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# Relationship between mental health and quality of life among health care workers during COVID-19 pandemic in Vietnam

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## Abstract

**Background**: The COVID-19 pandemic has serious consequences around the world, especially in the healthcare system. With a crucial role in the pandemic, mental health and quality of life among health care workers (HCWs) needs to be addressed.

**Purposes**: The study aimed to describe mental health and the health-related quality of life among HCWs and explore the relationship between mental health and quality of life among HCWs during the COVID-19 pandemic.

**Methods**: A cross-sectional study was conducted from 6 April to 19 April 2020 at nine hospitals in Vietnam. The questionnaire included participant's characteristics, health-related quality of life (HRQoL), Patient Health Questionnaire (PHQ), and Generalized Anxiety Disorder (GAD). De-pression and anxiety were defined as PHQ score ≥ 10 and GAD score ≥ 8, respectively. Descriptive, bivariate, and multiple regression analyses were used to analyze the data with a significant level at $p < 0.05$.

**Results**: A total of 3,757 HCWs were enrolled in the study. Proportions of de-pression and anxiety were 4.5% and 3.1%, respectively. The overall mean score of HRQoL was 73.4 ± 14.9 (possible score range from 0 to 100). Protective factors of HRQoL consisted of physical activity, ability to pay for medication, gender, and social status, while its risk factors included suspected COVID-19 symptoms, smoking status. HRQoL was associated with depression (B(95%CI) = -8.15 (-10.76 to -5.55) and anxiety (B(95%CI) = -6.87 (-9.99 to -3.75)), $p<0.001$.

**Conclusion**: There was a relationship between mental health and the health-related quality of life among HCWs. Integration of healthy lifestyles and psychological support can help improve mental health and quality of life for HCWs during the pandemic.

**Keywords:** Healthcare worker; Nursing care; COVID-19; SARS-CoV-2; Mental health

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## 1. Introduction

One year after the World Health Organization (WHO) declared the global pandemic, SARS-Coronavirus -2 (COVID-19) has rapidly spread to 223 countries and territories with over 118 million confirmed cases [1]. CThe COVID-19 pandemic becomes a global burden with its serious consequences, especially in the healthcare system [2-4]. In Vietnam, the first phase of COVID-19 outbreak from 23 January to 5 March 2020. Although the health care system still has an imbalance situation and many hospitals face overcrowding, Vietnam had limited the pandemic by timely healthcare strategies. Thus, the entire Vietnamese health system has strong efforts during the pandemic, especially when prevention measures are prioritized [5-7].

Health care workers (HCWs), including doctors, nurses, technicians, and other support staff, play an important role in any health care system [8]. While people worldwide are advised to stay at home during the pandemic, many HCWs have prolonged working under high-pressured circumstances. Besides the professionalism, their authoritative voice is crucial to promote effective COVID-19 prevention strategies. HCWs were considered as the most important resource in the COVID-19 pandemic [9-11].

During the global pandemic, HCWs have encountered many unpredictable challenges. HCWs have a high risk of COVID-19 infection in any medical setting, especially in the lack of personal protective equipment (PPE) [8,10,12]. Other occupational risks were reported, such as physical exhaustion, stigma, and discrimination. To minimize occupational risks, management strategies have been proposed, including protecting HCWs from infection, improve the capacity of HCWs, and re-arranging suitable working time [11,12].

HCWs were considered as one of the vulnerable populations in the pandemic. Besides the negative impacts on physical health, HCWs have faced mental health problems. Thus, the mental health of HCWs was considered a priority of healthcare strategies in the pandemic [13-15]. Depression and anxiety were the common psychological symptoms among HCWs in the COVID-19 pandemic [17-22]. To improve mental health for HCWs, psychological interventions have been promoted, mainly focusing on counseling and psychotherapies. However, most of HCWs refused to receive mental health care, but needed more rest [23,24].

In addition to mental health problems, the quality of life among HCWs was affected during the pandemic. Nevertheless, previous studies have focused on frontline HCWs and did not conclude the specific improvement measures. Research is needed to explore the relationship between mental health and quality of life among HCWs working at non-frontline areas in the COVID-19 pandemic. Therefore, the current study aimed to describe mental health, and the health-related quality of life (HRQoL), to examine factors related to depression, anxiety, and HRQoL, and to explore the relationship between mental health and HRQoL among HCWs during the COVID-19 pandemic [25,26].

