nature of our study across different countries in the Indo-Pacific region with different healthcare systems during a period of surge using validated tools has significant merit and would hopefully serve as a baseline for future comparative studies.

In conclusion, we report worryingly high burnout rate in each of these countries and demonstrate its association with lower SAQ scores during this time of unprecedented healthcare burden. Our study also shows that limiting shift hours can improve patient safety attitudes, perhaps more so than reducing workdays per week. Thus, during times when surge capacity is needed, enforcing work–rest cycles may be important for sustaining increased HCW work hours per week. Any measure to improve burnout, depression and anxiety would also improve patient safety attitudes. These measures include training in mental resilience,[35,69] availability of dedicated mental health professionals, and providing workplace training and protection[70] for continuing healthcare services under pandemic conditions.[71] As the COVID-19 pandemic draws on, it would be useful to re-evaluate safety attitudes in the context of improved vaccine, provision of PPE, test availability for HCWs and understanding of COVID-19. With COVID-19 increasingly likely to be endemic, a good safety culture will be vital for the sustenance of effective healthcare services even during surge periods.[66]

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Conflicts of interest

Tan BYQ, Sia CH, Chan YH and Kang S are members of the SMJ Editorial Board, and were thus not involved in the peer review and publication decisions of this article.

Supplemental digital content

Appendix at https://links.lww.com/SMJ/xxx [TBC]

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Table S1: Participating Hospitals

| Name of Hospital                                           | Valid n | Median Range of Number of COVID-19 Patients |
|------------------------------------------------------------|---------|--------------------------------------------|
| **Indonesia**                                              |         |                                            |
| Moewardi Hospital                                          | 143     | 1-25                                       |
| **Malaysia**                                               |         |                                            |
| Hospital Umum Kuching Sarawak                             | 3       | More than 100                              |
| Hospital Sungai Buloh                                     | 40      | 51-100                                     |
| Hospital Wanita & Kanak Kanak Likas, Kota Kinabalu         | 9       | 26-50                                      |
| Hospital Tengku Ampuan Afzan Kuantan                      | 17      | 26-50                                      |
| Hospital Queen Elizabeth I/II Kota Kinabalu               | 2       | 26-50                                      |
| Hospital Bintulu                                          | 26      | 1-25                                       |
| Hospital Tuanku Jaafar Seremban                           | 17      | 1-25                                       |
| Hospital Labuan                                            | 37      | 1-25                                       |
| Hospital Raja Perempuan Zainab 2 Kota Bharu               | 84      | 1-25                                       |
| Hospital Selayang                                         | 35      | 1-25                                       |
| Hospital Tengku Ampuan Rahimah Klang                      | 87      | 1-25                                       |
| Pusat Perubatan UIA Kuantan                               | 6       | 1-25                                       |
| Hospital USM                                              | 68      | 0                                          |
| **India**                                                  |         |                                            |
| GCS Hospital                                               | 12      | More than 100                              |
| Zydus Hospital                                             | 108     | 1-25                                       |
| Yashoda Hospital                                           | 4       | 1-25                                       |
| Max Saket Hospital                                         | 1       | 0                                          |
| SMS Saket Hospital                                         | 7       | 0                                          |
| **Singapore**                                              |         |                                            |
| Ng Teng Fong General Hospital                              | 416     | 51-100                                     |
| National University Hospital                               | 995     | 51-100                                     |
| Alexandra Hospital                                         | 75      | 1-25                                       |
| Institute of Mental Health                                 | 452     | 1-25                                       |
### Table S2: Safety Attitudes Questionnaire (5-point Likert Scale)

