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Published online: 06 Apr 2021.

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Factors Associated with Mental Health Outcomes: Results from a Tertiary Referral Hospital in Lebanon during the COVID-19 Pandemic

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ABSTRACT

Coronavirus Disease (COVID-19) has caused global mental health impacts, and healthcare workers (HCWs) face an increased risk of exposure to the disease when compared to the general population. This study aimed to assess factors associated with mental health among Lebanese HCWs six months after the start of the COVID-19 pandemic. A cross-sectional study was conducted among HCWs at a tertiary hospital, in Lebanon between June and July 2020. The survey included data on demographics, exposure to COVID-19, preparedness to COVID-19 outbreak, risk perceptions of COVID-19, and mental health dimensions. Chi-squared and Fisher's exact tests were used to understand the association among these variables. One hundred and ninety-three of 1,600 Lebanese HCWs participated. More than 80% reported high preparedness levels towards the COVID-19 outbreak, 69% believed that their job was putting them at risk, and 70% altruistically accepted these risks. Anxiety and depression symptomatology were present in 24% and 23% of HCWs; who were more likely to feel more stress at work (83% vs 60%; $p = 0.004$; 82% vs 61%; $p = 0.01$, respectively), feel afraid of falling ill (72% vs 55%; $p = 0.03$; 77% vs 54%; $p = 0.01$, respectively), fear death (21% vs 7%; $p = 0.01$; 25% vs 6%; $p \leq 0.001$, respectively), and believed that people avoided their families (39% vs 21%; $p = 0.01$; 35% vs 65%; $p = 0.02$, respectively). HCWs who reported signs of depression were less likely to altruistically accept the risks of caring for COVID-19 patients, compared to those who did not (57% vs 74%; $p = 0.03$). This study aimed to detect factors associated with mental health among Lebanese HCWs during the COVID-19 pandemic. Findings suggested that altruistic acceptance of COVID-19 risks is higher among HCWs with positive exposure history to COVID-19 and those with less depressive symptomatology.

1. Introduction

The ongoing Coronavirus Disease 19 (COVID-19) pandemic has affected all aspects of daily life and caused individuals to feel destabilized, with many struggling to adapt to life under quarantine [1]. Researchers have been attempting to describe the increased psychological distress and to investigate the underlying triggers of these symptoms in relation to the pandemic. Multiple studies have documented an increase in overall psychological distress [1,2], which could be predictive of a long-term increase in mental health issues among exposed populations [1–3]. As of December 2020, the international count is over 72 million cases with almost 1.5 million deaths. In Lebanon, the numbers have been rapidly escalating, with over 140,000 cases to date [4].

Due to the nature of their work at the frontlines of the fight against COVID-19, healthcare workers (HCWs) face an increased risk of exposure to the disease when compared to the general population [5].

This in turn could put them at higher risk of developing psychological distress. Information extrapolated from studies conducted during recent similar pandemics ((Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS)) has been helpful in predicting the trends of mental health issues that would unfold during this one. Research conducted on the psychological impact of working during the SARS epidemic indicated that HCWs reported symptoms of post-traumatic stress disorder due to the acute stress experienced under those conditions [6]. Nonetheless, the realization of the full-extent of the COVID-19 pandemic as well as fears of lack of proper preparedness by healthcare institutions might not have been apparent in sample populations tested for psychological symptoms early during the pandemic [7].

The stress-appraisal theory hypothesizes that perceived vulnerability to a disease as well as the ability to cope with the pandemic affect the extent of

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perceiving it as a threat [8]. It is important to understand the relationship between COVID-19 risk perceptions and HCWs' mental health, as well as attempting to examine the factors that would enable HCWs to cope with this pandemic. Additionally, theories in social psychology have stated that altruistic behavior gains dominance over negative emotions and anxiety, which leads to increased engagement in altruistic activities in challenging situations [9]. Few studies have tried to understand the impact of altruistic acceptance of risks by HCWs on the psychological responses towards the pandemic; hence, it is pertinent to examine this variable and its impact on mental health.

To our knowledge, this is the first study in Lebanon that aims to assess the preparedness of HCWs six months after the COVID-19 pandemic, their perceptions of COVID-19 risks, their altruistic acceptance of risks, as well as the extent to which these variables are associated with mental health dimensions (anxiety and depression) among these HCWs. The results of this study might serve as important evidence for healthcare policy makers and mental health advocates in Lebanon, in order to develop and implement mental health programs, and better design risk communication programs for future pandemics.

