The Risk of Post-Traumatic Stress Disorder (PTSD) among Frontline Healthcare Workers in Saudi Arabia during the COVID-19 Pandemic: A Cross-sectional Study

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***Abstract*—Background: Frontline healthcare workers (HCWs) are at risk of developing posttraumatic stress disorder (PTSD) due to the nature of their work and, due to the additional stress and mental fatigue brought on by the COVID- 19 pandemic, this risk has increased significantly. A proper understanding of the risk factors for PTSD in this context is crucial to the development of both preventive and corrective measures that will improve the psychological and emotional health of HCWs and reduce their predisposition to PTSD in the short and long term. This study was conducted to determine the prevalence and associated risk factors of PTSD among frontline HCWs in Riyadh, Saudi Arabia, during the COVID-19 pandemic.**

Methods: This cross-sectional survey study examined responses from emergency medical service personnel (paramedics, nurses, and physicians) in eleven large public hospitals in Riyadh, Saudi Arabia, between June 01 and July 01, 2020. The total number of respondents was 613. The PTSD Checklist for the Diagnostic and Statistical Manual of Mental Disorders (PCL-5), a self-administered tool, was used to diagnose PTSD. Additionally, demographic factors, such as age, gender, race, marital status, occupation, and years of experience, were identified, and the effects of these factors were assessed using statistical analysis.

Results: The results revealed a prevalence of PTSD of 33.4% among participants. The highest prevalence was found among paramedics and nurses, while physicians had the lowest prevalence. The study also found statistically significant differences in PTSD scores based on marital status, job title, and years of experience. Half of the participants were aware of the availability of psychological/emotional support and perceived the process for obtaining that support to be clear and accessible.

Conclusion: Frontline healthcare workers are at increased risk of developing PTSD, with the degree of risk significantly associated with marital status, job title, years of experience, and the accessibility of psychological/emotional support. Healthcare organisations within Saudi Arabia and elsewhere should use this information to strengthen their psychological and emotional support systems and reduce the risk of PTSD in their employees.

***Index Terms*—PTSD, COVID-19, healthcare workers, Saudi Arabia.**

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I. Background

PTSD can result from directly experiencing a traumatic event, from witnessing the event, from learning that a close family member or friend has experienced such an event, or from experiencing repeated or extreme exposure to aversive events, as in the case of first responders collecting human remains [1].

On March 11, 2020, the World Health Organization (WHO) declared COVID-19, the disease caused by the novel Coronavirus SARS-CoV2, a pandemic after a widespread outbreak of COVID-19 cases worldwide [2]. The severe impact of COVID-19 resulted in more than 131,000,000 cases and approximately 2,854,276 deaths worldwide, as of April 6, 2021 [3]. In Saudi Arabia, COVID-19 surpassed 394,169 cases and 6,711 deaths as of the same date [4].

Previous infectious epidemics, such as severe acute respiratory syndrome (SARS), were found to elevate stress levels and cause significant psychological disturbances among HCWs in Hong Kong and Toronto [5,6]. Furthermore fear caused by a novel avian-origin influenza H7N9 was a cause of PTSD among HCWs [7], and an Ebola outbreak resulted in social isolation, emotional and physical exhaustion, depression, extreme stress, and stigmatisation among HCWs [8,9]. The extreme environment of the Ebola outbreak may also have caused burnout, which is linked to PTSD [10].

COVID-19 has had a substantial impact on both preexisting and new-onset behavioral health problems, including a spike in the number of anxiety and depression cases worldwide [11,12]. Moreover, individuals with preexisting mental health disorders are at higher risk of becoming severely ill or suffering long-term complications due to COVID-19 [13,14]. Under these circumstances, WHO, along with many other health organisations, offered immediate support and guidance on mental health issues, particularly on how to overcome the disruption of mental health services during the COVID-19 crisis [12].

HCWs are not immune to mental health issues, particularly during disease outbreaks [11, 12]. Throughout the COVID-19 pandemic, they have provided patient care under stressful and uncertain circumstances, and experienced the deaths and severe illness of patients and colleagues. The traumatic nature of these events has been exacerbated by the stress associated with shortages of staff and medical equipment, recurrent risk of personal exposure, and the possibility of themselves or family members becoming infected [15]. Taken together, these factors increase the risk of HCWs developing PTSD [11, 16]. A range of psychological issues have been reported among HCWs during the current COVID-19 pandemic, including fear, anger, stress, stigma, anxiety, and isolation, which may also have negatively affected the quality of care provided to COVID-19 patients [11,17].

