Open Access Library Journal
2022, Volume 9, e8507
ISSN Online: 2333-9721
ISSN Print: 2333-9705

Stress among Health Care Workers (Doctors and Nurses) as an Impact of COVID-19 Pandemic

Ambreen Goni[1*], Md Jahid Hasan[2], Kornelia Kotseva[3]

[1]Preventive Cardiology, National Institute of Ireland, Galway, Ireland
[2]Registrar Anaesthesiology, Portiuncula Hospital, Galway, Ireland
[3]National Institute of Prevention and Cardiovascular Health, Galway, Ireland
Email: *a.goni2@nuigalway.ie, dr.mjhasan@hotmail.com, kornelia.kotseva@nuigalway.ie

How to cite this paper: Goni, A., Hasan, M.J. and Kotseva, K. (2022) Stress among Health Care Workers (Doctors and Nurses) as an Impact of COVID-19 Pandemic. *Open Access Library Journal*, **9**: e8507.
https://doi.org/10.4236/oalib.1108507

Received: February 21, 2022
Accepted: March 18, 2022
Published: March 21, 2022

Abstract

Aim: First aim is to measure the magnitude of stress due to COVID-19 among Healthcare workers (HCWs). Secondly, personal and professional factors associated to their psychological health will be explored. Thirdly, stress levels of front-line and second-line HCWs will be compared. **Method:** This cross-sectional, direct questionnaire-based survey was carried out in Portiuncula hospital between 18th May 2021 and 5th June 2021. From 184 HCWs doctors and nurses, 148 participated in the survey. HCWs were taken from Anaesthetics/ICU, ED, Gynaecology and Surgery department. **Result:** Nurses, married and frontline HCWs were found to have more stress "some of the times" 46 (46.9%), 151 (48.6%), and 37 (46.3%) respectively. Around half of the female HCWs 52 (49.5%) suffered from mental stress compared to males. Irish and Middle aged HCWs (31 - 50 years) were more stressed than their counterparts. Frontline HCWs were shown to have 2.65 times more mental stress (CI: 1.24 - 5.67; p = 0.012) than second-line HCWs. Besides, physical stress was 1.55 times (CI: 0.72 - 3.31; p = 0.26) more in frontline compared to second-line HCWs. **Conclusion:** Frontline HCWs are more stressed mentally and physically than second-line HCWs due to COVID-19. Middle aged, married, females and frontline nurses are in state of distress compared to their counterparts. Fear of transmitting infection to family members was the main consternation amongst HCWs. Psychological support is imperative to overcome stress and mental exhaustion caused by the pandemic.

Subject Areas

Health Policy

Keywords

Covid-19, Corona Virus, Pandemic, Healthcare Workers, Frontline Workers, Mental Health, Stress, Psychological Well-Being

1. Introduction/Background

Corona virus broke out in late months of the year 2019 in the city of Wuhan in China [1]. Initially, it was believed to be a pneumonia of unknown origin. Later, the results from whole-genome sequencing disclosed that the causative agent was a novel corona virus, which was the seventh member of Corona-virus family to infect humans [2]. This virus outbreak was named as Corona virus disease (COVID-19) by World Health Organisation (WHO) on 12 February 2020. Based on evolution, taxonomy and entrenched practice, it was entitled "severe acute respiratory syndrome corona virus-2" SARs CoV-2 by International Committee on Taxonomy of Viruses (ICTV) [2]. Corona virus is presumed to be zoonotic novel virus of *Coronaviridae* family, which transmits through air borne droplets or coming in close contact with an infected person and gets multiplied after entering the respiratory system. The infected person can also spread the viral infection through body fluids—sputum, urine, blood and possibly other mucus membranes (like eyes) [3].

Disease Presentation: The virus causes mild to severe symptoms like cough, fever (38 degree Celsius), loss of sense of smell or taste, shortness of breath, fatigue, sore throat, headaches and diarrhoea [4]. In complicated cases, it causes adverse conditions like acute respiratory distress syndrome (ARDS), pneumonia, sepsis which can lead to hospitalisation, intensive care unit admission and even artificial ventilation in vulnerable people and elderly. Patients with COVID pneumonia show multiple mottling and ground glass opacity on Chest X-Ray.

Because of the severe and rapid spread of this life-threatening virus, it was given the title of SARS CoV-2 [2]. Corona virus is highly transmissible, mortality rates are very high and it has created a public health emergency. COVID 0 - 19 was declared as pandemic by World Health Organisation (WHO) on 11 March 2020 as outbreak was reported in more than 110 countries [5]. The rapid spread of this virus created terror and fear globally. Frontline workers being the main leaders of battle against corona outbreak were exposed to COVID-19 patients on everyday basis. They include doctors, nurses, paramedics, medics and cleaners. A significant impact on physical as well as psychological well-being of healthcare workers (HCWs) due to COVID-19 pandemic was observed [6]. Evidence from past outbreaks explains that even after the termination of disease, mental health of people remain disturbed due to after-shocks of the outbreak havoc [7] [8]. Currently scientists, nations and health organisations all are working very hard to focus on vaccine, cause, spread and management for deadly COVI-19, but unfortunately mental health impact remains unaddressed and under-estimated.

The first case of COVID-19 was confirmed on 27 February 2020 in Republic of Ireland. The cases gradually expanded along with an increase in death toll, but country experienced a rise in confirmed COVID-19 cases as never before in the start of year 2021. The newspaper Irish times from January 2021 reported that Ireland had the leading number of positive COVID-19 cases per million people globally [9]. Due to the flooding of COVID-19 cases, HCWs indeed had repercussions on physical health but their mental well-being also need attention as it may get hampered in such critical situations. Psychological stress is a potential contributor to burnout and contretemps in HCWs, and supporting their mental well-being is the key to ensure patient and health professional safety [10]. Front-line doctors and nurses working in ICU, ED are responsible for the initial identification and management of COVID-19 patients, therefore throwing them at an escalated COVID-19 risk. This terror of COVID-19 has created turbulence in the lives of front-line workers across the globe, which calls for the need for research to study its impact on psychological well-being based on the learning of past outbreaks.

This study aims to assess the mental stress of HCWs (doctors and nurses) during COVID-19 working front-line; ICU/Anaesthetics, ED and second-line; Gynaecology and Surgery department. Secondly, study will also try to evaluate the personal and professional factors associated with psychological wellbeing of HCWs like increase in workload, fear of getting infected and transmitting infection to their family members. Thirdly, stress levels of front-line and second-line HCWs will be compared. The findings of the study will help provide a framework for interventions and guidelines to the health system for addressing and alleviating psychological stress in HCWs due to COVID-19 pandemic.

The literate search was carried out in PubMed and Google scholar using the key words COVID-19, corona virus, pandemic and were cross referenced with mental health, stress, burnout, psychological well-being, healthcare workers and frontline workers.

***Current issues*:**

Due to the novel corona virus pandemic nations, governments, policy makers and WHO all are under great pressure to alleviate the spread of proliferating virus. The existing literature at the nexus of corona virus focus at vaccine, physical health concerns like social distancing, hand hygiene, face masks, personal protective equipment (PPE) and increased workload, but to a less extent towards psychological well-being of population including HCWs. Various recommendations and guidelines were formulated to mitigate the effects of deadly COVID-19, underpinning quarantine, social distancing and supportive hospital care [11]. The prodigious spread of corona virus from pre-symptomatic, symptomatic and even asymptomatic individuals to healthy persons has compelled nations to mandate the use of face masks and social distancing [12]. Many studies directed on protection of health care providers with the compulsory use of face mask at all times [13] [14]. Similarly, the rapid wildfire-like spread of corona virus has prompted WHO to map out guidelines for use of face mask [15]. Another centre of atten-

tion is COVID-19 vaccine nowadays, studies are highlighting the development and effects of vaccine [16] [17]. No doubt HCWs were prioritised in getting vaccine jabs but their mental health perhaps remain the lowest priority. Current attention being on the above categories in this ongoing pandemic, no evidence-based interventions or guidelines are in practice to mitigate the serious aftermath-mental distress due to this deadly virus. More research and clinical trials are needed in the area of COVID-19 related mental health turmoil to come up with effective interventions and guidelines.

***Possible causes for distress in HCWs*:**

Challenging situation of COVID-19 crisis has introduced HCWs not only to increased physical workload, long shifts, fear of catching infection but also is influencing their mental health. Despite putting their own lives in danger of COVID-19 to ensure patient's good health and get applauded, they had to face indecorous behaviour of people throwing HCWs in distress. Health care providers encountered social stigma in many countries like harassment taking public transport, physical assault and even had to vacant rented houses due to increased public pressure [18] [19] [20]. Several studies have revealed that inadequacy of personal protective equipment (PPE) and lack of training to deal with this havoc situation of COVID-19 pandemic lead to anxiety and stress among healthcare workers [21] [22]. Also, a survey conducted by Foley *et al.*, targeting Irish radiographers from six different regions of Ireland encountered scarcity of PPE, although majority 77% asserted the availability of PPE whilst 16% disagreed to that [23]. There is some evidence from researches suggesting separation from the family, in an attempt to keep them safe from corona virus also had a profound effect on mental health of HCWs [24] [25]. In addition to depression and stress, thoughts on job quitting were not uncommon in HCWs working in this catastrophic pandemic [23] [26].

The psychological well-being has some affiliation with age, gender, marital status and job designation as revealed by a cross sectional study conducted in Turkey among health care workers (HCWs) with non-health care workers (non HCWs). Reduced psychological wellbeing was seen in single, women and young and non-physician HCWs however, no notable difference was found in other sectors [24]. Another study reaffirmed by Guo *et al.*, depicted no psychological distress amongst the medical staff on the whole but frontline workers, young medical staff and nurses were more likely to had anxiety and depression as an impact of COVID-19 compared to physicians, non-frontlines and old aged medics [27]. A prospective study in a maternity hospital in Dublin, Ireland strengthened the evidence of psychological stress and anxiety with greater ratio in young health workers, females and supporting workers [28].