2. Material and methods

2.1. Study design and population

This study used a quantitative cross-sectional research design. It was conducted at the American University of Beirut Medical Center (AUBMC), a tertiary care hospital in Lebanon, which treats COVID-19 patients. After securing ethical approval, data were collected using online self-administered questionnaire, via the Lime Survey portal. Since the study has no foreseeable risks, consent was obtained in an electronic format. All physicians, residents, and nurses working in the hospital who agreed to participate in the study were included. No exclusion criteria were applied. For privacy and confidentiality, the researchers were blinded to the list of emails of participants and all data were completely de-identified.

2.2. Instrumentation

Data were collected using an online questionnaire, consisting of five parts: (a) basic demographics, (b) data on exposure to COVID-19, (c) data on preparedness to COVID-19 outbreak, (d) during outbreak-perceptions of COVID-19 related risks/feelings, and (e) mental health dimensions (anxiety and depression).

2.2.1. Demographics
Participants were asked to provide information on demographic items: (a) age (b) gender (c) occupation (d) work experience and (e) living conditions.

2.2.2. Exposure to COVID-19
Participants were asked to answer four questions on whether they have (a) worked in a unit dealing with suspected COVID-19 patients, (b) been exposed to COVID-9 person, (c) cared for COVID-19 patient, (d) had a family member or relative infected by COVID-19. Each of these variables were answered with yes or no.

2.2.3. Preparedness for COVID-19
Participants from anesthesiology, emergency medicine, family medicine, internal medicine, obstetrics/gynecology, pediatrics and surgical specialties were asked to rate the preparedness of their practice towards the COVID-19 pandemic. Questions were answered using yes or no, or do not know. This survey has been previously administered as a nationwide survey by the National Nurses United (NNU) in the USA in March 2020 [10].

2.2.4. Risk perceptions and altruistic acceptance of risk questionnaire
This perceived threat questionnaire was developed by Chong et al. during the SARS pandemic [11], and was used in this study to measure outbreak perceptions of COVID-19 related risks. This 10-item questionnaire uses a 5-item Likert scale (strongly disagree, disagree, not sure, agree, strongly agree). Nine of these items addressed employees during-outbreak perceptions of a COVID-related threat, while the 10th item was a measure of altruistic acceptance of risk. Responses were dichotomized into positive responses: 'agree' or 'strongly agree', while 'strongly disagree', 'disagree', and 'not sure' were considered negative.

2.2.5. Mental health dimensions (PHQ-4)
The mental health of respondents was assessed using the four-item Patient Health Questionnaire (PHQ-4), a shortened version of the longer PHQ, which offers psychologists a concise, self-administered tool for assessing anxiety and depression. It consists of a 2-items depression scale (PHQ-2) and a 2-items anxiety scale for the General Anxiety Disorder (GAD-2) [12], and it was tested for validity and reliability. The internal consistencies, measured by Cronbach's alpha, for PHQ-4, PHQ2, and GAD2 are $\alpha = 0.78$, $\alpha = 0.75$, and $\alpha = 0.82$, respectively, and all are acceptable. In addition, the intercorrelation of the subscales PHQ-2 and GAD-2 ($r = 0.61$) reached the expected height.

This 4-item questionnaire uses a 4-item Likert scale ranging from 0 to 3 (0 = not at all, 1 = several days, 2 = more than half days, 3 = nearly every day). The responses on each 2-item subscale were dichotomized into positive for anxiety/depression symptomatology and negative for anxiety/depression symptomatology, whereby a score of 3 or greater was considered positive for screening purposes.

3. Data collection

Data were collected using an online survey. A pool of 1600 HCWs (physicians, residents, and nurses) received an invitation email to participate in the study between June 2020 and July 2020 after a major surge in the number of coronavirus cases in Lebanon. This invitation comprised a brief synopsis of the research and purpose of the study, along with an informed consent to be signed electronically before taking the survey.

3.1. Data analysis

The statistical analysis of the data was performed using IBM's Statistical Package for the Social Sciences (SPSS) version 27.0. Descriptive analysis was conducted to elaborate the data collected from the survey in terms of frequency and percentages for categorical variables (gender, occupation, work experience, living conditions, preparedness, risk perception, altruistic acceptance of risks, and mental health dimensions), as well as mean and standard deviation for continuous ones (age). Chi-squared test and Fisher's exact test were used to understand the bivariate associations of [1] risk perceptions with demographics and exposure history [2], altruistic acceptance of risk with demographics and exposure history [3], mental health dimensions with demographics and exposure history [4], risk perceptions and altruistic acceptance of risk with mental health dimensions.

