BMJ Open

Factors Associated with Mental Health Outcomes in Oman during COVID19: Frontline vs Non-frontline Healthcare Workers

SCHOLARONE™
Manuscripts

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Factors Associated with Mental Health Outcomes in Oman during COVID19: Frontline vs Non-frontline Healthcare Workers

Muna Alshekaili[1], Walid Hassan[1], Nazik Al-Said[1], Fatima alsulimani[1], Satish Kumar[2], Adhra Al-Mawali [2], Moon Fai Chan[3], Sangeetha Mahadevan[4], Samir Al-Adawi[4]

[1] Al Masarra Hospital, Ministry of Health, Wilayat Al Amerat, Muscat, Oman
[2] Centre of Studies & Research, Directorate General Planning, and studies, Ministry of Health, Oman
[3] Department of Family Medicine & Public Health, College of Medicine & Health Sciences Sultan Qaboos University, Muscat, Oman
[4]Department of Behavioral Medicine, College of Medicine & Health Sciences, Sultan Qaboos University, Muscat, Oman

Corresponding author
Dr. Samir Al-Adawi
Department of Behavioral Medicine, College of Medicine & Health Sciences
Sultan Qaboos University
P.O. Box 35, P.C. 123
Al Khoudh, Muscat, Sultanate of Oman
Phone : (+968) 2414 -1139
Mobile : (+ 968) 9938 -0246
Fax : (+ 968) 2441 -3419
Email: adawi@squ.edu.om; samir.al-adawi@fulbrightmail.org

All Authors' emails
Muna Alshekaili [m.alshekaili@gmail.com]
Walid Hassan [ebrahimw@mymail.vcu.edu]
Nazik Al Said [alsaidnazik@gmail.com]
Fatima alsulaimani [um-alkhalil@hotmail.com]
Sathish Kumar Jayapal [sathish.kumar@moh.gov.om]
Adhra Al-Mawali [adhra.almawali@gmail.com]
Moon Fai Chan [moonf@squ.edu.om]
Sangeetha Mahadevan [sm5520@nyu.edu]
Samir Al-Adawi [samir.al-adawi@fulbrightmail.org]

Short Title: Mental Health Outcomes of HCWs in Oman during COVID19
Word count: 3,361

1

Abstract

OBJECTIVE:

This study aims to assess and compare demographic and psychological factors and sleep status of frontline HCWs in relation to non-frontline HCWs

DESIGN, SETTINGS, AND PARTICIPANTS

This cross-sectional study was conducted using an online survey from the 8th to the 17th of April 2020 across varied health care settings in Oman accruing 1139 HCWS.

MAIN OUTCOMES AND MEASURES

Mental health status was assessed using *Depression, Anxiety, and Stress Scales* (DASS-21), and insomnia was evaluated by the *Insomnia Severity Index* (ISI). Samples were categorized into the frontline and non-frontline groups. Chi-square, odds ratio, and independent t-tests were used to compare groups by demographic and mental health outcomes.

Results

This study included 1139 HCWs working in Oman. There was a total of 368 (32.3%), 388 (34.1%), 271 (23.8%), and 211 (18.5%) respondents reported to have depression, anxiety, stress, and insomnia, respectively while working during the pandemic period. HCWs in the frontline group were 1.4 times more likely to have anxiety (OR=1.401, p=0.007) and stress (OR=1.404, p=0.015) as compared to those working in the non-frontline group. On indices of sleep-wake cycles, HCWs in the frontline group were 1.37 times more likely to report insomnia (OR=1.377, p=0.037) when compared to those working in the non-frontline group. No significant differences in depression status between workers in the frontline and non-frontline groups were found (p=0.181).

CONCLUSIONS AND RELEVANCE

To our knowledge, this is the first study to explore the differential impacts of the COVID-19 pandemic on different grades of HCWs. This study suggests that frontline HCWs are disproportionally affected compared to non-frontline HCWs. The problem with managing sleep-wake cycles and anxiety symptoms were highly endorsed among frontline HCWs. As psychosocial interventions are likely to be constrained owing to the pandemic, mental health care must first be directed to frontline HCWs.