***Spread of COVID-19 in healthcare workers*:**

The outbreak of the lethal SARS CoV-2 has impacted thousands of HCWs worldwide by infecting them and many lost their lives in substantial numbers. In Zhongnan hospital, Wuhan China 138 patients were detected of COVID pneumonia in early pandemic and about 70% of them were health providers, who

were the candidates for mechanical ventilation [29]. Within a period of three months after declaration of pandemic, a total of 152 888 infections and 1413 deaths were reported in HCWs globally working against COVID-19 as evident from a survey done by Erden *et al.* on 37 countries [30]. There is still no halt in deaths of frontline workers even after a year of continued pandemic. Recently in India, around February 2021, a newspaper reported 734 doctors lost their lives to COVID-19 pandemic [31]. All these predicaments can exacerbate distress among HCWs due to apparently imperishable corona virus disease. A large-scale study was pursued in China in February 2020 involving 11,118 medical staff participants amongst which 4.98% showed middle and high level of anxiety whereas 13.47% reported to have moderate and high levels of depression [27]. Endurance of mental disturbances impede the efficient workability of a person as explored by Ruitenburg *et al.* and will have consequences on patient's health as well [32].

***Learning from past outbreaks*:**

The situation of COVID-19 pandemic is analogous to previous pandemics and epidemics in context of mental health turmoil. The previous humanitarian emergencies have led to incorporation of resilience training programmes to prepare HCWs for future calamities. The outbreak of severe acute respiratory syndrome (SARS) corona virus was labelled as epidemic back in the year 2003. It was believed to be a health setting catastrophe and potentially affected the mental health of healthcare workers putting them at increased stress [8] [33]. In 2009, influenza A/H1N1 virus infection which was the first pandemic of 21st century declared by WHO also had detrimental effects on mental health of healthcare providers. A significant number of HCWs had moderate to high levels of anxiety and distress due to pandemic [34] [35]. The research on outbreak of Ebola virus epidemic in 2014-2015 asseverated stigmatisation, anxiety and post-traumatic stress on HCWs in quest of providing support and care to patients [36]. In an attempt to address and overcome these psychological disturbances many international organisations, WHO and psychological first aid guidelines were implemented [37]. Guidelines encompassing mental health effects of pandemic influenza virus by WHO are also in place [38]. The evidence from SARS pandemic fortified the importance of acquiring training skills among healthcare force not only in their work but also on psychological coping with stress and anxiety [39]. In Sierra Leone WHO, Christian blind mission (CBM) international put their hands together with local organisations and equipped the nurses with psychological first aid training programme which deemed to be a success in combating mental morbidity caused by Ebola.

***Synopsis of current situation*:**

Healthcare systems are mainly focussing on vaccine, physical health prevention and management whereas mental health remains neglected and un-noticed domain. No particular intervention is formulated to prevent the psychological wellbeing of public including healthcare workers. However, literature has explored that healthcare and emergency workers who work in these intense situa-

tions are exposed to different levels of stress: psychological, physical, emotional, cognitive and relational [21] [40] [41] [42] [43]. Studies also revealed that nurses who work front-line have more depression and stress levels compared to second-line nurses [44]. According to an Italian survey; psychological, emotional and somatic symptoms were not rare in HCWs trying to cure COVID-19 patients [45]. Hospital workload greatly impacts the mental health of HCWs as explored in an observational cohort study of two different hospitals by Ali *et al.* [46]. This study revealed disparity in all areas of anxiety, stress and depression in two hospital HCWs which could be linked to increased mortality due to COVID-19. It is worth noting that pre-existing medical conditions among individuals play a significant role in the management of COVID-19 positive patients [47]. They are believed to have high levels of anxiety and stress compared to those who lack pre-existing psychiatric illness.

Post-traumatic stress

Research shows that 10% HCWs had post-traumatic stress repercussions even after 3 years of SARS pandemic in Beijing China [7]. Many studies reveal front-line workers battling against COVID-19 show widespread symptoms of burnout and post-traumatic stress [43]. A survey from six regions in Ireland by Foley *et al.* explored burnout symptoms in 40% of radiographers due to pandemic [23]. Another survey from Italy which was conducted on 1379 HCWs avouched 49.38% had post-traumatic stress [48]. The results in particular showed increased levels of anxiety, stress and depression among HCWs due to the surge in COVID-19 pandemic.

Aims and Objectives:

- To measure the magnitude of stress among doctors and nurses of Anaesthetics/Intensive care unit (ICU), Emergency department (ED), Gynaecology and Surgery department due to COVID-19 pandemic.
- To evaluate the personal and professional factors associated with to psychological well-being during COVID-19.
- To compare the stress levels among front-line and second-line HCWs.

Research Question:

Do healthcare workers experience stress as an impact of COVID-19 pandemic?

2. Materials and Methods

2.1. Participants

A total of 184 direct survey questionnaires were distributed and 148 HCWs participated in the study, out of which 7 were excluded for incomplete data, so the final sample comprised of 141 participants with a response rate of 80.43%. The HCWs (doctors and nurses) were recruited from Anaesthetics/ICU, ED, Gynaecology and Surgery department of Portiuncula Hospital, Ballinasloe from 18 May 2021 to 5th June 2021. The HCWs were categorised in two groups for this survey; Front-line HCWs (Anaesthetics/ICU and ED) and Second-line HCWs

(Gynaecology and Surgery).

Inclusion Criteria:

- All senior and junior doctors and nurses of ICU or Anaesthetics, ED, Gynaecology and Surgery department of Portiuncula hospital, Ballinasloe, co-Galway.
- All age groups.

Exclusion Criteria:

All the medical staff of Portiuncula hospital excluding doctors and nurses of ICU/Anaesthetics, ED, Gynaecology and Surgery department.

2.2. Procedure

All the doctors and nurses working in ICU/Anaesthesia, ED, Gynaecology and Surgical department in Portiuncula hospital were recruited as representative sample of the study population. By obtaining permission from hospital administration, subjects were approached directly or via group chairs and senior/service mangers. A detailed information leaflet underpinning the full description of the study was provided to all participants 24-hours before undertaking the survey. Participants who agreed to take part in the survey, were provided with a consent form, a questionnaire and psychometric measuring tool DASS-21. All the participants were assured that their identity will not be divulged at any point, in concordance with European Union Data Protection Regulation Act 1998 and 2003.

2.3. Ethics Consideration

Ethics approval was obtained from Research Ethics Committee, Galway (Ref: C.A. 2369). Informed written consent was acquired from each participant. The survey was based on anonymous data collection, where identity was not revealed at any point.

2.4. Measures

Survey questionnaire:

A sociodemographic form was created to gather participant information; age, gender, marital status, nationality, designation and workplace. The main domains relating to stress in emergency situations were underpinned in the questionnaire for this study: emotional, cognitive, social and physical as highlighted by Walton *et al.* [21]. Moreover, focusing on the deadly pandemic the questionnaire also focus on fear of contracting infection and transmitting to family members [21] [49] [50].

Depression, Anxiety and Stress Scale (*DASS* 21):

The depression, anxiety and stress scale (DASS) which was designed by Australian University of South Wales to measure depression and anxiety previously, but later on a third factor-stress was included in it [51]. DASS is based on dimension rather than a categorical conception of psychological disorder. The

original DASS has 42 items measuring three dimensions of negative emotions-depression (DASS-D), anxiety (DASS-A) and stress (DASS-S). DASS-42 has been used in many clinical settings and researches for its favourable psychometric results [52]. For time saving purpose a short version of DASS was formulated by Lovibond and Lovibond in 1995 known as DASS-21 [53]. The DASS-21 has been used by psychologists and clinicians because of its reliability and validity to screen for symptoms of depression, anxiety and stress. Similar to DASS-42, the version 21 shows effective discrepancy among diagnostic groups and capitulates relationship with respective measures of depression and anxiety [54] [55]. The DASS-21 is a set of three self-reported sub-scales designed to measure emotional states, it comprises 21 items that is 7 items per sub-scale; depression, anxiety and stress. Participants were asked to score every item ranging from 0 to 3 indicating "do not apply to me at all" to "apply to me most of the time". Each sub-scale score was summed up and multiplied by factor 2. Sum score for DASS total is between 0 and 120 and therefore for sub-scales range lies between 0 and 42. Scores from each subscale are then categorised as normal, mild, moderate, severe and extremely severe. Higher the score means severe the emotional distress. Cut-off scores of 28+, 20+ and 34+ are used for the total DASS score, depression, anxiety and stress subscale respectively [53].

DASS 21 is good tool for distinguishing between anxiety, depression and stress as well as used in many clinical and non-clinical settings [56].

2.5. Statistical Analysis

The data collected was statistically analysed by using SPSS 25. Several descriptive and inferential statistical methods were used to analyze the data. Frequency distribution and bar charts were used in descriptive analyses. For inferential analyses, first, cross-tabulations including Chi-square test with P-value was used for both outcomes, mentally stressed and physically stressed. Second, ordinal logistic regression was used because the categories of the outcomes were on an ordinal scale. The odds ratio (OR) with 95% confidence interval (CI) and P-value were calculated using ordinal logistic regression. At a 5% level of significance, all conclusions were drawn. The rank data from DASS 21 which was obtained from counts of each level, was presented as percentages and frequencies. Two-tail independent *t*-tests and effect size were carried out for depression, anxiety and stress. Also, multivariate analysis was done, for checking the association between predictors and dependent variables were presented as odds ratio and 95% CI after adjusting the confounders.