3.1.1. Ethical consideration

The ethical approval was secured from the Institutional Review Board at the American University of Beirut (AUB; IRB# SBS-2020-0194) on 5 June 2020.

4. Results

4.1. Characteristics of respondents

Of all invited participants, 193 (12%) filled the questionnaire. The surveyed HCWs comprised 57% women and 43% men with a mean age of 38 (21–75) years. Thirty-three percent of them were attending physicians, 24% were residents, and 43% were nurses. Thirty percent of respondents had a work experience of more than 16 years, and the majority of them (72%) lived with their families during the outbreak. Sixty-six percent reported working in units dealing with suspected COVID-19 patients, 22% were exposed to COVID-19 person, 18% cared for COVID-19 patients, and 10% reported having one COVID-19 positive family member or friend.

4.2. Preparedness

Six out of the ten preparedness items scored 80% and above, and these were [1]: employer provided information about novel coronavirus and how to recognize and respond to possible cases [2] employer instituted travel/exposure history screening for all patients with fever and/or respiratory symptoms [3] employees have access to N95 respirators [4] employees were trained on safely donning and doffing proper personal protective equipment (PPE) in the previous year [5] there has been a plan in place to isolate a patient with a possible novel coronavirus infection and [6] employer had a policy to address employees with suspected or known exposure to novel coronavirus. The remaining four items scored lower, and addressed having access to powered air-purifying respirators (28%), having sufficient PPE stock on hand (63%), being fit tested in the previous year (46%), and having an overflow plan to place additional trained staff to enable safe care provision to patients on isolation for possible novel coronavirus exposure (59%) (Table 1).

4.3. Risk perceptions and altruistic acceptance of risk during the outbreak

Nearly two thirds of HCWs believed that their job was putting them at risk and felt extra stress at work. In addition, 59% were afraid of falling ill with COVID-19, while 43% felt they had little control over being infected or not. Ten percent of participants felt they would die if they get infected and 3% thought about resigning because of COVID-19. Seventy-seven percent were afraid to pass COVID-19 to others and 60% were concerned that families and friends feared to get infection through them. Only 25% were worried that people avoided their families because of their work. As for altruistic acceptance of risks, most participants (70%) accepted taking the risk of caring for COVID-19 patients (Appendix A).

A considerable proportion of nurses felt extra stress at work (81%, 95% C.I. [73%, 89%]) compared to physicians and residents (60%, 95% C.I. [47%, 72%] and 46%, 95% C.I. [31%, 61%]; $p < 0.001$), were afraid of falling ill with COVID-19 (69%, 95% C.I. [58%, 79%]) compared to physicians and residents (52%, 95% C.I. [39%, 65%] and 50%, 95% C.I. [35%, 65%]; $p = 0.05$), and perceived that people avoided their families because of work (41%, 95% C.I. [31%, 53%]) compared

Table 1. Respondents' perceived preparedness to COVID-19 outbreak.

	n (%) out of 152[a]	95% C.I. (LL, UL)
• My employer has provided me with information about novel coronavirus and how to recognize and respond to possible cases	140 (92)	(87, 96)
• My employer has instituted travel/exposure history screening for all patients with fever and/or respiratory symptoms	140 (92)	(87, 96)
• I have access to N95 respirators in my unit/department	121 (80)	(72, 86)
• I have access to PAPRs	43 (28)	(21, 36)
• My employer has sufficient PPE stock on hand t protect staff if there is a rapid surge in patients with possible coronavirus infections	96 (63)	(55, 71)
• I have been trained on safely donning and doffing PPE in the previous year	123 (81)	(74, 87)
• I have been fit tested in the previous year	69 (46)	(37, 54)
• There has been a plan in place to isolate a patient with a possible novel coronavirus infection	132 (87)	(80, 92)
• My employer had an overflow plan to place additional, trained staff to enable safe care provision to patients on isolation for possible novel coronavirus	89 (59)	(50, 66)
• My employer has a policy to address employees with suspected or known exposure to novel coronavirus	127 (84)	(77, 89)

[a]152 is the total number of participants who were asked about preparedness, and those were from anesthesiology, emergency medicine, family medicine, internal medicine, obstetrics/gynecology, pediatrics, and surgical specialties.
95% C.I. (LL, UL): 95% Confidence Interval for a Proportion (Lower Limit, Upper Limit).

to physicians and residents (10%, 95% C.I. [2%, 20%] and 17%, 95% C.I. [8%, 31%]; $p < 0.01$). Also, residents were more afraid of passing COVID-19 to others (89%, 95% C.I. [76%, 96%]) than physicians and nurses (67%, 95% C.I. [54%, 78%] and 77%, 95% C.I. [67%, 86%]; $p = 0.02$). As for living conditions, HCWs who lived alone were more likely to accept caring for COVID-19 patients than those who lived with their families (87%, 95% C.I. [76%, 95%] vs 64%, 95% C.I. [55%, 72%]; $p = 0.003$) (Appendix A).