Keywords: Frontline Health Care Workers; COVID-19; Depression; Anxiety; Insomnia; The depression, Anxiety and Stress Scale; Insomnia Severity Index; Oman

---

Article Summary

Methods

- The study accrued 1139 participants of which 574 were working as frontline HCWs (565 non-frontline workers) serving patients with COVID-19 in different categories of healthcare settings in Oman.

- The following tools used were used alongside the collection of demographic information: The depression, Anxiety and Stress Scale (DASS-21) and Insomnia Severity Index.

- Strengths: This nationally representative study is the first of its kind to investigate the differences in magnitude and the covariates of stress and distress between frontline and non-frontline healthcare workers in Oman.

- Limitations: The use of an online survey and the use of symptom checklists (DASS, ISI) which are typically no match for the 'gold-standard' interviews.

- It is also not clear whether the observed mental health outcomes constitute adjustment disorders/ acute stress reaction or present a chronic-type and thus irreversible psychological distress.

INTRODUCTION:

COVID-19, a new strain among the class of corona-virus, has been reported to have first manifested in humans in December 2019, subsequently triggering a global pandemic [1]. Among the countries affected, specifically in the Arabian Gulf, is Oman. On February 24th, 2020, Oman reported its first two cases testing positive for COVID-19. The initial report implicated the spread of COVID-19 in Oman via citizens who had travelled abroad [2]. More recently, the Ministry of Health has reported an increasing number of people being diagnosed with COVID-19 with a few deaths and multiple recoveries [3]. With the ever-growing number of confirmed and suspected cases, the workload of healthcare workers (HCWs) has been overwhelming. The long and irregular hours of such continuous and heavy volumes of work have the potential to trigger stress and distress.

Empirical evidence suggests that stress associated with a period of tribulation tends to weaken the immune system, further increasing the risk of diseases [4]. Given this fact, in addition to having a high risk of contracting COVID-19, partly attributed to suboptimal protection [5,6], HCWs are prone to poor mental health outcomes [7,8]. Therefore, early detection among HCWs has the potential to 'pre-empt' the development of intransigent, and an advanced pathology of mental health outcomes, thereby helping to reduce the less desirable trend of having compromised HCWs during a pandemic.

The prevalence of stress and distress during times of great tribulation and seismic political, social and economic situations have been extensively investigated [9]. Studies have shown a significant peak of poor coping, maladjustment and the development of emotional disorders in the wake of such unpredictable times [10]. With the current global pandemic of COVID-19, Holmes et al. [11] have emphasized the importance of giving priority to all three tiers of social, psychological, and biological health. As stress and distress have commonly been reported among healthcare workers, often outshining the rate observed in the general population [12,13,14], the question remains whether there are differences in magnitude and the covariates of

4

stress and distress among those working on the frontlines and those who are not. This hypothesis has received scant attention.

While impressionistic reports on the psychosocial issues among healthcare workers have emerged in Oman [8], there is the dearth of studies that address these issues among a nationally-representative sample of healthcare workers. This study from Oman aims to fill this gap in the existing literature. Thus, this study assessed and compared the demographic and psychological factors and sleep status of frontline HCWs vs non-frontline HCWs. Understanding demographic factors that have the potential to tamper with relevant preventative measures and knowing if their magnitude is higher among frontline HCWs will help inform the urgent mechanisms that are needed to preserve the wellbeing and resilience of such subtypes of HCWs [11].

Methods

SETTING AND PARTICIPANTS

This cross-sectional study was conducted from 8th April to 17th April 2020 across the varied health care settings in the country. Oman has a universal free healthcare system and is divided into primary, secondary, tertiary, and polyclinics [15]. According to the Ministry of Health of Oman, the first point of contact with healthcare is the primary healthcare setting. If the service seeker should require secondary or tertiary care, then they are referred or transported to the relevant catchment areas with secondary or tertiary care services.

With persisting social distancing, the study proforma was disseminated using emails of representative HCWs working in different regions of the country [16]. After initial contact, potential respondents were also asked to disseminate the information to their colleagues to increase the response rate.