## 2. Material and methods

### 2.1. Study Design, Settings, and Sampling

**Table 1** Research sites and the number of participants

| Name of hospitals | Possible Participants | Studied participants |
|---|---|---|
| Thai Nguyen National Hospital | 1,186 | 988 |
| Quang Ninh General Hospital | 922 | 683 |
| Bai Chay Hospital | 819 | 476 |
| General Hospital of Agricultural | 555 | 424 |
| Bac Ninh Obstetric and Pediatric Hospital | 391 | 364 |
| E Hospital | 1,125 | 335 |
| Quang Ninh Obstetric and Pediatric Hospital | 478 | 290 |
| Da Nang Oncology Hospital | 555 | 134 |
| Thien An Obstetric and Gynecology Hospital | 68 | 63 |
| Total | 6,099 | 3,757 |

A cross-sectional study with a convenient sampling method was conducted at nine hospitals in Vietnam, from 6 April to 19 April 2020. Eligible participants were health care workers working at nine hospitals with ages from 20 to 60 years old and willing to take the survey. A total of 3,757 participants (61.6% of possible participants) completed the survey. The distribution of studied and possible participants at each hospital was shown in Table 1.

### 2.2. Measurements

Characteristics of participants include age (years), gender (male vs. female), marital status (married, single, others), ability to pay for medication (very difficult to very easy), social status (low, middle, high), type of health care personnel (doctor, nurse, others). Participants were classified with suspected COVID-19 symptoms if they had any of the following symptoms, including common (cough, fever, dyspnea), and less common symptoms (myalgia, fatigue, headache, sore throat, sputum production, diarrhea, nausea/vomiting, chest pain, hemoptysis, confusion, and rhinorrhea) [27]. Comorbidity were identified by using the Charlson Comorbidity Index items and categorized into two groups (no comorbidity vs. one or more) [28]. Comparing with before the pandemic, participants reported their health-related behaviors, including smoking, drinking, and physical activity, and categorized into three groups (never, stop or less, and unchanged or more). Participants were asked about their working experience (years), epidemic containment experience (yes vs. no), and accidents with biological material (yes vs. no).

The Patient Health Questionnaire (PHQ-9) has been validated and widely used in the world and in Vietnam. The PHQ-9 was used to measure depression severity including nine symptom items. Participants rated on a 4-point Likert scale from 0 (not at all) to 3 (almost every day) about the frequency of nine symptoms bothering their life during the last two weeks. The total score of PHQ ranges from 0 to 27, with the higher score indicates the higher severity of depression. PHQ ≥ 10 was classified as depression disorder [29-31].

The Generalized Anxiety Disorder (GAD-7) with seven symptom items was used to assess anxiety in this study. GAD-7 is an efficient scale for evaluating anxiety severity in both research and clinical practice with good reliability and validity. Vietnamese version of GAD has been validated in the previous study [32]. With a 4-point Likert scale from (not at all) to 3 (almost every day), participants were asked about the occurrence of seven symptoms during the last two weeks. The total score of GAD-7 ranges from 0 to 21, with the higher score denotes the higher severity of anxiety. Participants were classified as having anxiety disorder if they had a GAD score ≥ 8.

Health-Related Quality of Life (HRQoL) was measured by the 36-Item Short Form Survey (SF-36), which was developed by Research and Development Corporation (RAND). The reliability and validity of this scale were investigated in previous studies. The scoring method of RAND-36 was instructed by RAND Corporation. Overall score ranges from 0 to 100, with a higher score indicates a better quality of life [33-35].

### 2.3. Data Collection Procedure

After obtaining institutional review board approval and permission from target hospitals, researchers provided a four-hour training session to research assistants (doctors, nurses and medical students). The training session includes data collection methods, infection prevention and control based on the World Health Organization and Vietnam Ministry of Health guidelines [8]. All potential participants were invited to join in the study. Most of HCWs (98.3%) completed the survey by filling out the online questionnaire. The remaining participants filled out the printed questionnaires, including 8 HCWs from Quang Ninh general hospital and 56 HCWs from Thien An Obstetrics and Gynecology hospital. It took about 20 minutes for participants to complete the questionnaire. Participants could contact researchers or research assistants if they have any questions regarding to the survey. All participants completed the questionnaires without missing data due to as we used the mandatory online questions and recheck printed questionnaires by research assistants.