A higher proportion of HCWs working in units dealing with suspected COVID-19 patients perceived the following risks compared to those who did not: their job was putting them at great risk (78%, 95% C.I. [70%, 85%] vs 56%, 95% C.I. [45%, 68%]; $p = 0.001$), extra stress at work (75%, 95% C.I. [66%, 82%] vs 53%, 95% C.I. [41%, 64%]; $p = 0.001$), significant worries by family and friends (68%, 95% C.I. [58%, 76%] vs 47%, 95% C.I. [36%, 49%]; $p = 0.005$), and people avoiding their families (34%, 95% C.I. [25%, 43%] vs 13%, 95% C.I. [6%, 22%]; $p = 0.001$). In addition, HCWs who worked in a unit dealing with suspected COVID-19

patients, exposed to a COVID-19 person, or cared for COVID-19 patient were more likely to accept the risks than those who did not (76%, 95% C.I. [67%, 83%] vs 62%, 95% C.I. [50%, 72%]; $p = 0.04$, 86%, 95% C.I. [75%, 96%] vs 66%, 95% C.I. [57%, 73%]; $p = 0.01$, and 88%, 95% C.I. [73%, 97%] vs 66%, 95% C.I. [58%, 73%]; $p = 0.008$, respectively) (Appendix B).

4.4. Mental health

Anxiety and depression symptomatology were present in 24% and 23% of the participants, respectively. A higher proportion of nurses developed anxiety symptoms compared to physicians and residents (36%, 95% C.I. [26%, 47%] vs 18%, 95% C.I. [9%, 29%] and 13%, 95% C.I. [4%, 26%]; $p = 0.004$), and depression symptoms (32%, 95% C.I. [22%, 43%] vs 18%, 95% C.I. [9%, 29%] and 13%, 95% C.I. [5%, 26%]; $p = 0.02$) (Table 2). No significant association was found between exposure history and mental health (Table 3).

As shown in Table 4, HCWs who developed anxiety and depression symptoms were more likely to report the following: feeling extra stress at work (83%, 95% C.I. [69%, 92%] vs 60%, 95% C.I. [52%, 68%]; $p = 0.004$; 82%, 95% C.I. [67%, 92%] vs 61%, 95% C.I. [53%, 69%]; $p = 0.01$, respectively), being afraid of falling ill with COVID-19 (72%, 95% C.I. [57%, 84%] vs 55%, 95% C.I. [46%, 63%]; $p = 0.03$; 77%, 95% C.I. [62%, 89%] vs 54%, 95% C.I. [45%, 62%]; $p = 0.01$, respectively), fear of death (21%, 95% C.I. [11%, 36%] vs 7%, 95% C.I. [3%, 12%]; $p = 0.01$; 25%, 95% C.I. [13%, 40%] vs 6%, 95% C.I. [3%, 11%]; $p = < 0.001$, respectively), and people avoiding their families (40%, 95% C.I. [26%, 56%] vs 21%, 95% C.I. [14%, 28%]; $p = 0.01$; 35%, 95% C.I. [24%, 55%] vs 21%, 95% C.I. [15%, 29%]; $p = 0.02$, respectively). In addition, HCWs who developed anxiety symptoms were also more likely to be worried about infecting others with COVID-19 as compared to those who did not (87%, 95% C.I. [74%, 95%] vs 73%, 95% C.I. [65%, 80.2%]; $p = 0.05$). A higher proportion of HCWs who developed depression symptoms believed their job was putting them at great risk compared to those who did not report depressive symptoms (86%, 95% C.I. [73%, 95%] vs 64%, 95% C.I. [56%, 72%]; $p = 0.01$). Also, HCWs who reported signs of depression symptoms were also less likely to altruistically accept the risks of caring for COVID-19 patients, compared to those who did not (57%, 95% C.I. [41%, 72%] vs 74%, 95% C.I. [66%, 81%]; $p = 0.03$).

5. Discussion

The field healthcare is very stressful, with high prevalence of burnout, anxiety, and depressive symptoms. This has been established in the literature and

Table 2. Association of mental health dimensions with demographics.