3. Results

Demographic Results:

Participant demographics and responses are illustrated in **Table 1(a)** and **Table 1(b)**. Out of 141 participants with a response rate of 80.4%, 80 (56.7%) were

Table 1. (a) Demographic Characteristics of Participants; (b) Frequency distribution of collective participant responses.

(a)

Demographic characteristics		*Front-line HCWs* (n = 80)		*Second-line HCWs* (n = 61)	
		Mean	*Standard Deviation* (*SD*)	*Mean*	*Standard Deviation* (*SD*)
Age		20	5.38	15.25	7.36
		Frequency (*N*)	*Percentage* (*%*)	*Frequency* (*N*)	*Percentage* (*%*)
Age (years)	21 - 30	17	85.0	3	15.0
	31 - 40	27	62.8	16	37.2
	41 - 50	23	52.3	21	47.7
	51 - 60	13	38.2	21	61.8
Gender	Male	22	61.1	14	38.9
	Female	58	55.2	47	44.8
Nationality	Irish	57	56.4	44	43.6
	Non-Irish	23	57.5	17	42.5
Marital Status	Single	17	73.9	6	26.1
	Married	54	51.4	51	48.6
	Others	9	69.2	4	30.8
Designation	Doctors	23	53.5	20	46.5
	Nurses	57	58.2	41	41.8

(b)

Participant Responses	*Frequency* (*N*)	*Percentage* (*%*)
Workplace Characteristics		
Frontline	80	56.7
Second-line	61	43.3
Have ever got infected by Corona virus		
Yes	19	13.5
No	122	86.5
Find it worth the effort working in such difficult scenario of pandemic		
Yes	107	75.9
No	34	24.1
Feel depressed because of current situation		
Yes	49	34.8

Continued

No	92	65.2
Start or increase any substance (like alcohol or smoking) during the lockdown		
Yes	40	28.4
No	101	71.6
Fear of death while coming in contact with COVID-19 positive cases		
Yes	46	32.6
No	95	67.5
Psychological support is needed for frontline workers to overcome stress due to pandemic		
Yes	111	78.7
No	30	21.3
Worried about family members getting infected because of your COVID-19 exposure		
Most of the time	52	36.9
Some of the time	69	48.9
Seldom or never	20	14.2
Fear of catching the infection by working in hospital during current pandemic		
Most of the time	27	19.1
Some of the time	77	54.6
Seldom or never	37	26.2
Physically exhausted of the stressful increase in work		
Most of the time	53	37.5
Some of the time	53	37.5
Seldom never	35	24.8
Mentally exhausted of stressful increase in work		
Most of the time	47	33.3
Some of the time	66	46.8
Seldom or never	28	19.9

frontline HCWs and rest are second-line 61 (43.3%). The sample contained 57 (56.4%) Irish front-line and 44 (43.6%) Irish second-line HCWs. The majority HCWs were nurses in both frontline and second-line accounting 57 (58.2%) and 41 (41.8%) respectively. It is worth noting that there was preponderance of female HCWs in both front-line and second-line constituting 58 (55.2%) and 47 (44.8%) respectively. A considerable number of HCWs were married; front-line 54 (51.4%) and second-line 51 (48.6%). The minimum to maximum ages ranged from 21 to 60 years with mean (SD) age of the frontline HCWs being 20 (5.38) and those of second-line HCWs being 15.25 (7.36). Furthermore, there was difference in mean (SD) age that is 4.75 (1.98) among front-line and second-line HCWs. The sample was mainly middle aged, as most of the frequency came

from age 31 - 50 years. From Table 1(b) it can also be concluded that though some of the times, the workers were both mentally and physically exhausted, they were tensed about their family's safety, but most of them 98 (67.5%) argued that they were free from fear of death. A major proportion of HCWs 122 (86.5%) affirmed that they were not infected by COVID-19. Almost three quarter of HCWs 107 (75.9%) found it valuable to work in critical situation of pandemic. Besides, 111 (78.7%) suggested that psychological assistance is essential to cope-up with the pandemic aftermath.

Mental and physical stress prevalence:

From the bar charts shown in Figure 1(a) and Figure 1(b), it is quite evident that maximum frontline HCWs are more mentally and physically stressed than second-line HCWs. Also, the prevalence of mental and physical stress among HCWs during COVID-19 is reported in Table 2. For example, HCWs who "most of the times" were mentally exhausted consisted of 74.5% of frontline HCWs and only 25.5% of second-line HCWs. Similarly, HCWs who "most of the times" were physically exhausted consisted of 62.3% of frontline workers, compared 37.7% of second-line workers.

Association of Mental stress with other domains:

Table 3(a) clearly states that gender ($p = 0.003$), designation ($p = 0.004$), workplace characteristics ($p = 0.000$), found it worth the effort working in pandemic (0.017), and fear of infection ($p = 0.008$) was significantly associated with mental stress. Mental stress was more frequent in the female gender. Only 14 (13.3%) females were "seldom or never" mentally stressed while the percentage for male was 149 (38.9%). Similarly, nurses and frontline workers were more mentally stressed than their counterparts.

Association of Physical stress with other domains:

Table 3(b) shows workplace characteristics ($p = 0.009$) and fear of infection ($p < 0.001$) was significantly associated with physical stress. 33 (41.3%) of the frontline workers were physically stressed "most of the times" and 35 (43.8%) "some of the times" while 20 (32.8%) and 18 (29.5%) of the second-line workers were physically stressed "most of the times" and "some of the times" respectively. Moreover, the workers who were afraid "most of the times" about infection were found to be more physically stressed.

Regression Analysis:

Table 4(a) demonstrates that for frontline workers, the odds of being more mentally stressed (most or some of the times versus never/seldom) was 2.65 times (CI: 1.24 - 5.67; $p = 0.012$) that of the second line workers, holding all other variables constant. Besides, those workers, who did not find it worth the effort working in pandemic, had higher odds of being more mentally stressed (OR: 2.64, CI: 1.17 - 5.94; $p = 0.019$). Moreover, HCWs who were more worried about their family members, the odds of being more mentally stressed was higher.

From Table 4(b), we observed that for nurses, the odds of being physically stressed "most or some of the times" versus mentally stressed "never/seldom"

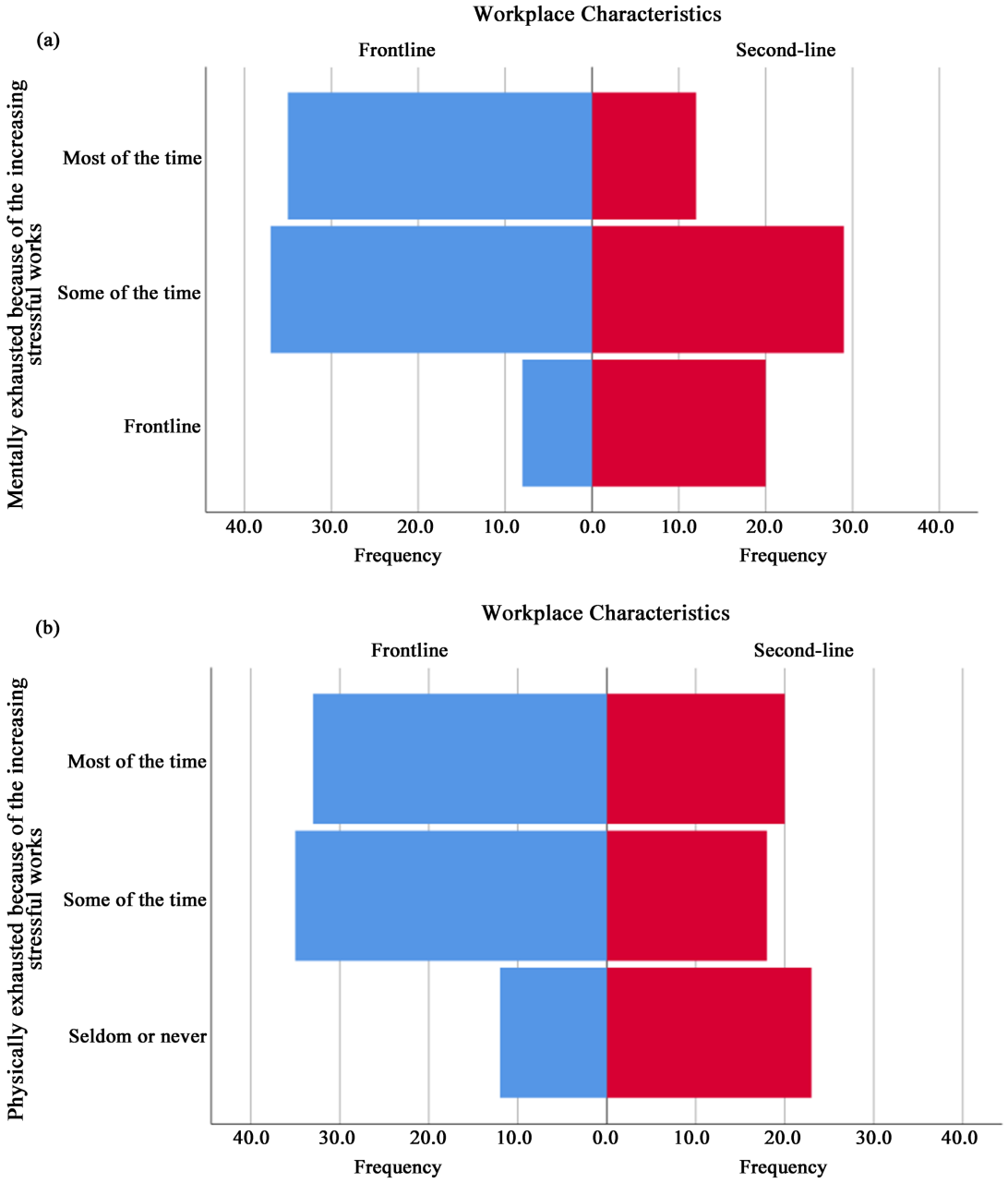

Figure 1. (a) Distribution of HCWs by workplace characteristics and mental stress; (b) Distribution of HCWs by workplace characteristics and physical stress.