| Question                                                                 | Domain     | Reversed Questions |
|--------------------------------------------------------------------------|------------|--------------------|
| 1. Nurse input is well received in this clinical area.                   |            |                    |
| 2. In this clinical area, it is difficult to speak up if I perceive a problem with patient care. |            | ✓                  |
| 3. Disagreements in this clinical area are resolved appropriately (i.e., not who is right, but what is best for the patient). | TW         |                    |
| 4. I have the support I need from other personnel to care for patients.  |            |                    |
| 5. It is easy for personnel here to ask questions when there is something that they do not understand. |            |                    |
| 6. The physicians and nurses here work together as a well-coordinated team. |            |                    |
| 7. I would feel safe being treated here as a patient.                    |            |                    |
| 8. Medical errors are handled appropriately in this clinical area.       | SC         | ✓                  |
| 9. I know the proper channels to direct questions regarding patient safety in this clinical area. |            |                    |
| 10. I receive appropriate feedback about my performance.                 |            |                    |
| 11. In this clinical area, it is difficult to discuss errors.            |            | ✓                  |
| 12. I am encouraged by my colleagues to report any patient safety concerns I may have. |            |                    |
| 13. The culture in this clinical area makes it easy to learn from the errors of others. |            |                    |
| 14. I like my job.                                                       | JS         |                    |
| 15. Working here is like being part of a large family.                   |            |                    |
| 16. This is a good place to work.                                        |            |                    |
| 17. I am proud to work in this clinical area.                            |            |                    |
| 18. Morale in this clinical area is high.                                |            |                    |
| 19. When my workload becomes excessive, my performance is impaired.      |            | ✓                  |
| 20. I am less effective at work when fatigued.                           | SR         | ✓                  |
| 21. I am more likely to make errors in tense or hostile situations.      |            | ✓                  |
| 22. Fatigue impairs my performance during emergency situations (e.g. emergency resuscitation, seizure). |            | ✓                  |
| 23. Management supports my daily efforts.                                | PM         |                    |
| 24. Management doesn’t knowingly compromise patient safety.              |            |                    |
| 25. Management is doing a good job.                                      |            |                    |
| 26. Problem personnel are dealt with constructively by our management.   |            |                    |
| 27. I get adequate, timely info about events that might affect my work, from management. |            |                    |
| 28. The levels of staffing in this clinical area are sufficient to handle the number of patients. |            |                    |
| 29. This hospital does a good job of training new personnel.             | WC         |                    |
| 30. All the necessary information for diagnostic and therapeutic decisions is routinely available to me. |            |                    |
| 31. Trainees in my discipline are adequately supervised.                 |            |                    |
| 32. I experience good collaboration with nurses in this clinical area.    |            |                    |
| 33. I experience good collaboration with staff physicians in this clinical area. |            |                    |
| 34. I experience good collaboration with pharmacists in this clinical area. |            |                    |
| 35. Communication breakdowns that lead to delays in delivery of care are common. |            | ✓                  |
| 36. My suggestions about safety would be acted upon if I expressed them to management. |            |                    |

TW: Teamwork climate, SC: Safety Climate, JS: Job Satisfaction, SR: Stress Recognition, PM: Perceptions of Management, WC: Working conditions
Table S3: Oldenburg Burnout Inventory (4-point Likert Scale)

| Question                                                                 | Domain | Reversed Questions |
|--------------------------------------------------------------------------|--------|--------------------|
| 1. I always find new and interesting aspects of my work.                 | D      | ✓                  |
| 2. There are days when I feel tired before I arrive at work.              | E      |                    |
| 3. It happens more and more often that I talk about my work in a negative way. | D      |                    |
| 4. After work, I tend to need more time than in the past in order to relax and feel better | E      |                    |
| 5. I can tolerate the pressure of my work very well.                     | E      | ✓                  |
| 6. Lately, I tend to think less at work and do my job almost mechanically. | D      |                    |
| 7. I find my work to be a positive challenge.                            | D      | ✓                  |
| 8. During my work, I often feel emotionally drained.                     | E      |                    |
| 9. Over time, one can become disconnected from this type of work.        | D      |                    |
| 10. After working, I have enough energy for my leisure activities.       | E      | ✓                  |
| 11. Sometimes I feel sickened by my work tasks.                          | D      |                    |
| 12. After my work, I usually feel worn out and weary.                    | E      |                    |
| 13. This is the only type of work that I can imagine myself doing.        | D      | ✓                  |
| 14. Usually, I can manage the amount of my work well.                    | E      | ✓                  |
| 15. I feel more and more engaged in my work.                             | D      | ✓                  |
| 16. When I work, I usually feel energized.                               | E      | ✓                  |