		Gender			Occupation			Living conditions		
		n (%)[a]			n (%)[a]			n (%)[a]		
Dimension	Total, n (%)[a]	Males, n = 83	Females, n = 110	P-value	Physician, n = 63	Resident, n = 46	Nurse, n = 84	P-value	With family, n = 138	Alone, n = 55	P-value
Anxiety	47 (24)	16 (19)	31 (28)	0.18	11 (18)	6 (13)	30 (36)	0.004	37 (27)	10 (18)	0.26
Depression	44 (23)	17 (21)	27 (25)	0.6	11 (18)	6 (13)	27 (32)	0.02	36 (26)	8 (15)	0.08

[a]Shown as percentage of the total number who screened positive for anxiety or depression.

Table 3. Association of mental health dimensions with exposure history.

		Worked in a unit dealing with suspected COVID-19 patients			Exposed to COVID-19 person			Cared for COVID-19 patient			Had a COVID-19 family member/friend		
	Total, n (%)[a]	n (%)[a]			n (%)[a]			n (%)[a]			n (%)[a]		
Dimension		Yes, n = 115	No, n = 78	P-value	Yes, n = 42	No, n = 151	P-value	Yes, n = 35	No, n = 158	P-value	Yes, n = 19	No, n = 174	P-value
Anxiety	47 (24)	30 (26)	17 (22)	0.49	11 (26)	36 (24)	0.75	7 (30)	40 (25)	0.51	7 (37)	40 (23)	0.18
Depression	44 (23)	29 (25)	15 (19)	0.33	12 (29)	32 (21)	0.31	8 (23)	36 (23)	0.99	6 (32)	38 (22)	0.33

[a]Shown as percentage of the total number who screened positive for anxiety or depression.

Table 4. Association of risk perceptions and altruistic acceptance of risk with mental health dimensions.

		Anxiety			Depression		
		n (%)[b]			n (%)[b]		
Risk perceptions	Total, n (%)[a]	Yes n = 47	No n = 146	P value	Yes n = 44	No n = 149	P value
I believed that my job was putting me at great risk	134 (69)	37 (79)	97 (66)	0.11	38 (86)	96 (64)	0.01
I felt extra stress at work	127 (66)	39 (83)	88 (60)	0.004	36 (82)	91 (61)	0.01
I was afraid of falling ill with COVID-19	114 (59)	34 (72)	80 (55)	0.03	34 (77)	80 (54)	0.01
I felt I had little control over whether I would get infected or not	83 (43)	25 (53)	58 (40)	0.11	60 (40)	23 (53)	0.16
I thought I would be unlikely to survive if I were to get COVID-19	20 (10)	10 (21)	10 (7)	0.01	11 (25)	9 (6)	0.00
I thought about resigning because of COVID-19*	6 (3)	2 (4)	4 (2.7)	0.64	1 (2.3)	5 (3)	1.00
I was afraid I would pass COVID-19 on to others	148 (77)	41 (87)	107 (73)	0.05	38 (86)	110 (74)	0.08
My family and friends were worried that they might get infected through me	115 (60)	32 (68)	86 (57)	0.17	30 (68)	85 (57)	0.19
People avoided my family because of my work	49 (25)	19 (40)	30 (21)	0.01	17 (35)	32 (21)	0.02
Altruistic acceptance of risk							
I accept the risk of caring for COVID-19 patient	135 (70)	28 (60)	107 (73)	0.08	25 (57)	110 (74)	0.03

[a]Shown as percentage of the total number who perceived some threat.
[b]Shown as percentage of the total number who screened positive for anxiety or depression.

also documented in our center prior to COVID-19 [13,14]. HCWs have reported an increase in the above-mentioned symptoms during the COVID-19 pandemic [15]. The HCWs are frontliners, and they are very susceptible to suffer from short- and long-term psychological impact of COVID-19 related stress. In order to support the mental health of physicians and nurses, they need training and support on how to develop resilience and withstand this stressful situation as well as to be heard, prepared, and protected [16].

