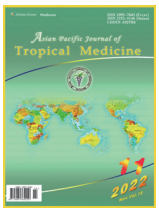

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# COVID−19−induced anxiety, depression and stress among healthcare professionals in Sri Lanka

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## ABSTRACT

**Objective:** To assess the degree of anxiety, depression and stress due to the COVID-19 epidemic among healthcare professionals in Sri Lanka.

**Methods:** Healthcare professionals from 6 selected government and private hospitals located in Gampaha District were recruited for the study. The socio-demographic factors, knowledge and attitudes of healthcare professionals on COVID-19 was collected through a self-administered questionnaire, while Depression, Anxiety and Stress Scale score was used to assess the psychological wellbeing. Descriptive statistics and binary logistic regression techniques were used for data analysis.

**Results:** Totally 324 healthcare professionals were included and the respondents had a high overall level of knowledge towards COVID-19. Twenty-five percent of the respondents had different levels of anxiety, while 10.8% had mild depression, and 4.6% had moderate depression. Interestingly, 40.4% of the respondents had mild stress, and 11.1% had moderate stress. Young people (20-35 years), medical laboratory technologist and nursing officer, being quarantined, having a SARS-CoV-2-infected family member, involvement in COVID-19 patient care, and limited availability of personal protection equipment, were recognized as significant risk factors associated with anxiety, depression and stress.

**Conclusions:** The healthcare professionals are high-risk groups to experience psychological impacts from COVID-19. Continuous monitoring and implementing appropriate intervention activities and provision of counseling support are highly recommended.

**KEYWORDS:** COVID-19; Anxiety, depression and stress; Healthcare providers; Sri Lanka

## 1. Introduction

Initially recognized in late December 2019, COVID-19 has now become a major health issue at the global level[1,2]. The COVID-19 is caused by a form of coronavirus, belonging to the family of viruses that are known to cause serious diseases like, severe acute respiratory syndrome and Middle East respiratory syndrome[3]. The SARS-CoV-2 virus is highly contagious and easily transmitted from human to human by air droplet inhalation or close interaction with infected people, with an incubation time that may last up to 14 days[4]. Moreover, the symptoms of the disease include fever, cough, sneezing, sore throat, difficulty in breathing, and tiredness[5]. In most cases, patients infected with SARS-CoV-2 experience none or mild to moderate symptoms that are alleviated within several weeks of isolation. However, in contrast, it can cause severe respiratory

**Significance**

COVID-19 epidemic has resulted a severe health burden on the healthcare professionals, which has been rarely studied in developing countries like Sri Lanka. This study reports the prevalence of a notable degree of anxiety, depression and stress among the healthcare professionals in Sri Lanka. Being a country with sparse specialist mental health care, immediate attention of the Health Care Administrators and policy makers should be placed on the psychological wellbeing of the healthcare professionals.

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syndrome or death, particularly in older people or patients with chronic health diseases[6]. Basically, there is no precise treatment for the ailment, and this necessitates the requirement to forestall the disease from spreading. Notable prevention strategies for COVID-19 are isolation of the infected persons, proper ventilation, hand hygiene and use of personal protective equipment[7].

As of 28th April 2022, a total of 511 536 014 confirmed cases of COVID-19 have been reported globally, along with 6 253 427 deaths. In Sri Lanka, the first case of COVID-19 was confirmed in January 2020. Since then, Sri Lanka has been affected by the COVID-19 epidemic, leading to devastating economic and health impacts. As of now, more than 500 000 confirmed cases have been reported along with more than 13 000 deaths[8]. In order to curb the COVID-19 epidemic, Sri Lanka has remained under lockdown situations lasting from weeks to months for more than thrice at the national level, in addition to travel restrictions and curfew conditions at the regional level. This COVID-19 epidemic prompted the implementation of public health protocols to control the spread of the virus, many of them involving social distancing, proper hygienic precautions (wearing of masks, face shields and use of appropriate sanitizing chemicals) and lockdown procedures, which has also induced public anguish and massive fear[9]. Widespread nature of the outbreak and lockdown conditions have further aggravated this condition. Any pandemic situation could arouse fear among people, while influencing psychological and emotional wellbeing of the community[9,10].

Emergency service providers, especially security forces and healthcare professionals (HCP) act as the frontline workers during the pandemic. In most cases, the HCP, including physicians, nurses and paramedical staff serve at the forefront for healthcare provision, contributing to diagnosis and treatment, vaccine administration, drug distribution, health education and provision of direct patient care[11]. Therefore, HCP are at the risk of being infected with SARS-CoV-2, while fulfilling their tiresome roles in epidemic management[4,12]. Regardless of the impacts on physical health, an epidemic situation could cause significant short-term and long-term impacts on mental health, which are often neglected during pandemic management[13]. Several recent studies conducted in different countries including China[4,14], Nepal[11], Pakistan[10] and Yemen[13], have evidenced that HCP are at risk of developing psychological health symptoms due to COVID-19. A high prevalence level of anxiety (44.6%), depression (50.4%) and insomnia (34.0%) conditions have been reported among HCP involved in COVID-19 patient care in China[4]. Numerous factors such as, the exponential increment in COVID-19 patients and deaths, inadequacy of physical and human resources, overloaded work burden, absence of effective treatments, limited availability of personal protective equipment, high risk of getting infected and fear of transmitting the infection to other family members have been recognized to induce severe impacts on the mental wellbeing of HCP[11,15]. Further, the knowledge and perceptions of the HCP on the preventive practices followed by them would also play a key role in building up their confidence. This will directly decrease their vulnerability to COVID induced psychological impacts[13].