Oman has eleven administrative regions known as governorates or *muhafazah* [16]. Concerted efforts were made to accrue participants from all such regions in the country. One relevant clinical department was randomly sampled from each chosen healthcare setting, and all HCWs in this department were asked to participate in this study. The required sample size corresponding to an acceptable margin of error for

5

proportion (0.1) was calculated. The proportion of HCWs with psychological comorbidity was estimated at 35%, based on an earlier SARS and COVID-19 outbreak report [7, 17]. To allow for analysis of the relevant subgroups, the investigators of this study increased the sample size by 50 percent intending to reach at least 1070 participants. The study proforma was available in both Arabic and English and could be accessed via an online platform (google document) and any information about this study was in the form itself. All respondents provided informed consent. At the end of the study survey, 1160 healthcare workers returned a fully completed study proforma

Outcomes and Covariates

The depression, Anxiety and Stress Scale (DASS-21): DASS-21 is a self-report screening checklist designed to measure the negative feelings that are broadly categorized as depressive symptoms, anxiety, and stress [18]. Both the English and non-English (including Arabic) versions of DASS-21 have been found to have adequate internal consistency (Cronbach's alpha scores of > 0.7) [18, 19]. DASS-21 has also been used in Oman and reported to have adequate Cronbach's α for the three subscales. The present study used the following cut-offs: Depression >= 10; Anxiety >= 8; Stress >=16 [19].

Insomnia Severity Index

Insomnia Severity Index (ISI) is a 7-item self-report questionnaire tapping into the severity of insomnia [20]. Both English and non-English including Arabic versions of the ISI have been found to have adequate internal reliability (Cronbach's alpha scores of > 0.7 [21]. A 5-point Likert scale was used to rate each item (e.g., 0 = no problem; 4 = very severe problem), yielding a total score ranging from 0 to 28. A previous study suggested that a cut-off score of 14 was deemed adequate for detecting clinical insomnia with a sensitivity of 82.4% and specificity of 82.1% [22].

Demographic factors

6

The study proforma included socio-demographic data (nationality, gender, age, marital status), type of medical setting (primary, secondary, tertiary care, or polyclinic) and whether they were directly engaged in clinical activities such as diagnosing, treating, or providing nursing care to patients with elevated temperatures or patients with confirmed Covid-19 infection. Those who responded as diagnosing, treating, or providing nursing care were identified as 'frontline HCWs'. Those participants who had no contact with the units assigned to handle services for COVID-19 patients were defined to constitute second-line workers or 'non-frontline HCWs'.

Participants' job type (physician, nurse, and allied healthcare professional) was also sought. Allied healthcare professions included pharmacists and other medical staffing including laboratory technicians. Finally, the participants were also asked whether they had previously sought consultation for psychiatric disorders ('yes' / 'no').

Ethical Issues

This study adhered to the American Association for Public Opinion Research reporting guidelines [23]. Ethical approval was obtained before the commencement of the study from the local IRB, Directorate General of Planning and Studies, Centre of Studies and Research, Ministry of Health (MOH/ DGPS/CSR/20/2311). Written consent was sought from participants and they were told specifically that their involvement could be terminated if they wish so without undue consequences. The survey was anonymous, and confidentiality of information was assured.

Statistical Analysis

Data analysis was performed using SPSS statistical software version 23.0 (IBM Corp). Descriptive statistics were used to explore the profile of the samples in terms of their demographic and psychological outcomes. Samples were categorized into the frontline and non-frontline groups. Chi-square, odds ratio, and independent t-tests were used to compare groups by demographic and psychical factors. All significant tests were set at 5% alpha level.

Patient and Public Involvement

7

It was not appropriate or possible to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research

Results

This cross-sectional study was conducted using an online survey from the 8th to the 17th of April in 2020 across different health care services in Oman. In total, we received 1167 questionnaires of which 28 were determined to be incomplete on examination. Thus, we only included 1139 records for further analysis.