Our study highlighted the preparedness, risk perceptions, altruistic acceptance of risks, and mental health outcomes during the COVID-19 pandemic at a tertiary care hospital in Lebanon. It showed that HCWs reported higher levels of perceived hospital preparedness compared to those reported by the National Nurses United in the USA during the COVID-19 pandemic [10]. The most significant differences were observed among the following preparedness items: 92% of our HCWs reported being provided with information about the novel coronavirus and how to recognize and respond to possible cases compared to 46% of nurses; 87% of our HCWs knew about institutional plans to place or isolate a patient with a novel coronavirus infection compared to 31% among nurses; 59% reported that their units had an overflow plan to place additional staff to enable safe provision of care to patients on isolation compared to 13% of nurses; and lastly 84% knew about an institutional policy to address employees with suspected or known exposure to COVID-19 compared to 19% of nurses. For instance, AUBMC implemented procedures and regulations, which involved creating working conditions that prioritize HCW safety by focusing on decreasing the risk of infection from patients and other co-workers, and thus the possibility of transferring the infection to family members and others. Measures also included training HCWs through educational modules and simulations on how to

safely care for COVID-19 patients. The hospital leadership was also heavily involved in continuously communicating updated information to all employees.

As for risk perception, it is not surprising that the majority believed that their job was putting them at increased risk (69%) and felt extra stress at work (66%). These were more significant among HCWs who worked in units dealing with suspected COVID-19 patients. This finding is in line with previous studies indicating that during pandemics, HCWs commonly perceive their jobs as placing additional risk on their lives and therefore experience more stress at work [11, 17–19]. Furthermore, in the present research, 59% were afraid of falling ill with COVID-19, compared to higher numbers in the literature during the SARS and COVID-19 pandemic [11, 20]. This could be attributed to the organizational preparedness plan, which focused on healthcare personnel management, training of HCWs, and infection prevention in HCWs. On the other hand, nurses who are frontliners were more likely to perceive COVID-19 as a threat compared to other HCWs, and this is also in line with previous research [17,21]. A recent meta-analysis indicates that COVID-19 has a considerable impact on the psychological wellbeing of frontline hospital staff, in particular nurses. Risk factors identified were underlying organic illness, gender (female), concern about family, fear of infection, lack of PPE and close contact with COVID-19. Systemic support, adequate knowledge and resilience were identified as factors protecting against adverse mental health outcomes [17].

As for the altruistic acceptance of risk by HCWs during pandemics, research found contradicting evidence. Some studies showed that 40% to 50% accept such risks [11,22], while others found that HCWs showed a great deal of professional dedication and acceptance of the need to place themselves at risk and to overwork [23,24]. Although participants in our study perceived relatively high risks of COVID-19, their altruistic acceptance of risk was still high (70%), and this clearly indicates that HCWs were accepting these risks as they saw it being an integral part of professional obligation. Nonetheless, respondents who worked in COVID-19 units, were exposed to a COVID-19 person, or cared for COVID-19 patients significantly reported higher altruistic acceptance of risk than those who did not. This might be attributed to the fact that real exposure to COVID-19 related situations may clarify threats, change intuitive judgements, and reduce inaccurate risk perceptions of COVID-19, whereby habituation or 'getting used to a situation' is a major aspect in reducing fear and accepting its risks [25].

Despite the high-perceived preparedness levels in our institution, our results showed that 24% and 23% of respondents reported anxiety and depression symptoms, respectively. Likewise, a previous systematic review that included 12 research studies reported a pooled prevalence of 23% for anxiety as well as depression symptoms, with similar higher prevalence among nurses [21]. Of note, mental health, as well as risk perceptions did not significantly differ among HCWs who lived alone or lived with their families. This is contradictory to previous work during the MERS epidemic, which found that significant concern was expressed by HCWs regarding their living conditions, as they reported higher risk of transmitting the disease to friends and family contributing to feelings of interpersonal isolation and additional job stress [26].

In our study, HCWs who reported anxiety and depression symptoms were more likely to perceive the risks of COVID-19. On the contrary, altruistic acceptance of risk was significantly negatively correlated with depression. This may indicate that altruistic acceptance of job-related risks may have protected some hospital employees against negative psychological outcomes following the COVID-19 outbreak. Our results were in line with a previous study that discussed altruistic behavior theory. It concluded that altruism is associated with reduced aggression and better psychological wellbeing [9]. This is supported by the social psychology theory, which posits that altruistic behavior gains dominance over fear and reduces stress caused by the fight-fight response in the face of perceived danger [27].