Studies have demonstrated a significant psychological impact of the COVID-19 pandemic on HCWs in Saudi Arabia. A study conducted among HCWs in the Ministry of Health during the pandemic found that more than half met the criteria for depressive disorder and generalised anxiety disorders (55.2% and 51.4%, respectively). Females, the 30-39 age group, and nurses had significantly higher scores for anxiety and depression [18]. Another study conducted between April and May 2020 found elevated scores on anxiety and depression measures among 35.6% and 27.9% of HCWs, respectively. The highest elevations were found among female HCWs and those with inadequate training [19].

In general, HCWs staffing the Emergency Department (ED) are more likely to experience significant stress compared with those working in other departments [20]. A cross-sectional study prior to the COVID-19 pandemic found that 26% of emergency medical services (EMS) personnel at one of the largest hospitals in Saudi Arabia screened positive for PTSD [21].

The PTSD risk among HCWs working in the ED during infectious outbreaks can be attributed to their role in being the first to confront an emerging public health crisis, when the cause, mode of transmission, and treatment are still uncertain. They are thus more prone to adverse psychological outcomes, such as PTSD, anxiety, and depression, when confronting emerging infectious diseases [22-24].

This study examined the prevalence of PTSD among HCWs in the ED during the COVID-19 pandemic in Saudi Arabia.

II. Methods Study design

We conducted a cross-sectional study in eleven large public hospitals in Riyadh, Saudi Arabia, between June 01 and July 01, 2020. An online survey was used, targeting physicians, nurses, and paramedics working in adult emergency departments.

A. Ethics approval and consent to participate:

All participants provided written informed consent, and ethical approval was granted by the Institutional Review Board (IRB) at King Fahad Medical City, Riyadh, Saudi Arabia (no. 00010471).

B. Participants

A survey link was sent, via e-mail and WhatsApp (a multiplatform messaging application widely used in Saudi Arabia), to all emergency department chairpersons, head nurses, and EMS chairpersons at the eleven hospitals, asking them to participate and also to distribute the survey to their team members. All participation in the study was voluntary.

C. Measurement

The PTSD Checklist for the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (PCL-5), a 20-item instrument that measures the occurrence and severity of PTSD symptoms, was used in this study [25]. It is a self-screening tool developed by the U.S. Department of Veterans Affairs National Center for PTSD to assist in diagnosing PTSD [26]. The self-report rating scale is 0-4 for each symptom (0= "Not at all" and 4= "Extremely") with a total possible score ranging from 0 to 80. A total score of 33 or more suggested a provisional PTSD diagnosis [26]. Questions about demographic characteristics, including gender, age, nationality, position, years of experience, and marital status, were included, as were questions about access to mental health services. Participants were asked whether their hospitals provided resources for psychological and emotional support, and whether there was a clear process for accessing that support.

D. Sample size

There are approximately 2,980 HCWs employed in the emergency departments of governmental hospitals in Riyadh, distributed as follows: 722 physicians, 1881 nurses, and 377 paramedics. Of these, 613 participants responded to our survey.

E. Data Analysis

All statistical analyses were conducted using SPSS version 25. We used the Mann-Whitney test, the Kruskal Wallis test, the linear-by-linear association test, and the chi-square test to analyse the data. Categorical variables are presented as percentage and frequency.

III. Results

A. Demographic Characteristics

The demographic characteristics of the 613 respondents are illustrated in Table 1. The distribution of physicians, nurses and paramedics in our sample was 39% physicians (n=239), 48% nurses (n=294), and 13.1% paramedics (n=80).

B. Posttraumatic stress disorder among participants

33.4% of the participants scored 33 or higher (n=205) on DSM-5 (PCL-5), suggesting a provisional PTSD diagnosis. Subgroup analysis was conducted to investigate the effects of gender, age, marital status, race, and years of experience, in addition to the possible influence of being a physician, a nurse, or a paramedic. Statistical analyses showed significant differences in PTSD scores according to marital status, job title, and years of experience. Married and divorced HCWs reported a higher score compared with other groups (Mdn= 1.2 and 1.25, respectively), while paramedics and nurses had higher scores (Mdn= 1.25 and 1.2, respectively) than physicians (Mdn=1.05). A simple linear regression was conducted to predict PTSD severity based on years of experience, and a significant regression was found ($F=1,611)= 4.547$, $P<0.05$ with $R^2= 0.007$. Other factors, such as age, gender, and nationality, revealed no significant differences in PTSD scores.