### 2.4. Ethical Consideration

This study was approved by the Institutional Review Board at the Hanoi University of Public Health in Vietnam (IRB number 133/2020/YTCC-HD3). Before collecting data at nine hospitals, ethical issues were reviewed and accepted by each hospital. Researchers ensured participants' protection about autonomy, confidentiality, and compliance with pandemic prevention regulations.

### 2.5. Data Analysis

Data were analyzed by using SPSS version 20.0 (IBM Corp., Armonk, NY, USA) with a significant level at $p < 0.05$. Descriptive analyses were used to describe the variables, including mean (standard deviation) and frequency (percentage). The non-normal distribution of HRQoL scores was determined by using Kolmogorov-Smirnov test.

Factors related to depression and anxiety were examined by using Chi-square test for nominal or categorical independent variables and Mann-Whitney U-test for continuous independent variables. Associated factors of HRQoL were defined by using Kruskal-Wallis H-Test, Mann-Whitney U-test, and Spearman correlation for nominal, categorical and continuous independent variables, respectively.

Multiple linear regression was used to explore the relationship between mental health (depression, anxiety) and HRQoL after controlling the effect of confounding factors. Before conducting Multiple liner regression, all independent variables have been checked to ensure the correlation between each of independent variables less than 0.30. Multiple linear regression was conducted by two models. All potential confounding factors were entered in model 1, then depression and anxiety were entered in model 2.