Table 2. Prevalence of mental and physical stress among HCWs during COVID-19.

Levels	Workplace Characteristics			
	Mentally Stressed		Physically Stressed	
	Front-line	*Second-line*	*Front-line*	*Second-line*
Most of the time	74.5%	25.5%	62.3%	37.7%
Some of the time	56.1%	43.9%	66.0%	34.0%
Seldom or never	28.6%	71.4%	34.3%	65.7%

Table 3. (a) Association between *Mental stress* and other characteristics including type of workers during COVID-19; (b) Association between *Physical stress* and other characteristics including type of workers during COVID-19.

(a)

Characteristics	Mentally Stressed			P-value*
	Most of the time N(%)	*Some of the time N(%)*	*Seldom/Never N(%)*	
Age				0.373
24 - 30	11 (55)	7 (35)	2 (10)	
31 - 40	15 (34.9)	21 (48.8)	7 (16.3)	
41 - 50	13 (29.5)	21 (47.7)	10 (22.7)	
51 - 60	8 (23.5)	17 (50)	9 (26.5)	
Gender				0.003
Male	8 (22.2)	14 (38.9)	14 (38.9)	
Female	39 (37.1)	52 (49.5)	14 (13.3)	
Nationality				0.520
Irish	36 (35.6)	47 (46.5)	18 (17.8)	
Non-Irish	11 (27.5)	19 (47.5)	10 (25)	
Marital Status				0.215
Single	12 (52.2)	7 (30.4)	4 (17.4)	
Married	31 (29.5)	51 (48.6)	23 (21.9)	
Others	4 (30.8)	8 (61.5)	1 (7.7)	
Designation				0.004
Doctor	8 (18.6)	20 (46.5)	15 (34.9)	
Nurse	39 (39.8)	46 (46.9)	13 (13.3)	
Workplace Characteristics				0.000
Frontline	35 (43.8)	37 (46.3)	8 (10)	
Second line	12 (19.7)	29 (47.5)	20 (32.8)	
Have ever got infected by Corona virus				0.229
Yes	8 (42.1)	10 (52.6)	1 (5.3)	
No	39 (32)	56 (45.9)	27 (22.1)	
Worth the effort working in such difficult scenario of pandemic				0.017
Yes	34 (31.8)	46 (43.0)	27 (25.2)	
No	13 (38.2)	20 (58.8)	1 (2.9)	
Depressed because of current situation				0.590
Yes	18 (36.7)	20 (40.8)	11 (22.4)	
No	29 (31.5)	46 (50)	17 (18.5)	

Continued

Start or increase any substance abuse				0.520
Yes	11 (27.5)	19 (47.5)	10 (25)	
No	36 (35.6)	47 (46.5)	18 (17.8)	
Ever have the fear of death while coming in contact with COVID-19 positive cases				0.400
Yes	13 (28.3)	21 (45.7)	12 (26.1)	
No	34 (35.8)	45 (47.4)	16 (16.8)	
Psychological support is needed for frontline workers				0.322
Yes	35 (31.5)	51 (45.9)	25 (22.5)	
No	12 (40)	15 (50)	3 (10)	
Worried about family members getting infected because of COVID-19				0.058
Most of the time	23 (44.2)	22 (42.3)	7 (13.5)	
Some of the time	21 (30.4)	35 (50.7)	13 (18.8)	
Seldom or never	3 (15)	9 (45)	8 (40)	
Fear of catching the infection by working in hospital				0.008
Most of the time	15 (55.6)	10 (37)	2 (7.4)	
Some of the time	27 (35.1)	35 (45.5)	15 (19.5)	
Seldom or never	5 (13.5)	21 (56.8)	11 (29.7)	

*Chi-square test.

(b)

Characteristics	Physically Stressed			P-value*
	Most of the time N (%)	*Some of the time N (%)*	*Seldom/Never N (%)*	
Age				0.467
24 - 30	10 (50)	7 (35)	3 (15)	
31 - 40	16 (37.2)	17 (39.5)	10 (23.3)	
41 - 50	19 (43.2)	15 (34.1)	10 (22.7)	
51 - 60	8 (23.5)	14 (41.2)	12 (35.3)	

Continued

Gender				0.348
Male	13 (36.1)	11 (30.6)	12 (33.3)	
Female	40 (38.1)	42 (40)	23 (21.9)	
Nationality				0.865
Irish	38 (37.6)	39 (38.6)	24 (23.8)	
Non-Irish	15 (37.5)	14 (35)	11 (27.5)	
Marital Status				0.521`

Continued

Single	10 (43.5)	10 (43.5)	3 (13)	
Married	37 (35.2)	40 (38.1)	28 (26.7)	
Others	6 (46.2)	3 (23.1)	4 (30.8)	
Designation				0.047
Doctor	11 (25.6)	16 (37.2)	16 (37.2)	
Nurse	42 (42.9)	37 (37.8)	19 (19.4)	
Workplace Characteristics				0.009
Frontline	33 (41.3)	35 (43.8)	12 (15)	
Second line	20 (32.8)	18 (29.5)	23 (37.7)	
Ever got infected by Corona virus				0.309
Yes	9 (47.4)	8 (42.1)	2 (10.5)	
No	44 (36.1)	45 (36.9)	33 (27)	
Worth the effort working in such difficult scenario of pandemic				0.05
Yes	37 (34.6)	38 (35.5)	32 (29.9)	
No	16 (47.1)	15 (44.1)	3 (8.8)	
Feel depressed because of current situation				0.297
Yes	21 (42.9)	14 (28.6)	14 (28.6)	
No	32 (34.8)	39 (42.4)	21 (22.8)	
Start or increase any substances during the lockdown				0.031
Yes	16 (40)	9 (22.5)	15 (37.5)	
No	37 (36.6)	44 (43.6)	20 (19.8)	
Fear of death while coming in contact with COVID-19 positive cases				0.026
Yes	14 (30.4)	14 (30.4)	18 (39.1)	
No	39 (41.1)	39 (41.1)	17 (17.9)	
Psychological support is needed for frontline workers to overcome stress due to pandemic				0.169
Yes	42 (37.8)	38 (34.2)	31 (27.9)	
No	11 (36.7)	15 (50)	4 (13.3)	
Worried about family members getting infected because of your COVID-19 exposure				0.227
Most of the time	22 (42.3)	21 (40.4)	9 (17.3)	
Some of the time	27 (39.1)	22 (31.9)	20 (29)	
Seldom or never	4 (20)	10 (50)	6 (30)	
Fear of catching the infection by working in hospital				0.000
Most of the time	17 (63)	7 (25.9)	3 (11.1)	
Some of the time	31 (40.3)	31 (40.3)	15 (19.5)	
Seldom or never	5 (13.5)	15 (40.5)	17 (45.9)	

*Chi-square test.

Table 4. (a) Factors associated with mental stress among HCWs during COVID-19, using multivariable ordinal logistic regression approach. (b) Factors associated with *Physical stress* among HCWs during COVID-19, using multivariable ordinal logistic regression approach.

(a)

Characteristics	Odds Ratio (OR)	95% Confidence Interval (CI)		P-value
		LCL	UCL	
Gender				
Male	1			
Female	2.08	0.83	5.18	0.117
Age				
24 - 30	1.74	1.34	0.72	0.469
31 - 40	1.40	0.71	0.67	0.506
41 - 50	1.24	0.58	0.46	0.649
51 - 60	1			
Marital Status				
Single	1.26	0.30	5.38	0.755
Married	1.05	0.32	3.39	0.939
Others	1			
Workplace Characteristics				
Frontline	2.65	1.24	5.67	0.012
Second-line	1			
Nationality				
Irish	1.29	0.57	2.90	0.541
Non-Irish	1			
Designation				
Doctor	1			
Nurse	2.27	0.99	5.19	0.052
Worry about family members getting infected because of your COVID-19 exposure				
Most of the time	4.34	1.34	14.05	0.014
Some of the time	2.43	0.83	7.14	0.105
Seldom or never	1			
Find it worth the effort working in such difficult scenario of pandemic				
Yes	1			
No	2.64	1.17	5.94	0.019
/cut1	1.66	-0.20	3.53	
/cut2	4.30	2.30	6.30	

(b)

Characteristics	Odds Ratio (OR)	95% Confidence Interval (CI)		P-value
		LCL	UCL	
Gender				
Male	1			
Female	0.73	0.29	1.84	0.506
Age				
24 - 30	1.78	0.42	7.59	0.438
31 - 40	1.38	0.53	3.57	0.508
41 - 50	1.96	0.79	4.83	0.144
51 - 60	1			
Marital Status				
Single	1.17	0.26	5.29	0.836
Married	0.95	0.27	3.26	0.929
Others	1.00			
Workplace Characteristics				
Frontline	1.55	0.72	3.31	0.259
Second-line	1			
Nationality				
Irish	1.02	0.46	2.25	0.96
Non-Irish	1			
Designation				
Doctor	1			
Nurse	2.65	1.15	6.13	0.023
Worry about family members getting infected because of your COVID-19 exposure				
Most of the time	2.40	0.78	7.37	0.125
Some of the time	1.78	0.64	4.95	0.271
Seldom or never	1			
Find it worth the effort working in such difficult scenario of pandemic				
Yes	1			
No	2.86	0.01	1.30	0.009
/cut1	0.71	−1.10	2.53	
/cut2	2.54	0.68	4.41	

was 2.65 times higher than doctors, holding all other variables constant. Like mental stress, those HCWs, who did not find it worth the effort working in pandemic, had higher odds of being more physically stressed (OR: 2.86, CI: 0.01 -

1.30; p = 0.009). Here, we also observed that for frontline HCWs, the odds of being more physically stressed was 1.55 times (CI: 0.72 - 3.31; p = 0.26) that of the second-line HCWs.