C. Hospitals and PTSD

The percentage and number of PTSD cases among participants at different hospitals is shown in Table 2. The nonparametric Kruskal Wallis test indicated significant differences in the prevalence of PTSD among HCWs in different hospitals ($p< 0.001$), $X^2(10)= 37.625$. HCWs in the Security Force Hospital were found to have the highest prevalence of PTSD (Mdn= 2.05), followed by King Faisal Specialist Hospital (Mdn= 1.95). The lowest prevalence was found in King Saud Medical City and King Abdulaziz Medical City (Mdn= 0.65).

D. Accessibility of psychological/emotional support and clarity of the process

We investigated the accessibility of psychological/emotional support in the studied hospitals, and whether the process for accessing such support was clear to the healthcare providers relative to several demographic variables (Table 3). We found that 48.6% of respondents perceived the process to be clear and the support accessible (n=298). We also found significant differences in perceptions of the clarity and accessibility between HCWs from different hospitals. Respondents from King Saud University Medical City, King Faisal Specialist Hospital & Research Centre, King Fahad Medical City, and King Abdulaziz Medical City were more likely to report the process as clear and accessible than those from the other hospitals; $\chi2= 75.42$ (10), $p < 0.05$.

A chi-square test of independence suggested that men were less likely to report the process of obtaining psychological/emotional support as being clear and accessible compared with women; $\chi2(1)= 6.233$, $p < 0.05$.

Moreover, nurses were more likely to report the process as being clear and accessible than physicians and paramedics; $\chi2(1)=17.69$, $p < 0.05$. The respondents' nationalities also influenced their perceptions: Saudis, Arabs, and Africans were more likely to deem the process unclear compared with Asians, Indians, Europeans, and Oceanians; Fisher's exact test=28.26, $p < 0.05$.

Age was not found to influence the perception of clarity or accessibility of mental support; $\chi2(4)=7.422$, $p > 0.05$. Marital status also had no influence; Fisher's exact test=6.19, $p > 0.05$. Likewise, the number of years of experience did not differ between those who perceived the process to be accessible and clear and those who did not; linear-by-linear association test=0.076, $p > 0.05$.

IV. Discussion

The prevalence of PTSD among HCWs in our analysis is 33.4%. These findings are comparable to those reported in previous studies that describe significant mental health problems among HCWs during pandemics [11, 27-34]. The study also revealed that married and divorced HCWs, paramedics and nurses, and HCWs with fewer years of experience were more likely to experience PTSD. Such findings are generally consistent with previous studies conducted during the SARS outbreak [29-31, 35].

Furthermore, we found that almost half of the participants perceived the process of obtaining psychological/emotional support to be clear, and the support accessible – especially women, nurses, and participants who are Asian, Indian, European, or Oceanian. There is some variation in the level of knowledge about available mental health support among HCWs in different institutions. One explanation for this finding is that HCWs who reported the availability and process of psychological/emotional support to be accessible and clear are working for large hospitals that are well equipped to offer such support. Internal communication with physicians, nurses, and other staff may also play a crucial role in how HCWs perceive the availability and usefulness of mental health care at their hospitals. As discussed elsewhere, provision of employee support services by employers can have a positive impact on employees' responses to a variety of disasters [36]. Interestingly, unlike previous studies that found an association between gender, age, and risk for PTSD [29,33,37], we did not find such a relationship.

It is noteworthy that PTSD mean scores were noted to be low among participants (M=1.27, SD= 0.88). This can be explained, again, by the fact that nearly half of the participants perceived the psychological/emotional support to be accessible. Another factor is the timely control interventions implemented by the Saudi government to prevent the spread of COVID-19 infection.

Table 1. Demographic characteristics of participants

Demographic Characteristic	Percentage (%)	N
Gender		
Male	43.4	266
Female	56.6	347
Occupation		
Physicians	39	239
Nurses	48	294
Paramedics	13.1	80
Age		
20-30 years old	39.6	243
31-40 years old	43.4	266
41-50 years old	12.1	74
Older than 50 years	4.9	30
Marital status		
Married	58.6	359
Single	38.8	238
Divorced	2.3	14
Widowed	0.3	2
Nationality		
Saudi Arabian	44.5	273
Arab but non-Saudi	8.6	53
Asian	39.8	244
Indian	4.4	27
African	1.8	11
European	0.7	4