6. Strengths and limitations

The scale of the COVID-19 pandemic in terms of mortality and morbidity cases across the globe mandated the need to provide high-quality data on the psychological impacts of COVID-19. The main strength of this study is its exclusive focus on mental health outcomes among HCWs during the COVID −19 pandemic in Lebanon, while discussing mental health issues is still considered as a taboo in some of the Arab countries. The study did not only highlight the need for early targeted interventions toward HCWs, but it explored particularly altruistic behavior among medical professionals, and the role it plays mitigating the negative effects of the COVID-19 pandemic. Of particular importance is the evidence that real exposure to COVID-19 related situations has increased altruistic acceptance of COVID-19 risks by HCWs. This was also associated with reduced depression. Hence, results of this study might help focus the efforts of health decision-makers and mental health advocates in Lebanon towards implementing primary interventions that are concerned with taking actions to mitigate sources of psychological distress among HCWs. Such interventions should also focus on structuring work environments, that nourish altruistic behavior among HCWs. Finally, this study used rigorous

validated tools to assess different psychological status among HCWs.

While the study used high methodological standards to explore factors associated with mental health outcomes, our study has several clear limitations. First, the study was conducted in a single well-prepared and large teaching hospital, limiting the generalization of our findings to other hospitals or community settings. Second, change in work pattern, absence of staff due to COVID 19 infection or isolation, and redeployment of HCWs to higher risk areas could have amplified the impact of COVID-19 pandemic. Third, the study was cross-sectional and lacks longitudinal follow-up, limiting our ability to examine causal relations between the study variables and mental health outcomes. Fourth, this study was conducted during unprecedented turbulent political and economic circumstances in the country, and this study was unable to distinguish between COVID-19 related mental health outcomes and stressors versus political and economic stress in Lebanon. Accordingly, invited HCWs might have strong aversion to participate in any research study due to the overall challenging circumstances in the country, and thus could have been too stressed to respond. This raises a fifth limitation which is the low response rate (12%). Sixth, this study was unable to distinguish between pre-existing mental health symptoms vs new symptoms, and this could skew the results.

7. Conclusions

Our study showed a relatively high level of perceived hospital preparedness towards the COVID-19 pandemic, yet our respondents still reported high levels of risk perception, anxiety, and depression particularly among nurses. Intriguingly, a higher altruistic acceptance of COVID-19 risks was observed among HCWs with positive exposure history, and this was also associated with reduced depression among our respondents. To face future epidemics, future research should further explore the latent factors that are associated with altruistic acceptance of risks, and to further confirm whether it will be also more prevalent among HCWs with virus exposure history. In addition, future research with a larger number of respondents should examine the moderating role that altruistic acceptance of risks may play in the relationship between risk perceptions and mental health outcomes.

Abbreviations

COVID-19: Coronavirus Disease 19; SARS: Severe Acute Respiratory Syndrome; MERS: Middle East Respiratory Syndrome; HCWs: Health care workers; PHQ-4: Patient Health Questionnaire; NNU: National Nurses United; GAD-2: General Anxiety Disorder; PHQ-2: Depression Scale; PPE: Personal Protective Equipment; AUBMC: American University of Beirut Medical Center.

Authors' contributions

Dr. Siddik-Sayyid had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Msheik-El Khoury, Siddik-Sayyid

Acquisition of data: Msheik-El Khoury, Siddik-Sayyid

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Statistical analysis: Msheik-El Khoury

Administrative, technical, or material support: Msheik-El Khoury, Siddik-Sayyid

Data deposition

Data is deposited in Mendeley public database and is available on this DOI: 10.17632/k2ycvyn27v.1.

Ethics approval and consent to participate

The study was approved by the Social behavioral Sciences (SBS) Institutional Review Board (IRB) of the American University of Beirut (Reference # SBS-2020-0194). Participation in the study was voluntary. All the necessary measures to safeguard participants' anonymity and confidentiality of information were respected. Electronic Informed consent was obtained from all the participants

Disclosure statement

The authors declare that there is no conflict of interest regarding the publication of this article.

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Appendix A. Association of risk perceptions, altruistic acceptance of risk with demographics