The performance of HCP in management of COVID-19 is a key element to restrain the spread of the epidemic. In addition to physical health, the psychological and emotional wellbeing of HCP is also important for their performance. Even though, timely assessment of the mental health of HCP involved in COVID-19 management is important, this aspect is poorly implemented in many developing countries, including Sri Lanka. Further, prevalence level of any COVID-19 induced psychological impacts among HCP in Sri Lanka has not been comprehensively studied. Therefore, this study was conducted to assess the level of COVID-19 induced anxiety, depression and stress among HCP in the District of Gampaha, while identifying the critical risk factors influencing the incidence of psychological impacts. Findings of this study would facilitate the healthcare administrators and policymakers to improve their interventions and policies to promote mental well-being of HCP and to ensure a higher performance level in COVID-19 management.

## 2. Subjects and methods

### 2.1. Ethics approval and consent for publication

Ethical approval was obtained from the Ethics Review Committee of the National Institute of Health Science, Kaluthara, Sri Lanka (ECR Clearance No: NIHS/ERC/21/10R). Permission from Regional Director of Health Service, Gampaha District and respective Director and Superintendents of each hospital was obtained, prior collection of data. The written informed consent was obtained from all the participants for participating prior to the conducting of the survey. The confidentiality of the acquired data was maintained throughout the study. The entire study was conducted adhering to regulations and guidelines of the Ethics Review Committee of the National Institute of Health Science. The written informed consent was obtained from all the participants for publication prior to the data collection.

### 2.2. Study area

The study was conducted as a descriptive cross-sectional study from September 2020 to July 2021. Three selected government hospitals (Gampaha District Hospital; Wathupitiwala Base Hospital and Ragama Teaching Hospital) and three private hospitals (Arogya Hospital; Melsta Hospital and Sethma Hospital), located in the Gampaha District were used as the sampling sites.

### 2.3. Determination of the sample size

All frontline HCP, including medical officers, nurses, medical laboratory technologists, attendants and minor staff (cleaning staff, labourers and other supportive staff), who are working in above mentioned hospitals, during the COVID-19 pandemic situation, were considered as the study population. The Lwanga and Lemeshow equation[16] was used to calculate the required sample size, as 324 HCP. The precision was maintained as 5% and the critical value of specified confidence level (95%) was used as 1.96, while the population proportion was set as 0.3 (30%). The HCP were recruited for the study based on the stratified random sampling technique, where nature of the hospital (government or private) and the designation of occupation were considered as strata. Participants who were not in a condition to answer the questions or who refused to participate the survey were excluded from the study.

### 2.4. Data collection

A self-administrated pre-tested questionnaire prepared in English, Sinhala and Tamil was used for data collection. The questionnaire consisted of close ended questions, multiple-choice and yes/no questions arranged under five sections. The content validity of the questionnaire was assessed by a panel of ten experts, consisting of two psychiatrists, two epidemiologists, two medical officers, two public health experts and two nursing officers. The questionnaire was pre-tested using 20 respondents. The Cronbach's alpha method was used to evaluate the internal consistency of the questionnaire, which was found to be satisfactory with a Cronbach's alpha value of 0.91.

The five sections of the questionnaire are, (1) Socio-demographic information: basic socio-demographic information of the participants, such as age, sex, ethnicity, educational qualifications, monthly income level, residence locality, marital status and nature of the family *etc*.; (2) Occupation related information such as type of hospital, occupational title, experience level, length of working hours per day and conditions faced during the working hours *etc*.; (3) Knowledge on COVID-19: knowledge of the participants on the nature, symptoms and prevention practices of COVID-19; (4) Attitudes on COVID-19: using a set of 12 statements, prepared under a five-point-Likert scale that ranged from "Strongly disagree" to "Strongly agree"; (5) Depression, anxiety and stress levels: using the Depression, Anxiety and Stress Scale (DAAS-21)[17].

### 2.5. Data analysis and interpretation

All collected data were double-checked and verified on the same day for completeness and consistency prior entering into Microsoft Access® data sheets (version 2013). Quality controlling procedures were followed throughout the process by trained personnel, while the accuracy of data was routinely checked by cross tabulations and logical checks. Discrepant data were checked against original data forms and any mistakes were promptly corrected.

Descriptive statistics were used to summarize the socio-demographic characteristics and occupation related information, while calculating the level of knowledge and attitude levels of respondents towards COVID-19. The depression, anxiety and stress levels of the respondents were calculated based on the DAAS-21 score. Within the DAAS-21 scale, statements 2, 4, 7, 9, 15, 19 and 20 assess the anxiety level, while the statements 3, 5, 10, 13, 16, 17 and 21 assess the depression level. Meanwhile, the remaining statements (1, 6, 8, 11, 12, 14 and 18) characterize the stress level within a respondent. During assessment, each statement was ranked over a scale of 0 (did not apply) to 3 (applied to me very much or most of the times) and subindices for anxiety, depression and stress were calculated by accumulating ranks of respective statements[17]. Based on the individual scores attained, five levels of anxiety, depression and stress were identified as normal, mild, moderate, severe and extremely severe, respectively, as shown in Supplementary Table 1. The binary logistic regression was used to determine predictors of depression, anxiety and stress among the HCP. All statistical analysis was done using the SPSS package 23.