Oceanian	0.2	1
Years of experience		
Less than one year	6.5	40
1-5 years	30	184
5-10 years	29.5	181
More than 10 years	33.9	208

Table 2. Percentage and number of PTSD cases among participants at different hospitals

Hospitals	**% of participants (n)**	**% of PTSD (n)**
SFH	*3.26 (20)*	*5.8 (12)*
RMH	*4.24 (26)*	*5.36 (11)*
PMAH	*2.44 (15)*	*1.95 (4)*
KSUMC	*7.34 (45)*	*5.36(11)*
KSMC	*33.6 (206)*	*37.56 (77)*
KFSHRC	*3.59 (22)*	*6.83 (14)*
KFMC	*19.9 (122)*	*15.6 (32)*
KAAUH	*9.95 (61)*	*4.87 (10)*
KAMC	9.62 (59)	6.3 (13)
Al-Iman General Hospital	5.54 (34)	9.75 (20)
King Salman Hospital	0.48 (3)	0.49 (1)
Total	100 (613)	100 (205)

SFH: Security Forces Hospital; RMH: Riyadh Military Hospital; PMAH: Prince Mohammed bin Abdulaziz Hospital; KSUMC: King Saud University Medical City; KSMC: King Saud Medical City; KFSHRC: King Faisal Specialist Hospital & Research Centre; KFMC: King Fahad Medical City; KAAUH: King Abdullah bin Abdulaziz University Hospital; KAMC: King Abdulaziz Medical City

Table 3. Accessibility of psychological/emotional support and clarity of the process at different hospitals

Hospital	Clear and accessible support* % (n)	No % (n)
SFH	1.67 (5)	4.76 (15)
RMH	4.02 (12)	4.44 (14)
PMAH	1 (3)	3.8 (12)
KSUMC	8.72 (26)	6.03 (19)
KSMC	36.24 (108)	31.1 (98)
KFSHRC	4.02 (12)	3.17 (10)
KFMC	22.14 (66)	17.7 (56)
KAAUH	3.69 (11)	15.87 (50)
KAMC	16.1 (48)	3.49 (11)
Al-Iman General Hospital	2.01 (6)	8.88 (28)
King Salman Hospital	0.33 (1)	0.63 (2)
Total	48.6 (298)	51.4 (315)

SFH: Security Forces Hospital; RMH: Riyadh Military Hospital; PMAH: Prince Mohammed bin Abdulaziz Hospital; KSUMC: King Saud University Medical City; KSMC: King Saud Medical City; KFSHRC: King Faisal Specialist Hospital & Research Centre; KFMC: King Fahad Medical City; KAAUH: King Abdullah bin Abdulaziz University Hospital; KAMC: King Abdulaziz Medical City

* Is the process clear and support accessible?

V. Conclusion

This study examined the prevalence of PTSD among HCWs working in the ED in Saudi Arabia during the COVID-19 pandemic. Our findings are generally consistent with previous studies and suggest that HCWs are more prone to mental health problems during epidemics. Therefore, it is crucial to provide them with access to mental health care and resources during such times, while continually examining and assessing the clarity and accessibility of such support. The present information can help to evaluate HCWs' mental health needs, and direct and strengthen psychological interventions during future health outbreaks.

VI. Limitations

This is the only study investigating the prevalence of PTSD among HCWs in Saudi Arabia during the COVID-19 pandemic, and is limited to those working in the emergency setting. As such, we note that one of this study's limitations is that the findings from HCWs in the emergency setting might not be generalisable to those working in other departments. The lack of information about mental health services provided to HCWs in each hospital during the COVID-19 pandemic is another limitation. Further studies are warranted to investigate the availability of mental health resources and services during health crises, as well as the perception of the accessibility of such services among HCWs during such times.

VII. List of abbreviations

DSM-5: Diagnostic and Statistical Manual of Mental Disorders

ED: Emergency Department

EMS: Emergency medical services

HCWs: Healthcare workers

IRB: Institutional Review Board

PCL-5: The PTSD Checklist for the Diagnostic and Statistical Manual of Mental Disorders

PTSD: Posttraumatic stress disorder SARS: Severe acute respiratory syndrome WHO: World Health Organization

VIII. Ethics approval and consent to participate

The study protocol was approved by the Institutional Review Board (IRB) of King Fahad Medical City, Riyadh, Saudi Arabia (no. 00010471). All

participants gave written informed consent to participate in the study.

IX. Availability of data and materials

Data is available, upon request, from the corresponding author.