Demographic and psychological outcomes of the study samples

In Table 1, among the 1139 HCWs, 228 (20.0%) are males, and 911 (80.0%) are females. Their average age was 36.3 ± 6.5 (Mean ± SD) and range from 21 to 65 years. The majority are Omani (n=981, 86.1%) and are married (n=987, 86.9%). A total of 574 (50.4%) were directly involved in diagnosing, treating, and taking care of confirmed or suspected cases of COVID19 (frontline group). There were 390 (34.2%), 164 (14.4%), 478 (42.0%), and 106 (9.3%) were working in primary, secondary health care, tertiary health care as well as polyclinics respectively. Among those HCWs, 384 (33.7%), 449 (39.5%), and 305 (26.8) were physicians, nurses, and allied health profession, respectively. Concerning psychological outcomes, 368 (32.3%), 388 (34.1%), 271 (23.8%), and 211 (18.5%) respondents reported symptoms of depression, anxiety, stress, and insomnia, respectively while working during the pandemic period.

Comparison of frontline and non-frontline staff on demographic and psychological outcomes

In Table 1, significant differences were found between the two presently defined cohorts of HCWs - frontline and non-frontline groups. The frontline group comprised of members younger in age (36.3 ± 6.5, p=0.004) with more of them being non-Omani (n=94, 59.5%, p=0.014), physicians and nurses (n=490, 58.8%, p<.001), not married (n=90, 60.4%, p=0.008), handled COVID-19 cases (n=372, 81.2%, p<.001), and working

8

in primary health care setting (n=242, 62.1%, p<.001) as compared to the non-frontline group. With regard to psychological outcomes, members of the frontline group were 1.4 times more likely to have anxiety (OR=1.401, p=0.007) and stress (OR=1.404, p=0.015) as compared to the non-frontline group. In considering insomnia, the frontline group was 1.37 times more likely to experience the same (OR=1.377, p=0.037) as compared to the non-frontline group. No significant differences in depression status were found between the two groups (p=0.181).

Discussion

Various mechanisms to come to grip with the COVID-19 pandemic, including travel restrictions, quarantines, and curfews which, in turn, have severely disrupted the social and economic activities of the society, nation, or for that matter the world [24], have been proposed. While the impact of socio-economic activities due to COVID-19 has been widely acknowledged in the countries of the Arabian Gulf [25], what has been overlooked is the fact that healthcare workers (HCWs) are in the frontline in the COVID-19 pandemic which, in turn, would suggest the importance of examining their resilience in the light of those challenges.

Being a "once-in-a-century pandemic" [26], some of the misgivings affecting HCWs include the fear of contracting a lethal virus and spreading it to the rest of their social network, lack of evidence-based prevention and intervention, lack of essential protective gear and the fact that the pandemic requires protracted shifts with a high volume of patients with different degrees of pathology and severity [27,28]. This would imply that HCWs are now working in a uniquely hazardous situation and are thus vulnerable to stress and distress. In addition to operational stresses, some preliminary studies have suggested that psychosocial dysfunctions are rife among HCWs [28, 29]. A recent systematic literature review and meta-analysis covering the literature of the pre-pandemic COVID-19 period suggest that 7.0% to 75.2% of HCWs are burned out [30]. This huge discrepancy in the prevalence of burnout hinges on country-specific factors, applied instruments and cut-off-criteria for burnout symptomatology [31]. The

9

prevalence of burnout among HCWs appears to outstrip the general population [32]. Similarly, in addition to burnout, the prevalence of depressive symptoms, anxiety, and stress among HCWs are also higher than the general population [12,13,14]. However, since the higher level of stress and distress among HCWs as compared to the general population has been a trend existing even before the pandemic, it not clear whether the emerging high level of mental health outcomes owes its onset to COVID-19. One approach to disentangling this issue is to compare mental health outcomes between frontline HCWs vs non-frontline HCWs. This study had therefore embarked on the assessment and comparison of demographic and psychological factors and sleep status of frontline versus non-frontline HCWs.

The present study accrued 1139 HCWs from different parts of the country. As the HCWs in Oman are predominantly female [33], this study is in line with the observed 'effeminization' of healthcare as 80.0% of the present participants were female. Approximately 50% fulfil the present definition of 'frontline HCWs' who, in their clinical practices, diagnose, treat, and take care of confirmed or suspected cases of COVID-19 in their respective clinics across the country. The cohort consisted of physicians, nurses, and allied health professionals.