***Optional results*:**

_cut1—This is the estimated cut point on the latent variable used to differentiate seldom/never stressed from some or most of the times when values of the predictor variables are evaluated at zero.

_cut2—This is the estimated cut point on the latent variable used to differentiate seldom/never or some of the times stressed from most of the times stressed when values of the predictor variables are evaluated at zero.

DASS-21 Results:

Based on Lovibond and Lovibond [53] percentile cut-offs of DASS-21 scale, Table 5 shows the prevalence of depression, anxiety and stress among front-line HCWs and second-line HCWs. Depression, anxiety and stress was overall more in front-line compared to second-line HCWs. The prevalence of mild to moderate depression, anxiety and stress (DASS-21) in front-line HCWs was considerably higher 3.80%, 11.39% and 1.27% respectively compared to second-line HCWs which was 1.61%, 1.61%, 0% respectively.

***Independent t-test for DASS*-21:**

Table 6 shows collective outcome of independent *t*-test (two tail) carried out for front-line and second-line HCWs. The *t* (212) for DASS-21; depression, anxiety and stress were 2.04, 2.70 and 3.87 with *p* values of 0.0431, 0.0078, 0.0008 respectively, illustrating 5% level of significance between front and second-line HCWs. In line with Cohen (1988) [57], the results show a moderate effect size

Table 5. Prevalence of depression, anxiety and stress (Using DASS 21) among HCWs.

Levels		Depression		Anxiety		Stress	
		Front-line	*Second-line*	*Front-line*	*Second-line*	*Front-line*	*Second-line*
Normal	0	91.14%	95.16%	74.68%	95.16%	91.14%	96.77%
Mild	1	5.06%	3.23%	12.66%	3.23%	7.59%	3.23%
Moderate	2	3.80%	1.61%	11.39%	1.61%	1.27%	0
Severe	3	0	0	1.27%	0	0	0
Extreme	4	0	0	0	0	0	0

Table 6. Results of independent *t*-tests and effect size for depression, anxiety and stress.

Variables	Front Line HCWs		Second Line HCWs		*T* (*212*)	*P*	*Cohen's d*
	Mean	*SD*	*Mean*	*SD*			
DASS-21 Depression	4.29	3.39	3.16	3.09	2.04	0.0431	0.346
DASS-21 Anxiety	4.43	3.77	2.90	2.68	2.70	0.0078	0.458
DASS-21 Stress	7.85	4.48	5.39	3.87	3.87	0.0008	0.584

for depression and anxiety which was 0.346 and 0.458 respectively while a strong effect size of 0.584 for stress.

Multi-variable Regression analysis for DASS-21:

Table 7(a); In this multivariable regression analysis, depression was predicted by five factors namely; age, gender, marital status, designation and work area. The data is also represented in scatted plot Figure 2(a) & Figure 2(b). The results

Table 7. (a) Summary of Multi-Variable Regression Analysis *for Depression*; (b) Summary of Multi-Variable Regression Analysis *for Anxiety*; (c) Summary of Multi-Variable Regression Analysis *for Stress.*

(*a*)

Predictors of DASS-21 **Depression**	**Estimate**	**95% Confidence Interval (LCL, UCL)**	**Beta (b)**	**p-value**	**R-Square (Model)**	**Sig. F (Model)**
(Intercept)	8.994	[5.193, 12.79]				
Age	−0.091	[−0.148, −0.033]	−0.264	0.002		
Gender	1.143	[−0.208, 2.494]	0.152	0.096	0.148	0.0005
Mar. Status	−0.714	[−1.453, 0.025]	−0.155	0.058		
Designation	−0.522	[−1.801, 0.757]	−0.073	0.421		
Work Area	−0.725	[−1.808, 0.358]	−0.110	0.188		

(b)

Predictors of DASS-21 **Anxiety**	**Estimate**	**95% Confidence Interval (LCL, UCL)**	**Beta (b)**	**P-value**	**R-Square (Model)**	**Sig. F (Model)**
(Intercept)	7.847	[3.909, 11.783]				
Age	−0.79	[−0.139, −0.019]	−0.223	0.009		
Gender	1.286	[−0.113, 2.686]	0.165	0.071	0.1437	0.0007
Marital Status	−0.504	[−1.270, 0.261]	−0.106	0.194		
Designation	−0.160	[−1.485, 1.165]	−0.022	0.811		
Work Area	−1.184	[−2.306, −0.061]	−0.173	0.038		

(c)

Predictors of DASS-21 **Stress**	**Estimate**	**95% Confidence Interval (LCL, UCL)**	**Beta (b)**	**p-value**	**R-Square (Model)**	**Sig. F (Model)**
(Intercept)	15.781	[10.808, 20.753]				
Age	−0.137	[−0.213, −0.0618]	−0.301	0.0004		
Gender	0.731	[−1.037, 2.499]	0.073	0.414	0.1704	0.0001
Mar. Status	−0.195	[−1.162, 0.772]	−0.032	0.690		
Designation	−0.876	[−2.550, 0.797]	0.093	0.302		
Work Area	−1.829	[−3.246, −0.410]	−0.208	0.011		

show that 14.8% of the variance in depression, can be accounted by five predictors collectively ($F(5, 135) = 4.694$, $p = 0.001$). Looking at the individual contributions of the predictors, the results show that age (b = −0.264, $p = 0.002$) and marital status (b = −0.155, $p = 0.058$) are statistically significant and negatively predict depression. It also shows that not all factors contribute to depression in HCWs.

Table 7(b); In this multivariable regression analysis anxiety was predicted by five factors namely; age, gender, marital status, designation and work area The data is also represented in scatted plot Figure 3(a) & Figure 3(b). Results show that 14.3%% of the variance in anxiety, can be accounted by five predictors collectively, ($F(5, 135) = 4.532$, $p = 0.001$). Looking at the individual contributions

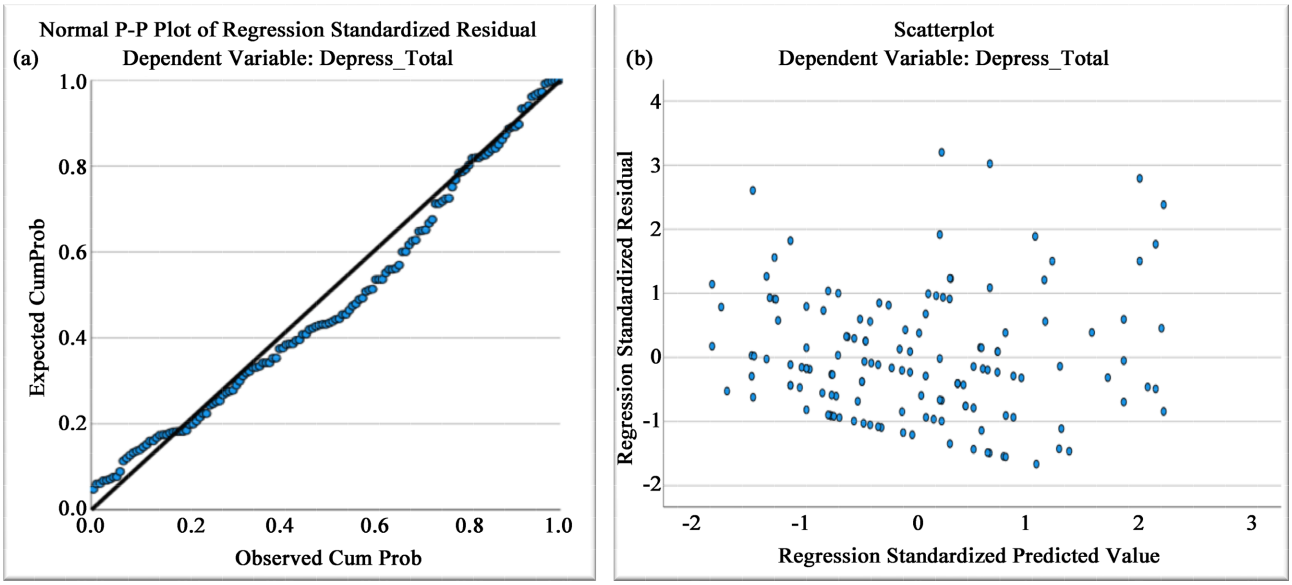

Figure 2. Regression analysis for depression.