## 3. Results

### 3.1. Socio−demographic factors of the study population

The socio-demographic details of the respondents are shown in Table 1. The majority of the respondents were females (75.6%) and were belonging to the 20-35 years old age group (46.3%), followed by the 41-50 years old group (24.7%). Around 60.5% ($n$=196) of the respondents were residing in rural areas, while Buddhists accounted for 77.8% of the study population, emerging as the major ethnic group. Among the study population, 84.6% were already married, while 63.6% had children in their families (Table 1). Completion of a diploma was the highest educational qualification of majority of respondents (50.6%), followed by degree (41.0%). By the time of data collection, a notable faction of respondents (15.7%) or their family members (14.2%) had been infected with SARS-CoV-2 previously, while 25.3% had remained quarantined (Table 1). It was noted that around, 86.7% of the respondents were living with their immediate family during the study period, while only a limited faction lived in hostels/apartments (6.8%) or alone (4.0%).

**Table 1.** Socio-demographic factors of the study population [*n* (%)].

| Parameters | Total respondents |
|---|---|
| Sex | |
| Male | 79 (24.4) |
| Female | 245 (75.6) |
| Age, years | |
| 20-35 | 150 (46.3) |
| 36-40 | 60 (18.5) |
| 41-50 | 80 (24.7) |
| >50 | 34 (10.5) |
| Locality | |
| Rural | 37 (11.4) |
| Semi-urban | 91 (28.1) |
| Urban | 196 (60.5) |
| Ethnicity | |
| Buddhism | 252 (77.8) |
| Hinduism | 5 (1.5) |
| Islam | 4 (1.2) |
| Christianity | 63 (19.4) |
| Marital status | |
| Married | 274 (84.6) |
| Unmarried | 50 (15.4) |
| Do you have children? | |
| Yes | 206 (63.6) |
| No | 118 (36.4) |
| Highest level of education | |
| Advanced level | 23 (7.1) |
| Diploma | 164 (50.6) |
| Degree | 133 (41.0) |
| Post-graduate | 4 (1.2) |
| Have you been infected with SARS-CoV-2? | |
| Yes | 51 (15.7) |
| No | 273 (84.3) |
| Has any family member been infected with SARS-CoV-2? | |
| Yes | 46 (14.2) |
| No | 278 (85.8) |
| Have you been quarantined? | |
| Yes | 82 (25.3) |
| No | 242 (74.7) |
| Has any of your family members been quarantined? | |
| Yes | 64 (19.8) |
| No | 260 (80.2) |
| Living arrangements during this COVID-19 epidemic | |
| Alone | 13 (4.0) |
| Hostel/shared apartments | 22 (6.8) |
| With immediate family | 281 (86.7) |
| With extended family | 8 (2.5) |

### *3.2. Occupation related information of the respondents*

The occupation related information of the respondents is shown in Table 2. In case of occupation, majority (48.5%) were serving as nursing officers, while only 31.8% were serving as medical laboratory technologists. Only, 19.8% of the participants were medical officers. Around 51.9% of the study population was employed at private hospitals, while the remaining (48.1%) were serving at government hospitals (Table 2). Among the government employees, the highest fraction was serving at secondary hospitals (25.3%), followed by primary hospitals (19.8%). A significant fraction of the study population (55.6%) was having more than 10 years of experience in the health sector, while only 18.8% were having a limited experience (<5 years). Around 19.4% (*n*=63) of the respondents were serving at COVID-19 wards, while 35.2% (*n*=114) were employed at medical and surgical wards. A notable fraction of the respondents (38.0%) was serving 10 to 15 hours per day, while another 33% (*n*=107) were serving <10 hours per day.

However, majority of the respondents were not having a sufficient training regarding COVID-19 precautions (51.2%) or adequate number of staff to manage the COVID-19 patients (51.5%). Meanwhile, around 66.4% (*n*=215) of the study population was being exposed to COVID-19 patients, either directly or indirectly during their duties. However, majority were satisfied with the availability of adequate personal protective equipment for healthcare workers (57.1%), national level guidelines and protocols relevant to management of COVID-19 (78.4%), current level of awareness on guidelines and protocols relevant to COVID-19 (58.6%) and preparations for management of COVID-19 patients at the work place (67.6%). Further, more than two third of the study population (78.7%) had been vaccinated against COVID-19, by the time of data collection (Table 2).

### *3.3. Knowledge on COVID-19 among respondents*

The majority of the respondents were well aware of the symptoms of COVID-19 (99.4%), transmission routes (85.8%), incubation period (97.5%), adverse outcomes of the infection such as pneumonia, respiratory failure, and death (100%), high risk imposed by COVID-19 on pregnant mothers (92.6%) and people with chronic diseases (99.7%), as shown in Supplementary Table 1. Further, the role of SARS-CoV-2 infected persons in transmission of COVID-19 as carriers and the importance of hand hygiene, covering nose and mouth while coughing, and avoiding sick contacts to facilitate the prevention of COVID-19 transmission, were known by the entire study population (100%). In addition, the majority of the respondents were aware of the importance of remaining quarantined for 14 days, if contact with a COVID-19 patient (96.9%), necessity of maintaining a 1-meter distance at public places (98.5%) and the efficacy of vaccines to prevent the spread of COVID-19 (87.3%). In case of the treatments, the fact that hospitalized treatments are only necessary for critical patients (91.7%) and early symptomatic and supportive treatment is the current treatment for COVID-19 (93.2%) were known by more than 90% of the sampling population (Supplementary Table 2). However, the possibility of getting infections of SARS-CoV-2 overtime, even after being recovered (88.9%) and possibility of other organisms to become infected with SARS-CoV-2 (78.7%) were limitedly known by the study population. In general, almost the entire study population (98.1%) were characterized with a high level of knowledge on COVID-19, while only 1.9% had a moderate level of knowledge.