To tap into the levels of depression, anxiety, and stress, the *Depression, Anxiety, and Stress Scale* (DASS-21) was used. Of the present cohort, comprised of both frontline and non-frontline HCWs, 32.3% endorsed case-ness for depressive symptoms, 34.1% for anxiety, and 23.8% for stress. In Singapore among HCWs using DASS-21, Tan et al. [34] have reported 8.9% case-ness for depression, 14.5% for anxiety, and 6.6% for stress. Using different screening tools, Lai et al. [7] have reported 50.4%, 44.6%, and 71.5% symptoms of depression, anxiety, and distress respectively among HCWs in Hubei province in China. Lai's study indicated that 34.0% of their sample had an elevated score of insomnia which appears to be lower compared to the prevalence of 38·9% among HCWs investigated as part of the studies included in their systematic review and meta-analysis [29]. Putting these studies together and within the background of the general population, other than the lower rate of depression in

10

Singapore, the magnitude of mental health outcomes appears to be higher among HCWs when compared to the general population. In the general population, the prevalence of depression, anxiety, and insomnia have been estimated to be 11.1% [12], 5.3%, 7.3% [13], and 10% - 30% [14] respectively. Low mental health outcomes among HCWs in Oman and Singapore could be attributed to the preparedness phase the country underwent as the first cases were registered much later than when the World Health organization declared COVID-19 a global pandemic [1]. While studies on the status of mental health outcomes and sleep status have been forthcoming from different parts of the world, many of them are single-center [8] and regional studies [7] with some of the catchment areas not being defined [34]. A study with a nationally representative sample of HWCs taking into account both the frontline and non-frontline are therefore warranted.

The second aim of the present study was to compare demographic and psychological outcomes among frontline and non-frontline HCWs. The present data suggest that frontline HCWs are likely to be younger, single, physicians or nurses working in primary healthcare and are required to handle COVID-19 cases. The majority of frontline HCWs were non-Omani, a trend that is worth contemplating. Despite the effort to 'Omanize' the healthcare infrastructure, foreign nationals still form the bulk of HCWs in Oman [35]. The COVID-19 pandemic has resulted in travel restrictions and an expected economic recession, resultant job security, and being cut off from their country of origin for the migrant population [36]. It remains to be seen whether these factors have rendered non-Omani HCWS to be more vulnerable to the presently observed mental health outcomes.

In psychological outcomes, compared to non-frontline HCWs, frontline HCWs were more likely to endorse anxiety symptoms and stress. A similar trend was observed with insomnia. Interestingly, the depressive symptoms did not emerge as being significant in the equation employed to differentiate between frontline vs non-frontline HCWs. Oman is characterized by a collectivistic society that is in direct contrast to western individualistic societies [37]. In such a society, anxiety symptoms

11

('I experienced trembling in the hands') and stress ('I felt that I was using a lot of nervous energy') tend to be perceived to be a veneer of physical symptoms and are therefore likely to be endorsed. In contrast, depressive symptoms ('I felt down-hearted and blue') are thought to be more of a weakness of character than a manifestation of 'disease'. As psychological outcomes are increasingly recognized to emerge as a consequence of COVID-19 [11], more studies are needed to decipher the culturally-specific idioms of distress intimately tied to mental health outcomes during the pandemic.

Limitations

Most psychosocial studies of this nature tend to have many limitations owing to the amorphous variables under scrutiny. Firstly, conducting a national wide survey requires proper logistics which was not feasible during the lockdown. An online survey is known to marred by the fact that it tends to accrue a selective population who are technologically savvy and more familiar with the evolving 'internet culture' [38]. Notwithstanding such a view, this study appears to have reached its targeted population based on the estimated sample size. Oman has established that > 71% of the total population (4.6 million) has access to internet services [38]. Secondly, DASS-21 and ISI are no match for the 'gold-standard' interviews such as those that follow the *Diagnostic and Statistical Manual of Mental Disorders* and World Health Organization *Composite International Diagnostic Interview* (CIDI). However, quick symptom checklists such as DAS-21 and ISI are the only viable tools to conduct such a study given the current circumstances [7]. Lastly, time factors are also considered important for quantifying the presence of psychological disorders. Within this view, it not clear whether the observed mental health outcomes constitute adjustment disorders/ acute stress reaction or present a chronic-type and thus irreversible psychological distress. Follow-up studies in this regard are therefore warranted.