X. Conflict of interests

The authors have no potential conflict of interest to declare.

XI. Funding

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XII. References

[1] American Psychiatric Association. *Diagnostic and statistical manual of mental disorders* (5th ed.). 2013; Available from: https://doi.org/10.1176/appi.books.9780890425596

[2] World Health Organization (WHO). Rolling updates on coronavirus disease (COVID-19). 2020; Available from https://www.who.int/emergencies/di seases/novel-coronavirus-2019/events-as-they-happ en.

[3] World Health Organization (WHO). WHO Coronavirus Disease (COVID-19) Dashboard. 2021;
Available from https://covid19.who.int

[4] Kingdom of Saudi Arabia - Ministry of Health portal. MOH, 2020 dashboard COVID 19. 2020;
Available from https://covid19.moh.gov.sa/

[5] Chua SE, Cheung V, Cheung C, McAlonan GM, Wong JW, Cheung EP, Chan MT, Wong MM, Tang SW, Choy KM, Wong MK. Psychological effects of the SARS outbreak in Hong Kong on high-risk health care workers. *The Canadian Journal of Psychiatry*. 2004;49(6):391-3.

[6] Maunder RG, Lancee WJ, Rourke S, Hunter JJ, Goldbloom D, Balderson K, Petryshen P, Steinberg R, Wasylenki D, Koh D, Fones CS. Factors associated with the psychological impact of severe acute respiratory syndrome on nurses and other hospital workers in Toronto. *Psychosomatic medicine*. 2004;66(6):938-42.

[7] Ho SM, Kwong-Lo RS, Mak CW, Wong JS. Fear of severe acute respiratory syndrome (SARS) among health care workers. *Journal of consulting and clinical psychology*. 2005;73(2):344.

[8] Gershon R, Dernehl LA, Nwankwo E, Zhi Q, Qureshi K. Experiences and psychosocial impact of West Africa Ebola deployment on US health care volunteers. *PLoS currents*. 2016;8.

[9] Lehmann M, Bruenahl CA, Addo MM, Becker S, Schmiedel S, Lohse AW, Schramm C, Löwe B. Acute Ebola virus disease patient treatment and health-related quality of life in health care professionals: A controlled study. *Journal of psychosomatic research*. 2016;83:69-74.

[10] Collopy KT, Kivlehan SM, Snyder SR. Are you under stress in EMS. Understanding the slippery slope of burnout and PTSD. *EMS World*, 2012;*41*(10): 47–56.

[11] Kang L, Li Y, Hu S, et al. The mental health of medical workers in Wuhan, China dealing with the 2019 novel coronavirus. *Lancet Psychiatry*. 2020;7(3): e14.

[12] World Health Organization (WHO). The impact of COVID-19 on mental, neurological and substance use services. 2020; Available from: https://www.who.int/publications/i/item/9789240012455

[13] Volkow ND. Collision of the COVID-19 and addiction epidemics. *Ann Intern Med*. 2020;173(1):61-62

[14] Li L, Li F, Fortunati F, Krystal JH. Association of a prior psychiatric diagnosis with mortality among hospitalised patients with coronavirus disease 2019 (COVID-19) infection. *JAMA Netw Open*. 2020;3(9):e2023282.

[15] Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, Wu J, Du H, Chen T, Li R, Tan H, Kang L, Yao L, Huang M, Wang H, Wang G, Liu Z, Hu S. Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. *JAMA Netw Open*. 2020 Mar 2;3(3):e203976.

[16] University of Michigan, Department of Psychiatry. Posttraumatic Stress Disorder during

COVID-19. 2020; Available from: https://medicine.umich.edu/dept/psychiatry/michigan-psychiatry-resources-covid-19/specific-mental-health-conditions/posttraumatic-stress-disorder-during-covid-19.

[17] National Centre for PTSD. Managing healthcare workers' stress associated with the COVID-19 virus outbreak. 2020; Available from: https://www.ptsd.va.gov/covid/COVID19ManagingStressHCW032020.pdf

[18] AlAteeq D A, Aljhani S, Althiyabi I, Majzoub S. Mental health among healthcare providers during coronavirus disease (COVID-19) outbreak in Saudi Arabia. *Journal of Infection and Public Health*. 2020; *13*(10):1432–1437. https://doi.org/10.1016/j.jiph.2020.08.013

[19] Qasem Surrati AM, Asad Mansuri FM, Ayadh Alihabi AA. Psychological impact of the COVID-19 pandemic on health care workers. *J Taibah Univ Med Sci*. 2020;15(6):536-543.