## 3. Results

**Table 2** Characteristics, quality of life, and mental health among health care workers (N=3,757)

| | **Total (N=3,757)** | **HRQoL (N=3,757)** | | **PHQ <10 (N=3,588)** | **PHQ ≥10 (N=169)** | | **GAD <8 (N=3,641)** | **GAD ≥8 (N=116)** | |
|---|---|---|---|---|---|---|---|---|---|
| | **N (%)** | **Median** | **p[1]** | **N (%)** | **N (%)** | **p[2]** | **N (%)** | **N (%)** | **p[3]** |
| **Age, year** | | | 0.265 | | | 0.273 | | | 0.201 |
| 21 – 30 | 1.755 (46.7) | 76.53 | | 1.669 (44.4) | 86 (2.3) | | 1.694 (45.1) | 61 (1.6) | |
| 31 – 60 | 2.002 (53.3) | 75.69 | | 1.919 (51.1) | 83 (2.2) | | 1.947 (51.8) | 55 (1.5) | |
| **Gender** | | | 0.018 | | | <0.010 | | | <0.001 |
| Male | 1.164 (31.0) | 77.99 | | 1.094 (29.1) | 70 (1.9) | | 1.106 (29.4) | 58 (1.5) | |
| Female | 2.593 (69.0) | 75.69 | | 2.494 (66.4) | 99 (2.6) | | 2.535 (67.5) | 58 (1.5) | |
| **Marital status** | | | 0.014 | | | 0.344 | | | 0.951 |
| Married | 2.956 (78.7) | 77.50 | | 2.828 (75.3) | 128 (3.4) | | 2.865 (76.3) | 91 (2.4) | |
| Single/Others | 801 (21.3) | 75.69 | | 760 (20.2) | 41 (1.1) | | 776 (20.7) | 25 (0.7) | |
| **Ability to pay for medication** | | | <0.001 | | | <0.001 | | | <0.001 |
| Very or fairly difficult | 2.038 (54.2) | 74.44 | | 1.924 (51.2) | 114 (3.0) | | 1.954 (52.0) | 84 (2.2) | |
| Very or fairly easy | 1.719 (45.8) | 78.47 | | 1.664 (44.3) | 55 (1.5) | | 1.687 (44.9) | 32 (0.9) | |
| **Social status** | | | <0.001 | | | 0.004 | | | <0.001 |
| Low | 510 (13.6) | 72.78 | | 472 (12.6) | 38 (1.0) | | 478 (12.7) | 32 (0.9) | |
| Middle/High | 3.247 (86.4) | 76.67 | | 3.116 (82.9) | 131 (3.5) | | 3.163 (84.2) | 84 (2.2) | |
| **Suspected COVID-19 symptoms** | | | <0.001 | | | <0.001 | | | <0.001 |
| Yes | 534 (14.2) | 68.33 | | 492 (13.1) | 42 (1.1) | | 502 (13.4) | 32 (0.9) | |
| No | 3.223 (85.8) | 77.08 | | 3.096 (82.4) | 127 (3.4) | | 3.139 (83.6) | 84 (2.2) | |
| **Type of health care personnel** | | | <0.001 | | | 0.081 | | | 0.002 |
| Doctor | 1.033 (27.5) | 79.31 | | 974 (25.9) | 59 (1.6) | | 986 (26.2) | 47 (1.3) | |
| Nurse | 1.916 (51.0) | 75.00 | | 1.836 (48.9) | 80 (2.1) | | 1.866 (49.7) | 50 (1.3) | |
| Others | 808 (21.5) | 74.86 | | 778 (20.7) | 30 (0.8) | | 789 (21.0) | 19 (0.5) | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Comorbidity** | | | <0.001 | | | 0.062 | | | 0.152 |
| Yes | 371 (9.9) | 71.94 | | 346 (9.2) | 25 (0.7) | | 355 (9.4) | 16 (0.4) | |
| No | 3.386 (90.1) | 76.67 | | 3.242 (86.3) | 144 (3.8) | | 3.286 (87.5) | 100 (2.7) | |
| **Epidemic containment experience** | | | 0.350 | | | 0.113 | | | 0.005 |
| Yes | 1.260 (33.5) | 76.11 | | 1.213 (32.3) | 47 (1.3) | | 1.235 (32.9) | 25 (0.7) | |
| No | 2.497 (66.5) | 76.11 | | 2.375 (63.2) | 122 (3.2) | | 2.406 (64.0) | 91 (2.4) | |
| **Accidents with biological material** | | | <0.001 | | | 0.131 | | | 0.062 |
| Yes | 519 (13.8) | 73.61 | | 489 (13.0) | 30 (0.8) | | 495 (13.2) | 24 (0.6) | |
| No | 3.238 (86.2) | 76.53 | | 3.099 (82.5) | 139 (3.7) | | 3.146 (83.7) | 92 (2.4) | |
| **Smoking status** | | | <0.001 | | | <0.001 | | | <0.001 |
| Never | 3.200 (85.2) | 76.94 | | 3.095 (82.4) | 105 (2.8) | | 3.132 (83.4) | 68 (1.8) | |
| Stop/less | 392 (10.4) | 71.53 | | 356 (9.5) | 36 (1.0) | | 366 (9.7) | 26 (0.7) | |
| Unchanged/more | 165 (4.4) | 70.42 | | 137 (3.6) | 28 (0.7) | | 143 (3.8) | 22 (0.6) | |
| **Drinking status** | | | 0.662 | | | <0.001 | | | <0.001 |
| Never | 2.062 (54.9) | 76.67 | | 1.997 (53.2) | 65 (1.7) | | 2.029 (54.0) | 33 (0.9) | |
| Stop/less | 1.523 (40.5) | 75.14 | | 1.448 (38.5) | 75 (2.0) | | 1.464 (39.0) | 59 (1.6) | |
| Unchanged/more | 172 (4.6) | 77.15 | | 143 (3.8) | 29 (0.8) | | 148 (3.9) | 24 (0.6) | |
| **Physical activity** | | | <0.001 | | | <0.001 | | | <0.001 |
| Never | 313 (8.3) | 70.14 | | 287 (7.6) | 26 (0.7) | | 299 (8.0) | 14 (0.4) | |
| Stop/less | 909 (24.2) | 69.86 | | 857 (22.8) | 52 (1.4) | | 865 (23.0) | 44 (1.2) | |
| Unchanged/more | 2.535 (67.5) | 78.75 | | 2.444 (65.1) | 91 (2.4) | | 2.477 (65.9) | 58 (1.5) | |
| **Working experience, year** | | | 0.008 | | | 0.412 | | | 0.193 |
| < 5 | 1.232 (32.8) | 77.29 | | 1.174 (31.2) | 58 (1.5) | | 1.185 (31.5) | 47 (1.3) | |
| 5-10 | 1.399 (37.2) | 75.83 | | 1.344 (35.8) | 55 (1.5) | | 1.362 (36.3) | 37 (1.0) | |
| >10 | 1.126 (30.0) | 75.14 | | 1.070 (28.5) | 56 (1.5) | | 1.094 (29.1) | 32 (0.9) | |
| HRQoL (mean ± SD) | 73.4 ± 14.9 | | | 74.0 ± 14.6 | 59.8±15.1 | <0.001 | 73.9 ± 14.7 | 58.3±13.2 | <0.001 |

Note. HRQoL, Health-Related Quality of Life, PHQ, Patient Health Questionnaire, GAD, Generalized Anxiety Disorder, COVID-19, corona virus disease-2019, N, number, %, percentage, SD, standard deviation, Factor related to HRQoL were examined by Mann-Whitney U-test, Kruskal-Wallis H-Test, and Spearman correlation for nominal, categorical and continuous independent variables, respectively, Factors related to depression and anxiety were examined by Chi-square test for nominal or categorical independent variables, and Mann-Whitney U-test for continuous independent variables, p1, p2, p3, p-value of non-parametric tests for HRQoL, PHQ, GAD, respectively.