Conclusion:

COVID-19, a new strain among the class of Coronavirus, has recently gripped all corners of the world triggering a global public health emergency. Within the

12

background of high rates of poor coping among HCWs even before the pandemic, studies are needed to explore how frontline HCWs fare compared to non-frontline HCWs in this regard. This study highlighted and appeared to be congruent with other studies in suggesting that the COVID-19 outbreak has triggered a higher rate of depressive symptoms, anxiety, and insomnia among HCWs. In comparing frontline and non-frontline HCWs, the present data suggested that frontline HCWs were likely to be younger non-Omani physicians or nurses who were single, and working in primary healthcare. It is therefore paramount to offer timely psychological intervention for the HCWs to promote coping and resilience among these vulnerable HCWs.

ARTICLE INFORMATION

Corresponding Authors: Dr. Samir Al-Adawi, Department of Behavioral Medicine, College of Medicine & Health Sciences, Sultan Qaboos University, P.O. Box 35, Al Khoudh 123, Muscat, Oman (samir.al-adawi@fulbrightmail.org)

Al Masarra Hospital, Ministry of Health, Wilayat Al Amerat, Muscat (**Alshekaili M., Hassan W., Al-Said N., alsulimani F.**); Centre of Studies & Research, Directorate General Planning and studies, Ministry of Health, Oman (**Kumar S., Al-Mawali A.**); Department of Family Medicine & Public Health, Sultan Qaboos University, Muscat, Oman(**Chan, Moon Fai**); Department of Behavioral Medicine, Sultan Qaboos University Hospital, Muscat, Oman (Mahadevan **S., Al-Adawi S.**)

13

Statistical analysis: Walid Hassan, Moon Fai Chan

Administrative, technical, or material support: Satish Kumar, Adhra Al-Mawali,

Supervision: Muna Alshekaili, Walid Hassan.

Conflict of Interest Disclosures: None reported.

Funding/Support: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Additional Contributions: We thank all the participants who contributed to our work.

Data Statement: All data generated and analysed during this study are included as part of this article.

References

1.   Balkhair AA. COVID-19 Pandemic: A New Chapter in the History of Infectious Diseases. Oman Medical Journal. 2020 Mar;35(2):e123.

2.   The Arabian Stories. Coronavirus: Omanis banned from leaving the country. March 18, 2020 https://www.thearabianstories.com/2020/03/18/coronavirus-omanis-banned-from-leaving-the-country/

3.   Oman Observer. Oman reports 463 new cases, total 7,257. 23/05/2020. https://www.omanobserver.om/oman-reports-463-new-cases-total-7257/

4.   de Kloet E, Joëls M. Mineralocorticoid Receptors and Glucocorticoid Receptors in HPA Stress Responses During Coping and Adaptation. Oxford Research Encyclopedia of Neuroscience, 2020. Retrieved 23 May. 2020, from https://oxfordre.com/neuroscience/view/10.1093/acrefore/9780190264086.001.0001/acrefore-9780190264086-e-266.

5.   Barranco R, Ventura F. Covid-19 and infection in health-care workers: An emerging problem [published online ahead of print, 2020 May 22]. Med Leg J. 2020;25817220923694. doi:10.1177/0025817220923694.

6.   Jin YH, Huang Q, Wang YY, et al. Perceived infection transmission routes, infection control practices, psychosocial changes, and management of COVID-19 infected healthcare workers in a tertiary acute care hospital in Wuhan: a cross-sectional survey. Mil Med Res. 2020;7(1):24. Published 2020 May 11. doi:10.1186/s40779-020-00254-8.

14

7.   Lai J, Ma S, Wang Y, et al. Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. JAMA Netw Open. 2020;3(3):e203976. Published 2020 Mar 2. doi:10.1001/jamanetworkopen.2020.3976.

8.   Badahdah AM, Khamis F, Mahyijari NA. The psychological well-being of physicians during COVID-19 outbreak in Oman [published online ahead of print, 2020 May 6]. *Psychiatry Res*. 2020;289:113053. doi:10.1016/j.psychres.2020.113053.