D: Disengagement, E: Exhaustion
### Table S4: Hospital Anxiety and Depression Scale

| Question                                                                 | Domain | Responses & Score                              |
|-------------------------------------------------------------------------|--------|-----------------------------------------------|
| 1. I feel tense or ‘wound up’                                           | A      | Most of the time                              |
|                                                                          |        | A lot of the time                             |
|                                                                          |        | From time to time, occasionally               |
|                                                                          |        | Not at all                                    |
|                                                                          |        |                                              |
|                                                                          | 3      | 2                                             |
| 2. I still enjoy the things I used to enjoy                              | D      | Definitely as much                             |
|                                                                          |        | Not quite so much                             |
|                                                                          |        | Only a little                                 |
|                                                                          |        | Hardly at all                                 |
|                                                                          | 0      | 1                                             |
| 3. I get a sort of frightened feeling as if something awful is about to happen | A      | Very definitely and quite badly              |
|                                                                          |        | Yes, but not too badly                         |
|                                                                          |        | A little, but it doesn’t worry me             |
|                                                                          |        | Not at all                                    |
|                                                                          | 3      | 2                                             |
| 4. I can laugh and see the funny side of things                         | D      | As much as I always could                     |
|                                                                          |        | Not quite so much now                         |
|                                                                          |        | Definitely not so much now                    |
|                                                                          |        | Not at all                                    |
|                                                                          | 0      | 1                                             |
| 5. Worrying thoughts go through my mind                                  | A      | A great deal of the time                      |
|                                                                          |        | A lot of the time                             |
|                                                                          |        | From time to time, but not too often          |
|                                                                          |        | Only occasionally                              |
|                                                                          | 3      | 2                                             |
| 6. I feel cheerful                                                      | D      | Not at all                                    |
|                                                                          |        | Not often                                     |
|                                                                          |        | Sometimes                                     |
|                                                                          |        | Most of the time                              |
|                                                                          | 0      | 1                                             |
| 7. I can sit at ease & feel relaxed                                     | A      | Definitely                                     |
|                                                                          |        | Usually                                       |
|                                                                          |        | Not often                                     |
|                                                                          |        | Not at all                                    |
|                                                                          | 0      | 1                                             |
| 8. I feel as if I am slowed down                                        | D      | Nearly all the time                           |
|                                                                          |        | Very often                                    |
|                                                                          |        | Sometimes                                     |
|                                                                          |        | Not at all                                    |
|                                                                          | 3      | 2                                             |
| 9. I get a sort of frightened feeling like ‘butterflies’ in the stomach | A      | Not at all                                    |
|                                                                          |        | Occasionally                                  |
|                                                                          |        | Quite often                                   |
|                                                                          |        | Very often                                    |
|                                                                          | 0      | 1                                             |
| 10. I have lost interest in my appearance                               | D      | Definitely                                    |
|                                                                          |        | I don’t take as much care as I should         |
|                                                                          |        | I may not take quite as much care             |
|                                                                          |        | I take just as much care ever                 |
|                                                                          | 3      | 2                                             |
| 11. I feel restless as I have to be on the move                          | A      | Very much indeed                              |
|                                                                          |        | Quite a lot                                   |
|                                                                          |        | Not very much                                 |
|                                                                          |        | Not at all                                    |
|                                                                          | 3      | 2                                             |
| 12. I look forward with enjoyment to things                              | D      | As much as I ever did                         |
|                                                                          |        | Rather less than I used to                    |
|                                                                          |        | Definitely less than I used to                |
|                                                                          |        | Hardly at all                                 |
|                                                                          | 0      | 1                                             |
| 13. I get sudden feelings of panic                                       | A      | Very often indeed                             |
|                                                                          |        | Quite often                                   |
|                                                                          |        | Not very often                                |
|                                                                          |        | Not at all                                    |
|                                                                          | 3      | 2                                             |
| 14. I can enjoy a good book or radio or TV program                       | D      | Often                                        |
|                                                                          |        | Sometimes                                     |
|                                                                          |        | Not often                                     |
|                                                                          |        | Very seldom                                   |
|                                                                          | 0      | 1                                             |

D: Depression, A: Anxiety

0-7: Normal, 8-10: Borderline abnormal, 11-21: Abnormal
Table S5: Confirmatory Factor Analysis

| Confirmatory Factor Analysis | OLBI   | SAQ   | HADS  |
|------------------------------|--------|-------|-------|
| Root mean square error of approximation (RMSEA) | Not available | 0.042 | 0.057 |
| Comparative fit index (CFI) | 1.0    | 0.893 | 0.900 |
| Standardized root mean square residual (SRMR) | 0.086  | 0.044 | 0.050 |

OLBI: Oldenburg Burnout Inventory
SAQ: Safety Attitudes Questionnaire
HADS: Hospital Anxiety and Depression Scale