**Table 2.** Occupation related information of the respondents.

| Parameters | Total respondents |
|---|---|
| Type of hospital | |
| Government | |
| Primary | 64 (19.8) |
| Secondary | 82 (25.3) |
| Tertiary | 10 (3.1) |
| Private | 168 (51.9) |
| Occupational title | |
| Medical officer | 64 (19.8) |
| Medical laboratory technologist | 103 (31.8) |
| Nursing officer | 157 (48.5) |
| Years of service | |
| <3 | 14 (4.3) |
| 3-5 | 47 (14.5) |
| 5-10 | 83 (25.6) |
| >10 | 180 (55.6) |
| Name of department/ward/unit | |
| COVID-19 ward | 63 (19.4) |
| Medical & surgical department | 114 (35.2) |
| Emergency treatment unit | 22 (6.8) |
| Intensive care unit | 22 (6.8) |
| Medical laboratory | 103 (31.8) |
| Length of duty per day, hours | |
| <10 | 107 (33.0) |
| 10-15 | 123 (38.0) |
| 15-20 | 71 (21.9) |
| >20 | 23 (7.1) |
| Have you received any training regarding COVID-19 precautions? | |
| Yes | 158 (48.8) |
| No | 166 (51.2) |
| Are you involved in caring for COVID-19 suspected or confirmed patients or diagnostics? | |
| Yes | 319 (98.5) |
| No | 5 (1.5) |
| Does your work place have adequate number of staff to manage the COVID-19 patients? | |
| Yes | 157 (48.5) |
| No | 167 (51.5) |
| Have you been exposed to a COVID-19 pa-tients, directly or indirectly during duties? | |
| Yes | 215 (66.4) |
| No | 109 (33.6) |
| Availability of adequate personal protective equipment for healthcare workers? | |
| Yes | 185 (57.1) |
| No | 139 (42.9) |
| Availability of national level guidelines and protocols relevant to management of COVID-19 at your work place? | |
| Yes | 254 (78.4) |
| No | 70 (21.6) |
| Are you fully aware about such guidelines and protocols relevant to COVID-19? | |
| Yes | 190 (58.6) |
| No | 134 (41.4) |
| Is there any preparation workflow for management of COVID-19 patients? | |
| Yes | 219 (67.6) |
| No | 105 (32.4) |
| Have you been vaccinated for COVID-19? | |
| Yes | 255 (78.7) |
| No | 69 (21.3) |

### *3.4. Attitudes of healthcare professionals on COVID–19*

The summary of the perceptions of HCP on COVID-19 is shown in Supplementary Table 3. A vast majority of the study population was having positive perceptions (strongly agreed) on following safety precautions against COVID-19, such as hand washing is necessary to prevent transmission of COVID-19 (98.8%), wearing masks is necessary to prevent transmission of COVID-19 (98.8%), avoiding crowded places would prevent spreading of COVID-19 (90.2%), being positive with COVID-19 should not be hidden from others (98.2%) and following of rules and guidelines is necessary to prevent the spread of COVID-19 (92.9%). However, less than half of the respondents strongly agreed with the fact that he/she could get infected with SARS-CoV-2, despite following the safety practices (44.6%) and avoiding smoking and drinking will not prevent COVID-19 (46.2%). Interestingly, around 70.7% of the respondents agreed with the fact that healthcare system is capable of controlling COVID-19, while 70.8% strongly disagreed with the fact that HCP are the only responsible people to prevent the COVID-19 (Supplementary Table 3). Majority of HCP were well aware that young people are also prone to be infected with SARS-CoV-2 (96.9%), while majority strongly disagreed for the fact that hand hygiene and wearing of masks is not necessary for people vaccinated with COVID-19 (90.5%). However, the efficacy of Ayurvedic treatments to minimize the spread of COVID-19 was considered to be poor by majority of the HCP (68.6%).

### *3.5. Prevalence of anxiety, depression and stress among the healthcare professionals*

The prevalence levels of COVID-19 induced anxiety, depression and stress among the respondents are shown in Figure 1. Nearly 75% of the respondents had normal anxiety during this COVID-19 pandemic, while the rest had different levels of anxiety. Around 15.1% of the respondents had moderate anxiety, while another 3.4% had severe anxiety. In case of depression, around 83.6% of the respondents had normal behavior, while only 10.8% had mild depression, followed by another 4.6% with moderate depression. Interestingly, 40.4% of the respondents had mild stress, followed by moderate (11.1%) stress level (Figure 1).

### *3.6. Driving factors of anxiety, depression and stress among the healthcare professionals*

#### *3.6.1. Anxiety*

Prevalence of higher anxiety levels was significantly associated with age, remaining quarantined, having a family member who had been infected with SARS-CoV-2, condition of living arrangements during the COVID-19 pandemic, involvement in direct or indirect care of COVID-19 patients, limited availability of personal protective equipment, prevalence of depression and stress conditions ($P$<0.05) as shown in Table 3. Respondents belonging to