9.   Shah K, Kamrai D, Mekala H, Mann B, Desai K, Patel RS. Focus on mental health during the coronavirus (COVID-19) pandemic: applying learnings from the past outbreaks. Cureus. 2020 Mar;12(3).

10.   Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, Ho RC. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in china. International Journal of Environmental Research and Public Health. 2020 Jan;17(5):1729.

11.   Holmes EA, O'Connor RC, Perry VH, et al. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. Lancet Psychiatry. 2020;7(6):547-560. doi:10.1016/S2215-0366(20)30168-1.

12.   Bromet E, Andrade LH, Hwang I, et al. Cross-national epidemiology of DSM-IV major depressive episode. BMC Med. 2011;9:90. doi:10.1186/1741-7015-9-90.

13.   Baxter AJ, Scott KM, Vos T, Whiteford HA. Global prevalence of anxiety disorders: a systematic review and meta-regression. Psychol Med. 2013;43(5):897-910. doi:10.1017/S003329171200147X.

14.   Roth T. Insomnia: definition, prevalence, etiology, and consequences. J Clin Sleep Med. 2007;3(5 Suppl): S7-S10.

15.   Mataria A, Hajjeh R, Al-Mandhari A. Surviving or thriving in the Eastern Mediterranean region: the quest for universal health coverage during conflict. Lancet. 2020;395(10217):13-15. doi:10.1016/S0140-6736(19)33061-2.

16.   Al Riyami A, Elaty MA, Morsi M, Al Kharusi H, Al Shukaily W, Jaju S. Oman world health survey: part 1 - methodology, sociodemographic profile and epidemiology of non-communicable diseases in oman. Oman Med J. 2012;27(5):425-443.

17.   Lee AM, Wong JG, McAlonan GM, et al. Stress and psychological distress among SARS survivors 1 year after the outbreak. Can J Psychiatry. 2007;52(4):233-240. doi:10.1177/070674370705200405.

15

18. Moussa MT, Lovibond P, Laube R, Megahead HA. Psychometric properties of an arabic version of the depression anxiety stress scales (DASS). Research on Social Work Practice. 2017 May;27(3):375-86.

19. Lee J, Lee EH, Moon SH. Systematic review of the measurement properties of the Depression Anxiety Stress Scales-21 by applying updated COSMIN methodology. Qual Life Res. 2019;28(9):2325-2339. doi:10.1007/s11136-019-02177-x.

20. Morin CM. Insomnia: Psychological assessment and management. New York: Guilford Press; 1993.

21. Suleiman KH, Yates BC. Translating the insomnia severity index into Arabic. Journal of Nursing Scholarship. 2011 Mar;43(1):49-53.

22. Gagnon C, Bélanger L, Ivers H, Morin CM. Validation of the Insomnia Severity Index in primary care. J Am Board Fam Med. 2013 Nov-Dec;26(6):701-10. doi: 10.3122/jabfm.2013.06.130064.

23. American Association for Public Opinion Research (AAPOR) reporting guideline. https://www.aapor.org/Publications-Media/AAPOR-Journals/Standard-Definitions.aspx.

24. Bedford J, Enria D, Giesecke J, et al. COVID-19: towards controlling of a pandemic. *Lancet*. 2020;395(10229):1015-1018. doi:10.1016/S0140-6736(20)30673-5.

25. Country/Territory Report - Oman.; 2020:1-49. http://ezproxysrv.squ.edu.om:2127/login.aspx?direct=true&db=awr&AN=143036153 &site=ehost-live&scope=site. Accessed May 29, 2020.

26. Gates B. Responding to Covid-19 - A Once-in-a-Century Pandemic?. *N Engl J Med*. 2020;382(18):1677-1679. doi:10.1056/NEJMp2003762

27. Senni M. COVID-19 experience in Bergamo, Italy. Eur Heart J. 2020;0:1–2. doi: 10.1093/eurheartj/ehaa279

28. Huang J, Liu F, Teng Z, et al. Care for the psychological status of frontline medical staff fighting against COVID-19 [published online ahead of print, 2020 Apr 3]. *Clin Infect Dis*. 2020;ciaa385. doi:10.1093/cid/ciaa385.