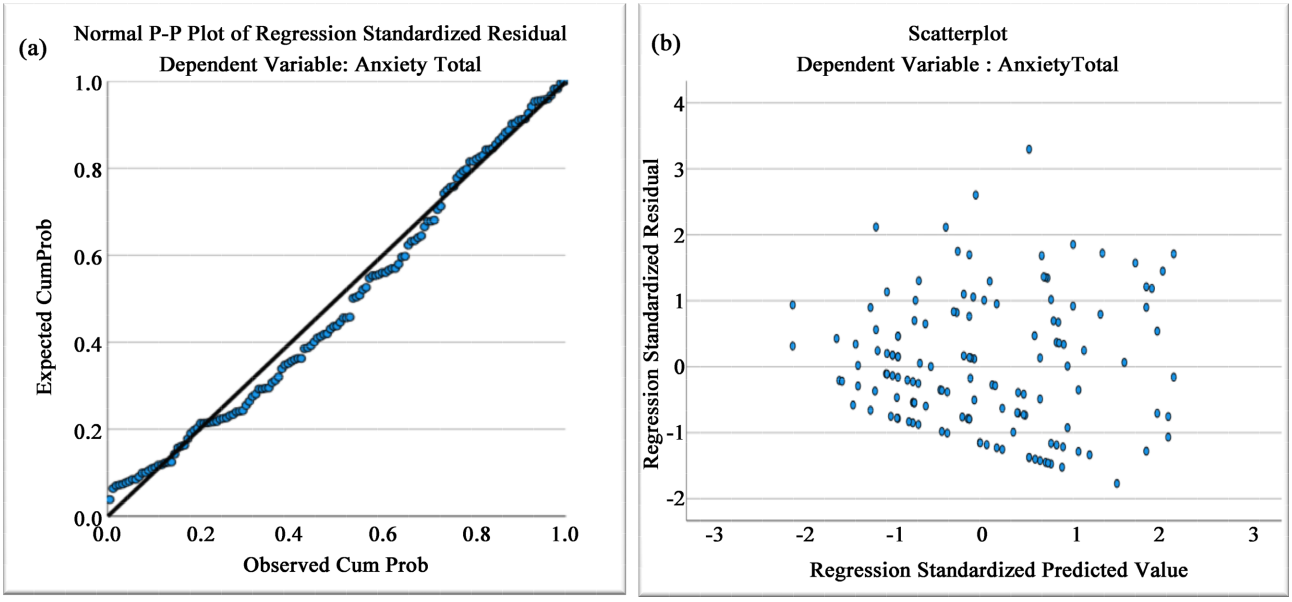

Figure 3. Regression analysis for anxiety.

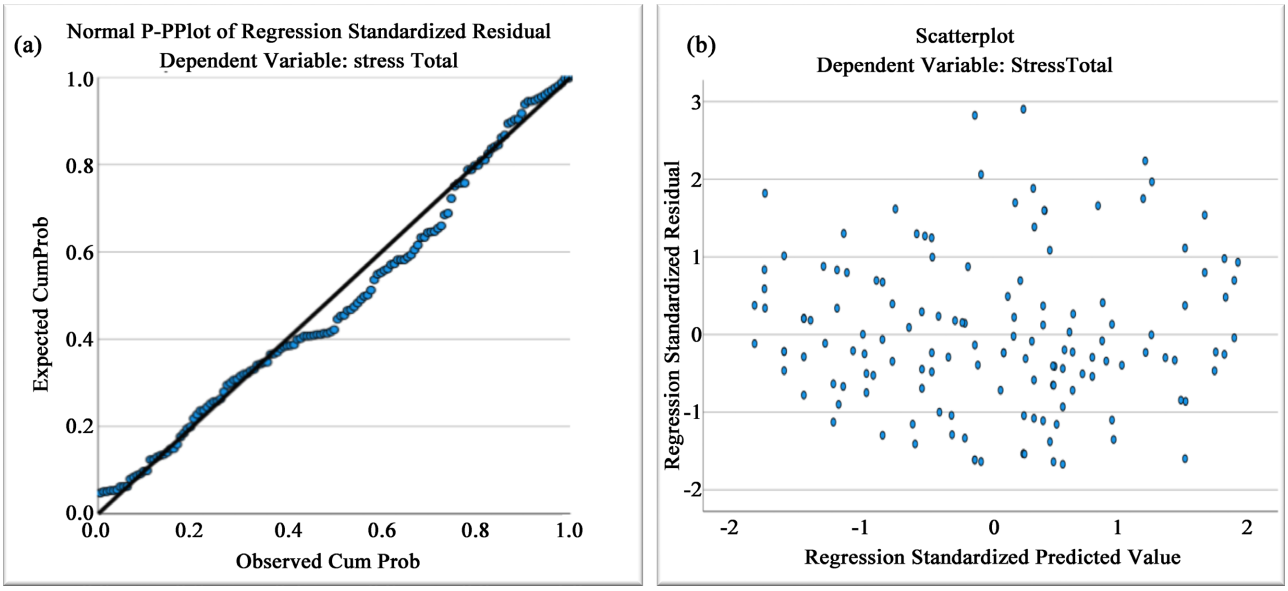

Figure 4. Regression analysis for stress.

of the predictors, the results show that age (b = −0.223, $p = 0.009$) and work area (b = −0.173, $p = 0.038$) are statistically significant and negatively predict anxiety. It also shows that not all factors contribute to anxiety in HCWs.

Table 7(c); In this multivariable regression analysis, stress is predicted by five factors namely; age, gender, marital status, designation and work area. The data is also represented in scatted plot Figure 4(a) & Figure 4(b). Results show that 17.0%% of the variance in stress, can be accounted by five predictors collectively, (F (5, 135) = 5.547, p = 0.001). Looking at the individual contributions of the predictors, the results show that age (b = -0.301, $p = 0.0004$) and work area (b = −0.208, p = 0.011) are statistically significant and negatively predict anxiety. It also shows that not all factors contribute to stress in HCWs.

4. Discussion

This study assessed the prevalence of anxiety, depression and stress among HCWs of Portiuncula hospital, due to COVID-19 pandemic by the aid of a questionnaire and DASS 21 scale. COVID-19 pandemic threw HCWs in a state of physical and mental stress due to the wide spread of the deadly virus.

The first aim of the study was to evaluate the magnitude of stress among HCWs. A recent study conducted by Lenzo *et al.* [42] depicted moderate to severe levels of depression, anxiety and stress among HCWs. On the other-hand, our study revealed mild to moderate levels of stress, anxiety and depression in HCWs. Moreover, majority of HCWs (65.2%) also asserted that they were not depressed due to the current situation. The reason for this might be the availability of PPE, sanitizers, face masks and vaccination, which was prioritised for HCWs in Ireland. Also, the conduction of this study took place when there was a declining phase in COVID-19 cases in Ireland, that could be the reason for less distress. In line with literature, our study also found that nurses experience more

stress than doctors [22] [24] [27] [28] [43]. Increased number of stressed nurses may be attributed to the fact that almost 70% of the participants in our study were nurses. But at the same time, we appreciate that nurses have a close dealing and prolonged contact with patients as compared to doctors.

The second aim of this study was to evaluate the personal and professional domains associated with stress among HCWs. Personal and family related factors were highlighted by various studies [24] [42] including our one, for causing stress among HCWs especially the frontlines. We found that most HCWs were married 105 (74.5%) and majority were worried and stressed about their family members getting infected by their exposure to COVID-19 patients. Contrary to our study findings, Ceri *et al.* [24] found that single HCWs were more depressed and stressed. A study done in China with 500 participants also showed opposite results to our study, that there is no association of stress with workplace and marital status [7]. These findings of our study could be explained by the fact that married people have more concerns and responsibilities towards family than singles. Another personal factor evaluated by our study was the initiation or increase in substance use like alcohol and smoking by some of the HCWs 40 (28.4%) to cope up with the tensed situation of pandemic. These harmful substances in turn are foreseen to have negative repercussions on their health. This data is critical to understand the factors associated with stress as well as the need for consideration of mental health of HCWs. Besides, at professional level, working in hospital environment was a reason for being stressed at "some of the times" that was 77 (54.6%). Additionally, majority of HCWs claimed that working and caring for COVID-19 patients was worth the effort. So, it can be said that working during pandemic was not the main stay of stress among HCWs but transmitting the infection to family was the leading concern.

The third aim of this study was to compare the stress levels in frontline HCWs and second-line HCWs. A considerable level of stress was observed in HCWs working front-line compared to second-line HCWs during COVID-19 outbreak, which corresponds with findings of various other researches [24] [27] [42] [43] [44] [48]. In contrast to our findings, another study showed that HCWs and non-HCWs were equally affected by pandemic in terms of psychological well-being [26]. In terms of demographic characteristics our study findings coincides with several other studies [24] [27] [43] that majority participants were females and nurses working frontline. Similar to study done by Barello *et al.* [45] our study also explored that three quarter of frontline HCWs (74.4%) were "most of the times" mentally distressed compared to just a quarter of second-line HCWs (24.5%). The possible reason of increased stress among frontline workers could be the fear of catching infection due to their daily exposure with COVID-19 patients and transmitting it to their family. Moreover" it was worth noting that front-line nurses were more stressed than doctors and second-line nurses. It is because front-line nurses are the people who deal with the patient in first place. Additionally, our study found out that most HCWs were from the age group 31

to 50 years, increased stress could be attributed to the fact that at this age, spouse and children are usually living in the same house, so the concern of transmitting infection is more. Another finding evaluated by our study was the increased physical stress among frontline workers compared to second-line workers that was (62.3%) and (37.7%) respectively. The reason behind this finding could be the surge in COVID-19 patients, who are treated in first place by frontline HCWs.

Despite of distress, this study examined majority (almost 75%) HCWs affirmed that it was worth working in such havoc times. Contrary to our findings a study done in India found that HCWs were stigmatised working during COVID019 because of harassment done to them by public [20]. This positive attitude of HCWs in Ireland, could be relayed back to the appreciation they got from people and government during pandemic. HCWs were facilitated in hospitals, provided PPE, sanitizers, face masks and were given supremacy for vaccine jabs. Fortunately, the HCWs in Ireland were not separated from their families during pandemic compared to some other countries like Turkey, where HCWs had to stay away from families for more than a week that showed negative repercussions on their mental health [24].

Furthermore, in this study more than three quarter of HCWs stated that phycological support is mandatory to overcome the stress caused by COVID-19 pandemic. A previous study done on Ebola outbreak survivors has revealed that post-traumatic stress is amongst the main aftermaths of pandemic and need a strong focus [36]. There is definitely a need to psychologically support the real heroes who are working day and night in this battle against COVID-19 pandemic. Our study also found out negative but statistically significant association between stress/anxiety with age and workplace whereas depression was negatively associated with age and marital status. The findings of our study provide valuable information about physiological well-being of HCWs during COVID-19 pandemic. This information can help government, policy makers and health organisations to prioritise mental health in times of infectious disease outbreak. Interventions and guidelines focusing and addressing the mental health of HCWs are mandatory. This study only emphasises on caring for psychological well-being of HCWs, and does not mention any suggestions for mental health problems.