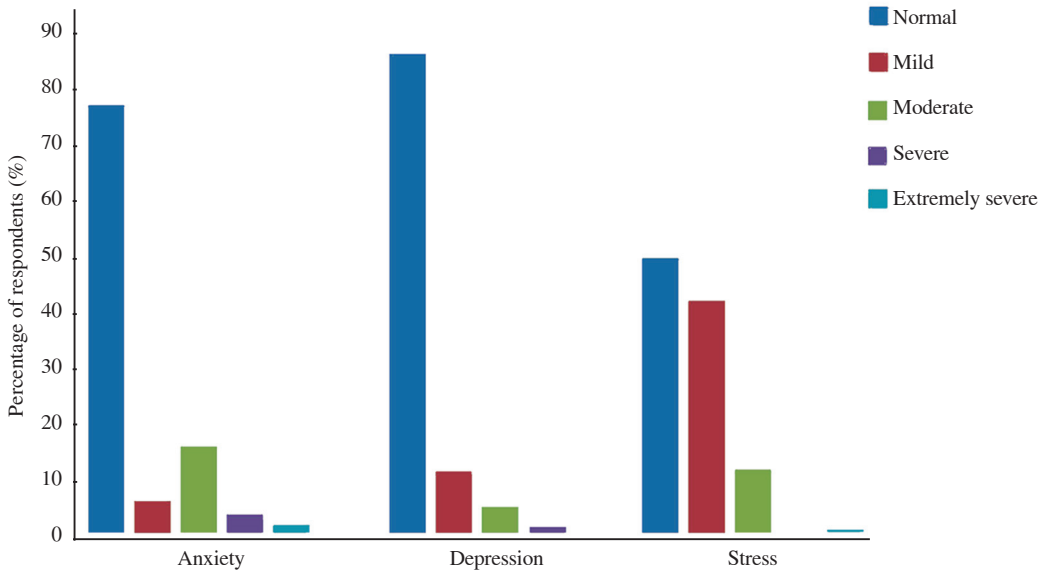


**Figure 1.** Prevalence of anxiety, depression and stress levels among the healthcare professionals.

**Table 3.** Determinants for incidence of anxiety.

| Parameters | Total respondents | Prevalence of depression | *P* | *OR* | 95% *CI* |
|---|---|---|---|---|---|
| Age, years | | | | | |
| 20-35 | 150 | 46 (30.7) | | Reference | |
| 36-40 | 60 | 11 (18.3) | 0.019 | 0.02 | 0-0.21 |
| 41-50 | 80 | 18 (22.5) | 0.014 | 0.11 | 0.02-0.79 |
| >50 | 34 | 8 (23.5) | 0.038 | 0.04 | 0-0.29 |
| Has any family member been infected with SARS-CoV-2? | | | | | |
| Yes | 46 | 22 (47.8) | | Reference | |
| No | 278 | 61 (21.9) | 0.003 | 0.05 | 0.01-0.37 |
| Have you ever been quarantined? | | | | | |
| Yes | 82 | 38 (46.3) | | Reference | |
| No | 242 | 45 (18.6) | 0.048 | 0.26 | 0.20-0.81 |
| What are your living arrangements during this COVID-19 epidemic? | | | | | |
| Alone | 13 | 2 (15.4) | | Reference | |
| Hostel/shared apartments | 22 | 16 (72.7) | 0.049 | 5.07 | 3.81-6.32 |
| With immediate family | 281 | 63 (22.4) | 0.045 | 1.61 | 1.05-20.33 |
| With extended family | 8 | 2 (25.0) | 0.048 | 0.43 | 0.10-0.52 |
| Have you been exposed direct or indirect care to a patient with suspected or confirmed? | | | | | |
| Yes | 215 | 63 (29.3) | | Reference | |
| No | 109 | 20 (18.3) | 0.005 | 0.13 | 0.03-0.53 |
| Is there available adequate personal protective equipment supply for healthcare workers? | | | | | |
| Yes | 185 | 29 (15.7) | | Reference | |
| No | 139 | 54 (38.8) | 0.002 | 16.12 | 2.87-28.48 |
| Depression level | | | | | |
| Normal | 271 | 46 (17.0) | | Reference | |
| Mild | 35 | 23 (65.7) | 0.030 | 9.38 | 7.47-10.14 |
| Moderate | 15 | 11 (73.3) | 0.040 | 13.45 | 11.24-14.64 |
| Severe | 3 | 3 (100) | 0.050 | 18.57 | 12.45-38.75 |
| Stress level | | | | | |
| Normal | 155 | 5 (3.2) | | Reference | |
| Mild | 131 | 47 (35.9) | 0.010 | 1.87 | 1.43-8.19 |
| Moderate | 36 | 29 (80.6) | 0.018 | 22.87 | 5.09-43.52 |
| Severe | 2 | 2 (100) | 0.008 | 38.75 | 15.87-62.75 |