### 3.1. Participant's Characteristics

In total 3.757 HCWs were enrolled in the study, the majority of participants were female (69.0%), and 53.3% of participants more than 30 years old. There was 78.7% of participants got married and 54.2% of participants had difficult ability to pay for medication. Most participants had middle or high social status (86.4%), and half of participants were nurses (51.0%). The rate of participants who had suspected COVID-19 symptoms, comorbidity, and accidents with biological material were 14.2%, 9.9% and 13.8%, respectively. Working experience of HCWs was illustrated as not much amount difference among groups < 5 years (32.8%), 5-10 years (37.2%), and > 10 years (30.0%). There was 33.5% of participants had epidemic containment experience. Compare to before the COVID-19 pandemic, the proportion of

unchanged or more smoking status, drinking status and physical activity were 4.4%, 4.6%, and 67.5%, respectively (Table 2).

### 3.2. Mental Health and Quality of Life

The overall mean score of HRQoL was 73.4 ± 14.9. The prevalence of depression and anxiety disorder among HCWs were 4.5% and 3.1%, respectively. Particularly, there were significant difference in the HRQoL score of those with depression and anxiety compare to those without depression and anxiety ($p < 0.001$) (Table 2).

### 3.3. Factors Associated with Mental Health and Quality of Life

The HRQoL score was significantly differed in gender, marital status, ability to pay for medication, social status, suspected COVID-19 symptoms, type of health care personnel, comorbidity, accidents with biological material, smoking status, physical activity, and working experience ($p<0.05$). Proportions of depression and anxiety of HCWs were varied by gender, ability to pay for medication, social status, suspected COVID-19 symptoms, smoking status, drinking status, physical activities ($p<0.05$). In addition, anxiety disorder was significantly differed by type of health care personnel and epidemic containment experience ($p<0.01$) (Table 2).

### 3.4. Relationship between Mental Health and Quality of Life

Sequential multiple regression was used to assess the ability of depression and anxiety to predict levels of HRQoL after controlling the effect of confounding factors. After checking independent variables for the correlation between each independent variable, six confounders were retained, including gender, ability to pay for medication, social status, suspected COVID-19 symptoms, smoking status, and physical activity. In the final model, depression and anxiety were statistically significant differed in HRQoL after controlling six confounding factors. Protective factors of HRQoL including physical activity (B(95%CI) = 4.71 (4.01 to 5.41)), ability to pay for medication (B(95%CI) = 2.41 (1.49 to 3.33)), gender (B(95%CI) = 1.75 (0.72 to 2.78)), and social status (B(95%CI) = 1.57 (0.23 to 2.90)). Risk factors of HRQoL including suspected COVID-19 symptoms (B(95%CI) = -5.99 (-7.28 to -4.70)), smoking status (B(95%CI) = -2.46 (-3.44 to -1.49)). HRQoL have the relationship with depression (B(95%CI) = -8.15 (-10.76 to -5.55)) and anxiety (B(95%CI) = -6.87 (-9.99 to -3.75)) (table 3).

**Table 3** The relationship between mental health and quality of life among HCWs using sequential multiple regression (N = 3.757)

| | **HRQoL** | | | **HRQoL** | | |
|---|---|---|---|---|---|---|
| | **Model 1** | | | **Model 2** | | |
| | **B** | **95%CI** | **p** | **B** | **95%CI** | **p** |
| Gender | 1.69 | 0.65 to 2.74 | 0.001 | 1.75 | 0.72 to 2.78 | 0.001 |
| Ability to pay for medication | 2.65 | 1.72 to 3.58 | 0.000 | 2.41 | 1.49 to 3.33 | 0.000 |
| Social status | 1.94 | 0.58 to 3.29 | 0.005 | 1.57 | 0.23 to 2.90 | 0.021 |
| Suspected COVID-19 symptoms | -6.44 | -7.75 to -5.14 | 0.000 | -5.99 | -7.28 to -4.70 | 0.000 |
| Smoking | -3.32 | -4.30 to -2.34 | 0.000 | -2.46 | -3.44 to -1.49 | 0.000 |
| Physical activity | 5.01 | 4.29 to 5.72 | 0.000 | 4.71 | 4.01 to 5.41 | 0.000 |
| Depression | | | | -8.15 | -10.76 to -5.55 | 0.000 |
| Anxiety | | | | -6.87 | -9.99 to -3.75 | 0.000 |

Note. B: unstandardized coefficient, 95% CI: 95% Confidence Interval for B, p: p-value, COVID-19, corona virus disease-2019, Depression and anxiety were categorical variables.