Risk perceptions	Total, n (%)[a]	Gender n (%)[a]			Occupation n (%)[a]				Living conditions n (%)[a]		
		Males, n = 83	Females, n = 110	P-value	Physician, n = 63	Resident, n = 46	Nurse, n = 84	P-value	With family, n = 138	Alone, n = 55	P-value
I believed that my job was putting me at great risk	134 (69)	57 (69)	77 (70)	0.84	41 (65)	31 (67)	62 (73)	0.49	99 (72)	35 (64)	0.27
I felt extra stress at work	127 (66)	55 (66)	72 (66)	0.91	38 (60)	21 (46)	68 (81)	0.00	96 (70)	31 (56)	0.08
I was afraid of falling ill with COVID-19	114 (59)	53 (64)	61 (56)	0.24	33 (52)	23 (50)	58 (69)	0.05	87 (63)	27 (49)	0.08
I felt I had little control over whether I would get infected or not	83 (43)	39 (47)	44 (40)	0.33	20 (31)	23 (50)	40 (47)	0.09	59 (43)	24 (44)	0.91
I thought I would be unlikely to survive if I were to get COVID-19	20 (10)	11 (13)	9 (8)	0.25	6 (10)	4 (9)	10 (11)	0.82	14 (10)	6 (11)	0.88
I thought about resigning because of COVID-19	6 (3)	2 (2)	4 (4)	0.70	1 (2)	0 (0)	5 (6)	0.12[#]	5 (4)	1 (2)	0.67[#]
I was afraid I would pass COVID-19 on to others	148 (77)	66 (60)	82 (75)	0.42	42 (67)	41 (89)	65 (77)	0.02	103 (75)	45 (82)	0.29
My family and friends were worried that they might get infected through me	115 (60)	54 (65)	61 (56)	0.18	31 (49)	28 (61)	56 (66)	0.10	83 (60)	32 (58)	0.8
People avoided my family because of my work	49 (25)	18 (21)	31 (28)	0.32	6 (10)	8 (17)	35 (41)	0.00	37 (27)	12 (22)	0.47
Altruistic acceptance of risk											
I accept the risk of caring for COVID-19 patient	135 (70)	58 (70)	77 (70)	0.99	42 (67)	38 (83)	55 (66)	0.1	88 (64)	48 (87)	0.003

[a]Shown as percentage of the total number who perceived some threat. [#] Fisher's exact test instead of Chi-square was used for association.

Appendix B. Association of risk perceptions, altruistic acceptance of risk with exposure history

Risk perceptions	Total, n (%)[a]	Worked in a unit dealing with suspected COVID-19 patients n (%)[a]			Exposed to COVID-19 person n (%)[a]			Cared for COVID-19 patient n (%)[a]			Had a COVID-19 family member/friend n (%)[a]		
		Yes, n = 115	No, n = 78	P-value	Yes, n = 42	No, n = 151	P-value	Yes, n = 35	No, n = 158	P-value	Yes, n = 19	No, n = 174	P-value
I believed that my job was putting me at great risk	134 (69)	90 (78)	44 (56)	.001	29 (69)	105 (70)	0.95	27 (77)	107 (68)	0.27	16 (84)	118 (68)	0.14
I felt extra stress at work	127 (66)	86 (75)	41 (53)	.001	27 (64)	100 (66)	0.82	25 (71)	102 (65)	0.44	13 (68)	114 (66)	0.80
I was afraid of falling ill with COVID-19	114 (59)	73 (64)	41 (53)	0.13	20 (48)	94 (62)	0.09	20 (57)	94 (60)	0.80	11 (58)	103 (59)	0.91
I felt I had little control over whether I would get infected or not	83 (43)	51 (44)	32 (41)	0.65	17 (41)	66 (44)	0.71	15 (43)	68 (43)	0.98	7 (37)	76 (44)	0.57
I thought I would be unlikely to survive if I were to get COVID-19	20 (10)	12 (10)	8 (10)	0.97	4 (10)	16 (11)	0.84	3 (9)	17 (11)	0.70	1 (11)	19 (11)	0.44
I thought about resigning because of COVID-19#	6 (3)	4 (4)	2 (3)	1.00#	2 (5)	4 (3)	0.61#	3 (9)	3 (2)	0.07#	0 (0)	6 (3)	1.00#
I was afraid I would pass COVID-19 on to others	148 (77)	90 (78)	58 (74)	0.52	33 (79)	115 (76)	0.74	29 (83)	119 (75)	0.34	14 (74)	134 (77)	0.75
My family and friends were worried that they might get infected through me	115 (60)	78 (68)	37 (47)	0.005	28 (67)	87 (58)	0.29	24 (69)	91 (57)	0.23	13 (68)	102 (59)	0.41
People avoided my family because of my work	49 (25)	39 (34)	10 (13)	0.001	13 (31)	36 (24)	0.35	11 (31)	38 (24)	0.36	1 (5)	48 (28)	0.04#
Altruistic acceptance of risk													
I accept the risk of caring for COVID-19 patient	135 (70)	87 (76)	48 (62)	0.04	36 (86)	99 (66)	0.01	31 (88)	104 (66)	0.008	13 (68)	122 (70)	0.87

[a]Shown as percentage of the total number who perceived some threat # Fisher's exact test instead of Chi-square was used for association.