Recommendations

Future researches with longitudinal studies are recommended to assess the long-term psychological consequences of COVID-19 outbreak on HCWs. With the past awareness of post-traumatic stress from Ebola and SARS outbreak, it is integral that nations and health organisations take a proactive role in addressing the distress due to COVID-19 pandemic. Provision of psychological aid to HCWs, brief interventions, self-care, team and administration support may show favourable results [58] [59].

Limitations

The study has several limitations that need to be acknowledged. First, the study was conducted in an acute setting hospital where there was limited number of staff. Moreover, probability of selection bias is there as convenience sampling was done. Second, the study was conducted at a point when all the HCWs were already been vaccinated and stress levels were low in contrast to the initial pandemic stage. The third limitation of this study was the use of Cross-sectional study design, which did not ascertain the causal relationship between variables. Therefore, further research is warranted in this arena using longitudinal studies for better clarification of mental-health effects of COVID-19 pandemic on HCWs.

5. Conclusion

Our study acknowledged the prevalence of mild to moderate levels of anxiety, depression and stress among HCWs due to COVID-19 pandemic. Various predictors for increased distress have been highlighted like middle-age, nurses, females, married and working frontline. The study also found that frontline HCWs were both physically and mentally stressed compared to second-line HCWs. Although, HCWs found it worth the effort by working and caring for COVID-19 patients, the most worrisome concern was transmission of infection to their loved ones. In accordance with HCW suggestions, this study also emphasises on addressing the phycological well-being of real heroes, who are battling the fight against COVID-19.

Acknowledgements

The author would like to thank the Research Ethics Committee, Galway for giving the approval for conduction of study. Also, thanks of gratitude to my supervisors and all the healthcare workers who participated in the study.

Funding

The research has no external funding.

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] National Health Commission of the People's Republic of China (2020, February 16) Update on the Novel Coronavirus Pneumonia Outbreak: China. http://www.nhc.gov.cn/xcs/yqtb/202002/18546da875d74445bb537ab014e7a1c6.shtml.

[2] Coronaviridae Study Group of the International Committee on Taxonomy of Virus (2020) The Species Severe Acute Respiratory Syndrome-Related Coronavirus: Classifying 2019-nCoV and Naming It SARS-CoV-2. *Nature Microbiology*, **5**, 536-544. https://doi.org/10.1038/s41564-020-0695-z

[3] Shi, Y., Wang, G., Cai, X., Deng, J., Zheng, L., Zhu, H., *et al.* (2020) An Overview of

COVID-19. *Journal of Zhejiang University*: *SCIENCE B*, **21**, 343-360. https://doi.org/10.1631/jzus.B2000083

[4] Meng, L., Hua, F. and Bian, Z. (2020) Coronavirus Disease 2019 (COVID-19): Emerging and Future Challenges for Dental and Oral Medicine. *Journal of Dental Research*, **99**, 481-487. https://doi.org/10.1177/0022034520914246

[5] World Health Organization (2020, March 11) WHO Director-General's Opening Remarks at the Media Briefing on COVID-19. World Health Organization, Geneva. https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

[6] Pfefferbaum, B. and North, C.S. (2020) Mental Health and the Covid-19 Pandemic. *The New England Journal of Medicine*, **383**, 510-512. https://doi.org/10.1056/NEJMp2008017

[7] Wu, P., Fang, Y., Guan, Z., Fan, B., Kong, J., Yao, Z., *et al.* (2009) The Psychological Impact of the SARS Epidemic on Hospital Employees in China: Exposure, Risk Perception, and Altruistic Acceptance of Risk. *The Canadian Journal of Psychiatry*, **54**, 302-311. https://doi.org/10.1177/070674370905400504

[8] Lu, Y.C., Chang, Y.Y. and Shu, B.C. (2009) Mental Symptoms in Different Health Professionals during the SARS Attack: A Follow-Up Study. *Psychiatric Quarterly*, **80**, Article No. 107. https://doi.org/10.1007/s11126-009-9095-5

[9] (2021, January 12) Ireland Had World's Highest Covid-19 Infection Rate Last Week. *The Irish Times*.

[10] Santarone, K., McKenney, M. and Elkbuli, A. (2020) Preserving Mental Health and Resilience in Frontline Healthcare Workers during COVID-19. *The American Journal of Emergency Medicine*, **38**, 1530-1531. https://doi.org/10.1016/j.ajem.2020.04.030

[11] Nicola, M., O'Neill, N., Sohrabi, C., Khan, M., Agha, M. and Agha, R. (2020) Evidence Based Management Guideline for the COVID-19 Pandemic: Review Article. *International Journal of Surgery*, **77**, 206-216. https://doi.org/10.1016/j.ijsu.2020.04.001

[12] Kimball, A., Hatfield, K.M., Arons, M., James, A., Taylor, J., Spicer, K. and Public Health—Seattle & King County, CDC COVID-19 Investigation Team (2020) Asymptomatic and Pre-Symptomatic SARS-CoV-2 Infections in Residents of a Long-Term Care Skilled Nursing Facility—King County, Washington, March 2020. *Morbidity and Mortality Weekly Report*, **69**, 377-381. https://doi.org/10.15585/mmwr.mm6913e1

[13] MacIntyre, C.R. and Wang, Q. (2020) Physical Distancing, Face Masks, and Eye Protection for Prevention of COVID-19. *Lancet*, **395**, 1950-1951. https://doi.org/10.1016/S0140-6736(20)31183-1

[14] Chughtai, A.A., Seale, H., Islam, M.S., Owais, M. and Macintyre, C.R. (2020) Policies on the Use of Respiratory Protection for Hospital Health Workers to Protect from Coronavirus Disease (COVID-19). *International Journal of Nursing Studies*, **105**, Article ID: 103567. https://doi.org/10.1016/j.ijnurstu.2020.103567

[15] World Health Organization (2020) Coronavirus Disease (COVID-19) Advice for the Public: When and How to Use Masks. World Health Organization, Geneva. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/when-and-how-to-use-masks

[16] Sharma, O., Sultan, A.A., Ding, H. and Triggle, C.R. (2020) A Review of the Progress and Challenges of Developing a Vaccine for COVID-19. *Frontiers in Immunology*, **11**, Article ID: 585354. https://doi.org/10.3389/fimmu.2020.585354

[17] Wu, S.C. (2020) Progress and Concept for COVID-19 Vaccine Development. *Bio-*

technology Journal, **15**, Article ID: 2000147. https://doi.org/10.1002/biot.202000147

[18] Bagcchi, S. (2020) Stigma during the COVID-19 Pandemic. *The Lancet Infectious Diseases*, **20**, 782. https://doi.org/10.1016/S1473-3099(20)30498-9

[19] McKay, D., Heisler, M., Mishori, R., Catton, H. and Kloiber, O. (2020) Attacks against Health-Care Personnel Must Stop, Especially as the World Fights COVID-19. *Lancet*, **395**, 1743-1745. https://doi.org/10.1016/S0140-6736(20)31191-0

[20] Iyengar, K.P., Jain, V.K. and Vaishya, R. (2020) Current Situation with Doctors and Healthcare Workers during COVID-19 Pandemic in India. *Postgraduate Medical Journal*, Published Online First. https://doi.org/10.1136/postgradmedj-2020-138496

[21] Walton, M., Murray, E. and Christian, M.D. (2020) Mental Health Care for Medical Staff and Affiliated Healthcare Workers during the COVID-19 Pandemic. *European Heart Journal. Acute Cardiovascular Care*, **9**, 241-247. https://doi.org/10.1177/2048872620922795

[22] Wang, H., Liu, Y., Hu, K., Zhang, M., Du, M., Huang, H., *et al.* (2020) Healthcare Worker's Stress When Caring for COVID-19 Patients: An Altruistic Perspective. *Nursing Ethics*, **27**, 1490-1500. https://doi.org/10.1177/0969733020934146

[23] Foley, S.J., O'Loughlin, A. and Creedon, J. (2020) Early Experiences of Radiographers in Ireland during the COVID-19 Crisis. *Insights into Imaging*, **11**, Article ID: 104. https://doi.org/10.1186/s13244-020-00910-6

[24] Ceri, V. and Cicek, I. (2021) Psychological Well-Being, Depression and Stress during COVID-19 Pandemic in Turkey: A Comparative Study of Healthcare Professionals and Non-Healthcare Professionals. *Psychology, Health & Medicine*, **26**, 85-97. https://doi.org/10.1080/13548506.2020.1859566

[25] Zhu, Z., Xu, S., Wang, H., Liu, Z., Wu, J., Li, G., *et al.* (2020) COVID-19 in Wuhan: Immediate Psychological Impact on 5062 Health Workers. *eClinicalMedicine*, **24**, Article ID: 100443. https://doi.org/10.1016/j.eclinm.2020.100443

[26] Gasparro, R., Scandurra, C., Maldonato, N.M., Dolce, P., Bochicchio, V., Valletta, A., *et al.* (2020) Perceived Job Insecurity and Depressive Symptoms among Italian dentists: The Moderating Role of Fear of COVID-19. *International Journal of Environmental Research and Public Health*, **17**, Article No. 5338. https://doi.org/10.3390/ijerph17155338

[27] Guo, J., Liao, L., Wang, B., Li, X., Guo, L., Tong, Z., *et al.* (2020) Psychological Effects of COVID-19 on Hospital Staff: A National Cross-Sectional Survey of China Mainland. *Lancet Psychiatry*. SSRN ID: 3550050. https://doi.org/10.2139/ssrn.3550050