**Table 4.** Determinants for incidence of depression.

| Parameters | Total respondents | Prevalence of depression | *P* | *OR* | 95% *CI* |
|---|---|---|---|---|---|
| Sex | | | | | |
| Male | 79 | 13 (16.5) | | Reference | |
| Female | 245 | 119 (48.6) | <0.001 | 9.36 | 3.51-24.99 |
| Age, years | | | | | |
| 20-35 | 150 | 77 (51.3) | | Reference | |
| 36-40 | 60 | 19 (31.7) | 0.001 | 0.67 | 0.24-0.84 |
| 41-50 | 80 | 23 (28.8) | 0.001 | 0.25 | 0.11-0.58 |
| >50 | 34 | 13 (38.2) | <0.001 | 0.77 | 0.30-0.99 |
| Occupational title | | | | | |
| Medical officer | 64 | 2 (3.1) | | Reference | |
| Medical laboratory technologist | 103 | 44 (42.7) | 0.005 | 4.92 | 1.89-15.00 |
| Nursing officer | 157 | 86 (54.8) | 0.006 | 10.11 | 2.97-21.87 |
| Has any of your family members been quarantined? | | | | | |
| Yes | 64 | 38 (59.4) | | Reference | |
| No | 260 | 94 (36.2) | 0.030 | 0.42 | 0.19-0.93 |
| Years of service | | | | | |
| <3 | 14 | 8 (57.1) | | Reference | |
| 3-5 | 47 | 14 (29.8) | 0.005 | 0.06 | 0.01-0.44 |
| 5-10 | 83 | 42 (50.6) | 0.009 | 0.18 | 0.03-0.34 |
| >10 | 180 | 68 (37.8) | 0.006 | 0.08 | 0.01-0.48 |
| Have you been exposed direct or indirect care to a patient with suspected or confirmed? | | | | | |
| Yes | 215 | 45 (20.9) | | Reference | |
| No | 109 | 87 (79.8) | 0.010 | 0.58 | 0.41-0.89 |
| Availability of various national level guidelines and protocols relevant to management of COVID-19 in your work place? | | | | | |
| Yes | 254 | 88 (34.6) | | Reference | |
| No | 70 | 44 (62.9) | 0.020 | 2.57 | 1.15-5.75 |
| Is there any preparation for workflow management during COVID-19? | | | | | |
| Yes | 219 | 71 (32.4) | | Reference | |
| No | 105 | 61 (58.1) | 0.050 | 1.94 | 1.40-4.18 |

**Table 5.** Determinants for incidence of stress.

| Parameters | Total respondents | Prevalence of depression [*n* (%)] | *P* | *OR* | 95% *CI* |
|---|---|---|---|---|---|
| Age, years | | | | | |
| 20-35 | 150 | 94 (62.7) | | Reference | |
| 36-40 | 60 | 24 (40.0) | 0.027 | 0.04 | 0-0.65 |
| 41-50 | 80 | 35 (43.8) | 0.030 | 0.01 | 0-0.11 |
| >50 | 34 | 16 (47.1) | 0.015 | 0 | 0-0.08 |
| Locality | | | | | |
| Rural | 37 | 8 (21.6) | | Reference | |
| Semi-urban | 91 | 57 (62.6) | 0.034 | 6.08 | 4.54-6.97 |
| Urban | 196 | 104 (53.1) | 0.041 | 4.10 | 2.90-4.93 |
| Occupational title | | | | | |
| Medical officer | 64 | 2 (3.1) | | Reference | |
| Medical laboratory technologist | 103 | 61 (59.2) | 0.013 | 3.82 | 2.78-5.09 |
| Nursing officer | 157 | 106 (67.5) | 0.000 | 4.43 | 3.29-5.88 |
| Has any family member been infected with SARS-CoV-2? | | | | | |
| Yes | 46 | 39 (84.8) | | Reference | |
| No | 278 | 130 (46.8) | <0.001 | 0 | 0-0.01 |
| Have you been quarantined? | | | | | |
| Yes | 82 | 63 (76.8) | | Reference | |
| No | 242 | 106 (43.8) | 0.002 | 0.04 | 0-0.31 |
| Does your work place have adequate number of staff to manage the COVID-19 patients? | | | | | |
| Yes | 157 | 59 (37.6) | | Reference | |
| No | 167 | 110 (65.9) | <0.001 | 3.21 | 2.21-3.66 |
| Depression level | | | | | |
| Normal | 271 | 120 (44.6) | | Reference | |
| Mild | 35 | 32 (97.1) | 0.026 | 2.08 | 1.12-6.81 |
| Moderate | 15 | 14 (73.3) | 0.044 | 13.42 | 9.21-14.63 |
| Severe | 3 | 3 (100) | 0.019 | 18.62 | 12.17-23.66 |

younger age groups (20-35 years of age) had a significantly higher susceptibility to anxiety when compared to 36-40 ($P$=0.019), 41-50 ($P$=0.014) and >50 ($P$=0.038) age groups. HCP who had previously being quarantined ($P$=0.048) and had a family member previously infected with SARS-CoV-2 or remained quarantined ($P$=0.003) reported statistically significant anxiety levels than others. Further, respondents residing in hostel/shared apartments had a significantly higher susceptibility to suffer from anxiety ($OR$=5.07), followed by respondents living with immediate family ($OR$ 1.61, 95% $CI$ 1.05-20.33), with compared to HCP residing alone (Table 3). Respondents who had been directly or indirectly involved in treatment of COVID-19 patients ($P$=0.005) and respondents employed at hospitals with limited availability of personal protective equipment ($P$=0.04) had a significantly higher level of anxiety. Further, respondents with higher depression ($P$=0.05) and stress levels also reported a significantly higher incidence rates of anxiety, when compared to normal HCP ($P$=0.008).

### 3.6.2. Depression

Sex, age, occupation title, experience, having a family member who had been quarantined, involvement in direct or indirect care of COVID-19 patients, poor level of practice in national level guidelines and protocols on COVID-19 management and poor preparation for workflow management during COVID-19, were recognized as significant risk factors ($P$<0.05) associated with the prevalence of higher depression levels among the respondents (Table 4). Female HCP had a significantly higher level of depression ($P$<0.001; $OR$ 9.36, 95% $CI$ 3.51-24.99), compared to male HCP. Further, HCP belonging to 20-35 years of age were characterized with higher depression levels, with respect to other age categories.