[20] Adriaenssens J, Degueht V, Maes S. The impact of traumatic events on emergency room nurses: findings from a questionnaire survey. *Int J Nurs Stud*. 2012; 49(11):1411-22.

[21] Alaqeel MK, Aljerian NA, AlNahdi M, Almaini RY. Posttraumatic Stress Disorder among Emergency Medical Services Personnel: A Cross-sectional Study. *AJMS*. 2019;10(4):28-1.

[22] Stara R, Hawryluck L, Robinson S, Kasapinovic S, Fones C, Gold WL. Impact on health care workers employed in High-risk areas during the Toronto SARS outbreak. *J Psychosom Res*. 2008;64(2):177-83.

[23] Memish ZA, Assiri AM, Alshehri M, Hussain R, Alomar I. The prevalence of respiratory viruses among healthcare workers serving pilgrims in Makkah during the 2009 influenza A (H1N1) pandemic. *Travel Medicine and Infectious Disease*. 2012;10(1):18-24.

[24] Angelina C, Chan H. Psychological impact of 2003 severe acute respiratory syndrome outbreak on health care workers in a medium-size regional general hospital in Singapore. *J Occupational Medicine*. 2004;54(3):190-96

[25] National Centre for PTSD. PTSD Checklist for DSM-5 (PCL-5). 2020; Available from https://www.ptsd.va.gov/professional/assessment/adult-sr/ptsd-checklist.asp

[26] Weathers FW, Litz BT, Keane TM, Palmieri PA, Marx BP, Schnurr PP. The PTSD Checklist for *DSM-5* (PCL-5). 2013. Scale available from the National Center for PTSD at www.ptsd.va.gov.

[27] Jung H, Jung SY, Lee MH, Kim MS. Assessing the Presence of Post-Traumatic Stress and Turnover Intention Among Nurses Post-Middle East Respiratory Syndrome Outbreak: The Importance of Supervisor Support. *Workplace Health Saf*. 2020 Jul;68(7):337-345.

[28] Wang L, Zhang J, Zhou M, Shi Z, Liu P. Symptoms of posttraumatic stress disorder among health care workers in earthquake-affected areas in southwest China. *Psychol Rep*. 2010 Apr;106(2):555-61.

[29] Sim K, Chong PN, Chan YH, Soon WS. Severe acute respiratory syndrome-related psychiatric and posttraumatic morbidities and coping responses in medical staff within a primary health care setting in Singapore. *J Clin Psychiatry*. 2004;65(8):1120-7.

[30] Tham K, Tan Y, Loh O, Tan W, Ong M, Tang H. Psychological Morbidity among Emergency Department Doctors and Nurses after the SARS Outbreak. *Hong Kong Journal of Emergency Medicine*. 2005;12(4):215-223.

[31] Phua DH, Tang HK, Tham KY. Coping responses of emergency physicians and nurses to the 2003 severe acute respiratory syndrome outbreak. *Acad Emerg Med.* 2005;12(4):322-8.

[32] Wu P, Fang Y, Guan Z, et al. 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*. 2009;54(5):302-311.

[33] Su TP, Lien TC, Yang CY, Su YL, Wang JH, Tsai SL, Yin JC. Prevalence of psychiatric morbidity and psychological adaptation of the nurses in a structured SARS caring unit during outbreak: a prospective and periodic assessment study in

Taiwan. *J Psychiatr Res*. 2007; 41(1-2):119-30.

[34] Chan AO, Huak CY. Psychological impact of the 2003 severe acute respiratory syndrome outbreak on health care workers in a medium size regional general hospital in Singapore. *Occup Med* (Lond). 2004;54(3):190-6.

[35] Lancee WJ, Maunder RG, Goldbloom DS; Coauthors for the Impact of SARS Study. Prevalence of psychiatric disorders among Toronto hospital workers one to two years after the SARS outbreak. *Psychiatr Serv*. 2008 Jan;59(1):91-5.

[36] Schouten R, Callahan MV, Bryant S. Community response to disaster: the role of the workplace. *Harv Rev Psychiatry*. 2004;12:229–237.

[37] Vizheh M, Qorbani M, Arzaghi SM, Muhidin S, Javanmard Z, Esmaeili M. The mental health of healthcare workers in the COVID-19 pandemic: A systematic review. *Journal of diabetes and metabolic disorders*. 2020; 19(2):1967-1978.

XIII. ACKNOWLEDGEMENTS

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