[28] Weilenmann, S., Ernst, J., Petry, H., Pfaltz, M.C., Sazpinar, O., Gehrke, S., *et al.* (2021) Health Care Workers' Mental Health during the First Weeks of the SARS-CoV-2 Pandemic in Switzerland—A Cross-Sectional Study. *Front Psychiatry*, **12**, Article ID: 594340. https://doi.org/10.3389/fpsyt.2021.594340

[29] Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., Zhang, J., *et al.* (2020) Clinical Characteristics of 138 Hospitalized Patients with 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA*, **323**, 1061-1069. https://doi.org/10.1001/jama.2020.1585

[30] Erdem, H. and Lucey, D.R. (2021) Healthcare Worker Infections and Deaths Due to COVID-19: A Survey from 37 Nations and a Call for WHO to Post National Data on Their Website. *International Journal of Infectious Diseases*, **102**, 239-241. https://doi.org/10.1016/j.ijid.2020.10.064

[31] Hindustan Times (2021, February 3) IMA Refutes Govts Data, Says 734 Doctors

Died Due to Covid-19, Condemns Centres Apathy.
https://www.hindustantimes.com/india-news/ima-refutes-govt-s-data-says-734-doctors-died-due-to-covid-19-condemns-centre-s-apathy-101612365469868.html

[32] Ruitenburg, M.M., Frings-Dresen, M.H. and Sluiter, J.K. (2012) The Prevalence of Common Mental Disorders among Hospital Physicians and Their Association with Self-Reported Work Ability: A Cross-Sectional Study. *BMC Health Services Research*, **12**, Article No. 292. https://doi.org/10.1186/1472-6963-12-292

[33] Bai, Y., Lin, C.C., Lin, C.Y., Chen, J.Y., Chue, C.M. and Chou, P. (2004) Survey of Stress Reactions among Health Care Workers Involved with the SARS Outbreak. *Psychiatric Services*, **55**, 1055-1057. https://doi.org/10.1176/appi.ps.55.9.1055

[34] Goulia, P., Mantas, C., Dimitroula, D., Mantis, D. and Hyphantis, T. (2010) General Hospital Staff Worries, Perceived Sufficiency of Information and Associated Psychological Distress during the A/H1N1 Influenza Pandemic. *BMC Infectious Diseases*, **10**, Article No. 322. https://doi.org/10.1186/1471-2334-10-322

[35] Pfefferbaum, B., Schonfeld, D., Flynn, B.W., Norwood, A.E., Dodgen, D., Kaul, R.E., *et al.* (2012) The H1N1 Crisis: A Case Study of the Integration of Mental and Behavioural Health in Public Health Crises. *Disaster Medicine and Public Health Preparedness*, **6**, 67-71. https://doi.org/10.1001/dmp.2012.2

[36] Ji, D., Ji, Y.J., Duan, X.Z., Li, W.G., Sun, Z.Q., Song, X.A., *et al.* (2017) Prevalence of Psychological Symptoms among Ebola Survivors and Healthcare Workers during the 2014-2015 Ebola Outbreak in Sierra Leone: A Cross-Sectional Study. *Oncotarget*, **8**, 12784-12791. https://doi.org/10.18632/oncotarget.14498

[37] World Health Organisation (2014) Psychological First Aid for Ebola Virus Disease Outbreak.
http://www.who.int/mental_health/emergencies/psychological_first_aid_ebola/en/#

[38] World Health Organization (2017) Pandemic Influenza Risk Management: A WHO Guide to Inform and Harmonize National and International Pandemic Preparedness and Response. World Health Organization, Geneva.

[39] Maunder, R.G., Lancee, W.J., Balderson, K.E., Bennett, J.P., Borgundvaag, B., Evans, S., *et al.* (2006) Longterm Psychological and Occupational Effects of Providing Hospital Healthcare during SARS Outbreak. *Emerging Infectious Diseases*, **12**, 1924-1932. https://doi.org/10.3201/eid1212.060584

[40] Argentero, P. and Setti, I. (2011) Engagement and Vicarious Traumatization in Rescue Workers. *International Archives of Occupational and Environmental Health*, **84**, 67-75. https://doi.org/10.1007/s00420-010-0601-8

[41] Bellelli, G., Di Schiena, R. (Ed.) (2012) Decisions and Emotions: How Psychology Explains the Conflict between Reason and Feeling. II Mulino, Bologna.

[42] Lenzo, V., Quattropani, M.C., Sardella, A., Martino, G. and Bonanno, G.A. (2021) Depression, Anxiety, and Stress among Healthcare Workers during the COVID-19 Outbreak and Relationships with Expressive Flexibility and Context Sensitivity. *Frontiers in Psychology*, **12**, Article ID: 623033.
https://doi.org/10.3389/fpsyg.2021.623033

[43] Lai, J., Ma, S., Wang, Y., Cai, Z., Hu, J., Wei, N., *et al.* (2020) Factors Associated with Mental Health Outcomes among Health Care Workers Exposed to Coronavirus Disease 2019. *JAMA Network Open*, **3**, Article ID: e203976.
https://doi.org/10.1001/jamanetworkopen.2020.3976

[44] Cheung, T. and Yip, P.S. (2015) Depression, Anxiety and Symptoms of Stress among Hong Kong Nurses: A Cross-Sectional Study. *International Journal of Environmental Research and Public Health*, **12**, 11072-11100.

https://doi.org/10.3390/ijerph120911072

[45] Barello, S., Palamenghi, L. and Graffigna, G. (2020) Burnout and Somatic Symptoms among Frontline Healthcare Professionals at the Peak of the Italian COVID-19 Pandemic. *Psychiatry Research*, **290**, Article ID: 113129. https://doi.org/10.1016/j.psychres.2020.113129

[46] Ali, S., Maguire, S., Marks, E., Doyle, M. and Sheehy, C. (2020) Psychological Impact of the COVID-19 Pandemic on Healthcare Workers at Acute Hospital Settings in the South-East of Ireland: An Observational Cohort Multicentre Study. *BMJ Open*, **10**, Article ID: e042930. https://doi.org/10.1136/bmjopen-2020-042930

[47] Chatterjee, S.S., Malathesh Barikar, C. and Mukherjee, A. (2020) Impact of COVID-19 Pandemic on Pre-Existing Mental Health Problems. *Asian Journal of Psychiatry*, **51**, Article ID: 102071. https://doi.org/10.1016/j.ajp.2020.102071

[48] Rossi, R., Socci, V., Pacitti, F., Di Lorenzo, G., Di Marco, A., Siracusano, A., *et al.* (2020) Mental Health Outcomes among Frontline and Second-Line Health Care workers during the Coronavirus Disease 2019 (COVID-19) Pandemic in Italy. *JAMA Network Open*, **3**, Article ID: e2010185. https://doi.org/10.1001/jamanetworkopen.2020.10185

[49] Sritharan, J., Jegathesan, T., Vimaleswaran, D. and Sritharan, A. (2020) Mental Health Concerns of Frontline Workers during the COVID-19 Pandemic: A Scoping Review. *Global Journal of Health Science*, **12**, 89-105. https://doi.org/10.5539/gjhs.v12n11p89

[50] Ornell, F., Halpern, S.C., Kessler, F.H. and Narvaez, J.C. (2020) The Impact of the COVID-19 Pandemic on the Mental Health of Healthcare Professionals. *Cad Saude Publica*, **36**, Article ID: e00063520. https://doi.org/10.1590/0102-311x00063520

[51] University of New South Wales (2005) Depression Anxiety Stress Scales. http://www2.psy.unsw.edu.au/groups/dass/

[52] Crawford, J.R., Henry, J.D. (2003) The Depression Anxiety Stress Scales (DASS): Normative Data and Latent Structure in a Large Non-Clinical Sample. *British Journal of Clinical Psychology*, **42**, 111-131. https://doi.org/10.1348/014466503321903544

[53] Lovibond, P.F. and Lovibond, S.H. (1995) The Structure of Negative Emotional States: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, **33**, 335-343. https://doi.org/10.1016/0005-7967(94)00075-U

[54] Antony, M.M., Bieling, P.J., Cox, B.J., Enns, M.W. and Swinson, R.P. (1998) Psychometric Properties of the 42-Item and 21-Item Versions of the Depression Anxiety Stress Scales in Clinical Groups and a Community Sample. *Psychological Assessment*, **10**, 176-181. https://doi.org/10.1037/1040-3590.10.2.176

[55] Tran, T.D., Tran, T. and Fisher, J. (2013) Validation of the Depression Anxiety Stress Scales (DASS) 21 as a Screening Instrument for Depression and Anxiety in a Rural Community-Based Cohort of Northern Vietnamese Women. *BMC Psychiatry*, **13**, Article No. 24. https://doi.org/10.1186/1471-244X-13-24

[56] Oei, T.P., Sawang, S., Goh, Y.W. and Mukhtar, F. (2013) Using the Depression Anxiety stress Scale 21 (DASS-21) across Cultures. *International Journal of Psychology*, **48**, 1018-1029. https://doi.org/10.1080/00207594.2012.755535

[57] Cohen, J. (1988) Statistical Power Analysis for the Behavioural Sciences. 2nd Edition, 12 Lawrence Erlbaum Associates Inc., Hillsdale.

[58] Unützer, J., Kimmel, R.J. and Snowden, M. (2020) Psychiatry in the Age of

COVID-19. *World Psychiatry*, **19**, 130-131. https://doi.org/10.1002/wps.20766

[59] Minihan, E., Gavin, B., Kelly, B.D. and McNicholas, F. (2020) COVID-19, Mental Health and Psychological First Aid. *Irish Journal of Psychological Medicine*, **37**, 259-263. https://doi.org/10.1017/ipm.2020.41