In case of the occupation title, the nursing officers had the highest susceptibility to depression ($OR$ 10.11, 95% $CI$ 2.97-21.87), followed by medical laboratory technicians ($OR$ 4.92, 95% $CI$ 1.89-15.00), while medical officers denoted the lowest level of incidence of depressive conditions. HCP with less experience (less than 3 years) denoted higher depression levels, while the incidence of depression decreased significantly with the increase in service period ($P$=0.01). People who had been directly or indirectly cared for a suspected or confirmed COVID-19 patients denoted a higher prevalence level of depression ($P$=0.01). In addition, HCP employed at hospitals with low adherence level of national level guidelines and protocols for COVID-19 management also reported a similar trend ($P$=0.02; $OR$=2.57, 95% $CI$ 1.15-5.75). Poor preparation for workflow management during COVID-19 at the workplace was also recognized as a significant risk factor for incidence of depression ($P$=0.05; $OR$=1.94, 95% $CI$ 1.40-4.18).

### 3.6.3. Stress

The incidence of stress was significantly related to the age, residing locality, occupation title, having a family member who had been infected with COVID-19 or remaining quarantined, inadequacy of staff members to work during the COVID-19 epidemic and prevalence of depression ($P$<0.05), as shown in Table 5. Similar to anxiety and depression, the respondents belonging to 20-35 years of age had a significantly higher incidence level of stress compared to older age groups ($P$=0.027, 0.030 and 0.015, respectively). In addition, respondents residing at urban ($OR$ 4.10, 95% $CI$ 2.90-4.93) and semi-urban ($OR$=6.08, 95% $CI$ 4.54-6.97) localities, were characterized with a significantly higher incidence probability of stress (Table 5). Nursing Officers tended to show a significantly higher likelihood of getting stressed ($P$=0.013; $OR$ 4.43, 95% $CI$ 3.29-5.88), followed by Medical Laboratory Technicians ($OR$ 3.82, 95% $CI$ 2.78-5.09) when compared with medical officers. The HCP who had remained quarantined ($P$=0.002) or with any family member who had being infected with COVID-19 ($P$<0.001), denoted higher affinities to suffer from stress. Respondents employed at hospitals with limited availability of employees for the COVID-19 patient management also reported a higher incidence level of stress ($P$<0 001; $OR$ 3.21, 95% $CI$ 2.21-3.66), while prevalence of mild ($OR$ 2.08, 95% $CI$ 21.12-6.81), moderate ($OR$ 13.42, 95% $CI$ 9.21-14.63) or severe ($OR$ 18.62, 95% $CI$ 12.17-23.66) depression levels was also found as a significant risk factor for incidence of stress.

## 4. Discussion

Since the reporting of the first confirmed COVID-19 case in Sri Lanka confirmed in January, 2020, fear and anxiety arose among the local community in Sri Lanka, due to the highly contagious nature of COVID-19 and lock-down situations. The HCP who directly involve in caring of COVID-19 patients and vaccine administration are a high-risk group to experience psychological impacts from COVID-19. This could directly influence the behavior and the performance of HCP[18].

Similar to many countries in the world, majority of the respondents (67%) was serving >10 hours per day, playing a key role in managing the COVID-19 epidemic as the front line of defense. This had directly led to more physical engagement of HCP with limited time to rest[10,13]. A similar study conducted in Nepal has reported that 70% of the respondents were working >40 hours per week, while almost 3/5 of them were not compensated for additional hours. As a result, the HCP could be significantly demotivated to continue providing their devoted duties[7]. Despite being actively involved in the care of COVID-19 patients, majority of the respondents were not having a sufficient training regarding COVID-19 precautions. This agrees with the findings of a recent study conducted in Yemen[13], where 60% had never received any training on COVID-19. However, around 98.1% of the respondents were having a higher knowledge on COVID-19. Few recent studies conducted in Yemen[13], Pakistan[10] reported satisfactory levels of knowledge on COVID. Preventing the spread of COVID-19 heavily relies on the knowledge and behaviours of the community. Therefore, having a higher degree of awareness on the COVID-19

symptoms, transmission routes, the incubation period and preventive practices by the HCP is important to curb the spread of COVID epidemic[19].

Around 15.1% of the respondents denoted a moderate level of anxiety, followed by another 3.4% denoting a severe anxiety level. In Yemen, around 51% of HCP had shown moderate anxiety levels, while 27.70% had reported a higher level of anxiety[13]. Meanwhile, several previous studies conducted in China[1] and Iran[20] have reported comparatively higher anxiety levels among HCP. In case of depression, only 10.8% exhibited a mild depression level, followed by another 4.6% with moderate depressive symptoms. In India around 23.9% of HCP have reported anxiety disorder, followed by another 20% with depression[21].

A recent study conducted in Australia, has reported stress related symptoms among 93.7% of medical officers out of 268 medical officers[22]. Meanwhile in Canada, depressive symptoms have been reported among 44% of HCP, along with anxiety and stress related symptoms among 47.5% and 85.6% of respondents[23]. According to a previous study in the USA, around 84.2% of respondents have reported stress related symptoms, along with anxiety and depression in 69.5% and 22.8%, respectively[24]. Several studies conducted in United Kingdom[25], Finland[26] and Turkey[27] have reported relatively moderate levels of anxiety and depression among different populations of HCP. On the contrary, another study by Hennein et al[28], has suggested relatively lower prevalence levels of anxiety (15.6%), depression (13.9%) and stress (22.8%) among HCP in USA. A similar trend has been reported in Italy also, where only 31.3% of HCP have reported anxiety related symptoms, along with prevalence rates of 26.8% and 34.3% for depression and stress[29].