## 4. Discussion

In our study, female HCWs outnumbered their male counterparts (69.0% vs. 31.0%), which is consistent with the distribution of human resources for health in Vietnam.[37] This was also reported in another study simultaneously conducted in Vietnam [26]. Half of the HCWs in this current study were nurses (51.0%). This proportion corresponds

to the one specified in a WHO's report, stating that nurses accounted for the largest number of health workforce in Vietnam. In addition, the age distribution in the current study was similar to that in the literature [26].

The current study points out that HCWs had mental health problems during the COVID-19 pandemic. The findings were similar to those of other studies that reported depression and anxiety as common mental health problems among HCWs during the pandemic [17,19-22]. However, the proportions of depression and anxiety in the current study were lower than in other studies. This might be because the data collection of this current study was conducted at the beginning of the COVID-19 pandemic. Hence, longitudinal studies is recommended to explore the long-term effects of the pandemic on the mental health of HCWs.

In the last studies, HCWs with depression and anxiety reported poorer quality of life than those without these conditions. Similarly, depression and anxiety were associated with the HCWs' reduced quality of life, as stated by prior studies [26]. Thus, interventions to prevent and treat mental health problems play an important role in improving their quality of life in the pandemic. Certain previous studies indicated typical strategies to decline mental health issues, such as enhancing intensive training of infection prevention, reducing workload, expanding isolation units [36-38].

This current study also reveals that HCWs with higher levels of drinking and smoking had higher odds of depression and anxiety. These results were in concordance with those of a previous study which suggested that drinking could increase depression levels. These additional findings suggest the need for interventions to limit the effects of drinking and smoking on mental health. Like previous studies, our current study also found that women reported more depression and anxiety than men [17,19,39,40]. Our study shows that HCWs with more physical activity were less likely to have mental health problems. The findings correspond to the literature in that physical activity at any level can be helpful for preventing depression. Moreover, the current study indicated that such factors as the difficulty paying for medication, low social status, and the presence of suspected COVID-19 symptoms were negatively related to the mental health of HCWs [41,42].

Using sequential multiple regression, the current study explored the relationship between the HCWs' mental health and their HRQoL during the pandemic. More specifically, mental health problems from which HCWs suffered might contribute to lowering their HRQoL. Thus, effective interventions could benefit both their mental health and quality of life. The mental healthcare system in Vietnam is still limited, however, simple but effective coping behaviors are recommended. To cope with HCWs' mental health problems, two most recommended behaviors were exercise and online therapeutic consultation [20].

In some current studies, physical activity was the major contributor to improving HRQoL of HCWs in the pandemic. Smoking status had a negative association with their HRQoL. The findings were also reported in certain previous studies. In addition, HCWs with suspected COVID-19 symptoms also had poorer HRQoL. Besides, male HCWs, those with better ability to pay for medication, and those with higher social status were more likely to have higher HRQoL. All of these factors should be carefully considered when psychological support is provided for HCWs as a means of promoting their quality of life [10,11,42,43].

The findings of our current study significantly contribute to further interventions for preventing HCWs' mental health problems and improving their HRQoL, especially during the pandemic. Nevertheless, it encountered some limitations that need to be addressed. Using a cross-sectional design with a convenience sampling method might lead to selection bias, and self-report measures might affect the results to a certain extent. Therefore, longitudinal studies should be conducted to explore the holistic of HCWs' mental health and HRQoL.

## 5. Conclusion

The COVID-19 pandemic has affected HCWs' mental health and quality of life, and depression and anxiety are associated with their quality of life. Besides psychological support, enhancing healthy lifestyles could help improve their quality of life. Our current study also demonstrated that avoiding smoking and staying physical active are behavior recommended to reducing the HCWs' vulnerability to the COVID-19 pandemic.

## Compliance with ethical standards

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*Disclosure of conflict of interest*

The authors declare that they have no conflict of interest.

*Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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