However, the current study has reported lower levels of anxiety among HCP compared to other countries, which could be possibly attributed to their higher level of knowledge and optimistic attitudes on COVID-19 and higher vaccination level[13]. Further, more than two third of the study population (78.7%) had been vaccinated against COVID-19, by the time of data collection, which could reduce their fear and worries regarding COVID-19, thereby decreasing the anxiety, depression and stress levels. On the other hand, 40.4% of the respondents have demonstrated mild stress levels, followed by moderate (11.1%) stress levels. This elevated stress level could be attributed to the higher workload of the HCP in caring for COVID patients, with limited time to rest[10].

In our study, the prevalence rates of anxiety, depression and stress were significantly higher among HCP in young age groups. Further, the HCP with limited experience (especially <3 years) also denoted a higher prevalence rate of depressive symptoms. The inexperienced nature of the young HCP and fear of being infected with SARS-CoV-2 and dying at a young age could be the major reasons for this observation[30]. An opposing trend has been reported in India, where HCP belonging to older age groups have reported a higher risk of reporting anxiety and depression, due to easily being exhausted with overloaded work[21]. In addition, female HCP had a higher risk of reporting depression, which is consistent with findings of several previous studies conducted in China[4] and India[21]. HCP working at hospitals located in urban and semi-urban settings also reported a higher risk for stress. Similar to many developing countries, hospitals located in semi-urban and urban localities often deal with a higher patient density, while leading to relatively higher workloads and fear among the HP, which could be the root causes for elevated stress levels[7,21]. Limited availability of staff members also directly contributes to higher workloads, aggravating the likelihood of being stressed among the HCP[31].

Even though some previous studies have not reported any significant association between living arrangements and mental health issues of HCP[21], findings of the current study suggest that residing in shared apartments or hostels are characterized with a higher prevalence rate of anxiety. Elevated risk of being infected due to sharing of common accommodation facilities with others and limited family support and relaxation received during the stay could be behind this association[32]. Remaining quarantined for 2 weeks, which could elevate the fear among HCP, was also found as a risk factor associated with prevalence of anxiety and stress. This has been a common observation in several previous studies[7,21]. In addition, active engagement in COVID patient care also led to significantly higher anxiety and depression conditions among HCP, as reported in other studies[33,34]. This elevates the chance of being contacted with COVID-19, which could be the reason behind aforementioned trend. Meanwhile, having a family member previously infected with COVID also aggravate the anxiety and depression among HCP[21].

Limitations in personal protective equipment, absence of adequate guidelines and protocols relevant to management of COVID-19 and limited preparation for workflow management during COVID-19 could cause fear within frontline HCP of getting infected with SARS-CoV-2. This subsequently contributes to elevated prevalence levels of anxiety and depression, which is consistent with previous studies[14,31,35]. Higher prevalence rates of depression were found as a risk factor of anxiety and stress among the HCP. Even though previous studies have suggested a strong relationship between the knowledge on COVID and the level of anxiety[13], current study did not report such a trend. This finding is in agreement with several studies conducted in China[36].

The prevalence rate of depression and stress were significantly higher among nursing officers and MLTs, compared to medical officers. During the COVID-19 epidemic, nursing officers have to bear additional responsibilities involving disposing and handling of highly infectious medical waste, sanitizing infective environments and treating COVID-19 patients, while MLTs have to work with infectious samples of suspected patients[21]. Meanwhile, previous studies have also suggested a similar trend, where nurses tend to report higher rates of psychological issues, since they spend more time in patient care[4,34]. A study conducted in India has reported a higher prevalence rate of anxiety and depression among nurses and medical officers[21]. Hindering of the will power, morale, focus and capability of the HCP could be identified as the short-term impacts of poor psychological health[37,38]. Few previous studies have evidenced that such mental health impacts could persist for years within HCP, leading to long-term impacts such as high risk of facing cardio-metabolic issues, persistence of maladaptive behaviours

such as substance use and disturbed sleep cycles, and suicidal behaviours[20,39].

Current study faced few limitations. Being a cross-sectional study, current study utilized self-reported DAAS-21 scale for diagnosis of anxiety, depression and stress, without any in depth diagnosis by medical officers. This could be recognized as a limitation. However, such limitations have been reported to be common in similar studies[21,37]. Participants belonging to different occupational categories, from both government and private hospitals were recruited for this study leading to a large sample, which is a major strength of this study. Inclusion of respondents from several health institutions, and occupational designations enhance the reliability of the findings of this study, while making them more generalizable. In addition, this study remains as one of the pioneer and comprehensive studies on the prevalence of COVID-19 induced psychological morbidities in Sri Lanka that cover anxiety, depression and stress. The current study revealed that the rapid spread of COVID-19 pandemic has led to notable levels of anxiety, depression and stress among the HCP in Sri Lanka. Among the risk factors associated with the prevalence of depression, anxiety and stress, age, occupation title, experience, remaining quarantined, having a SARS-CoV-2 infected family member, involvement in COVID-19 patient care and limited availability of personal protection equipment, were recognized to be significant. Prevalence of anxiety, depression and stress among frontline HCP warrants the need for firm psychological support to ensure the mental wellbeing of the HCP. Implementation of a proper mental health monitoring framework, introducing strategies to promote work-life balance, moderating the workload of HCP, incentivizing positive health behaviours and awareness building could be suggested as key strategies to promote mental health of HCP.

## Conflict of interest statement

The authors declare that they have no conflict of interest.

## Data availability

All the data is available upon request to the corresponding author and with agreement of the steering group.

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## Authors' contributions

LU conceptualized and designed the study. In addition, performed the statistical analysis and wrote the manuscript. AP supported the study design, data collection and reviewed the manuscript. LD collected the data and reviewed the manuscript. All authors read and approved the final manuscript.

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