16

29. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsi E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis [published online ahead of print, 2020 May 8]. *Brain Behav Immun*. 2020;S0889-1591(20)30845-X. doi:10.1016/j.bbi.2020.05.026.

30. Erschens R, Keifenheim KE, Herrmann-Werner A, et al. Professional burnout among medical students: Systematic literature review and meta-analysis. *Med Teach*. 2019;41(2):172-183. doi:10.1080/0142159X.2018.1457213.

31. Rotenstein LS, Torre M, Ramos MA, et al. Prevalence of Burnout Among Physicians: A Systematic Review. JAMA. 2018;320(11):1131-1150. doi:10.1001/jama.2018.12777

32. Dyrbye LN, West CP, Satele D, et al. Burnout among U.S. medical students, residents, and early career physicians relative to the general U.S. population. Acad Med. 2014;89(3):443-451. doi:10.1097/ACM.0000000000000134.

33. Mohamed NA, Abdulhadi NN, Al-Maniri AA, Al-Lawati NR, Al-Qasmi AM. The trend of feminization of doctors' workforce in Oman: is it a phenomenon that could rouse the health system?. *Hum Resour Health*. 2018;16(1):19. doi:10.1186/s12960-018-0283-y.

34. Tan BYQ, Chew NWS, Lee GKH, et al. Psychological Impact of the COVID-19 Pandemic on Health Care Workers in Singapore [published online ahead of print, 2020 Apr 6]. *Ann Intern Med*. 2020; M20-1083. doi:10.7326/M20-1083

35. Emerson C. Localization of the Nursing Workforce in the Sultanate of Oman. Case Studies in Global Health Policy Nursing. 2018 Jun 28:85.

36. Liem A, Wang C, Wariyanti Y, Latkin CA, Hall BJ. The neglected health of international migrant workers in the COVID-19 epidemic. The Lancet Psychiatry. 2020 Apr 1;7(4): e20.

37. Al-Adawi S. Adolescence in Oman. In Jeffrey Jensen Arnett, Editor. *International Encyclopedia of Adolescence: A Historical and Cultural Survey of Young People around the World* (2 Volume Set). New York: Routledge, 2006, pp.713-828.

38. Belwal R, Al Shibli R, Belwal S. Consumer protection and electronic commerce in the Sultanate of Oman. Journal of Information, Communication and Ethics in Society. 2020 https://doi.org/10.1108/JICES-09-2019-0110.**38.**

17

Table 1. Comparison of the frontline with non-frontline staff in association of demographic and psychological factors during the impacts of COVID-19 in Oman						
Variables			Frontline HCWs	Non-frontline HCWs		
		Total (n=1139)	Yes (n=574)	No (n=565)		
		n (%)	n (%)	n (%)	Statistics[a]	*p*-value
Socio-demographics factors						
Age (Years)	Mean ± SD	36.3 ± 6.5	35.8 ± 6.1	36.9 ± 6.8	2.884[b]	0.004
Gender	Male	228 (20.0)	102 (44.7)	126 (55.3)	3.651	0.056
	Female	911 (80.0)	472 (51.8)	439 (48.2)		
Nationality	Omani	981 (86.1)	480 (48.9)	501 (51.1)	6.075	0.014
	Non-Omani	158 (13.9)	94 (59.5)	64 (40.5)		
Healthcare type	Physician	384 (33.7)	229 (59.6)	155 (40.4)	87.586	<0.001
	Nurse	449 (39.5)	261 (58.1)	188 (41.9)		
	Allied health	305 (26.8)	84 (27.5)	221 (72.5)		
Previous sought mental health consultation	No	1013 (89.3)	512 (50.5)	501 (49.5)	0.013	0.910
	Yes	122 (10.7)	61 (50.0)	61 (50.0)		
Marital status	Not married	149 (13.1)	90 (60.4)	59 (39.6)	6.930	0.008
	Married	987 (86.9)	482 (48.8)	505 (51.2)		
Number of COVID-19 cases were handled[+]	No	679 (59.7)	200 (29.5)	479 (70.5)	293.203	<0.001
	Yes	458 (40.3)	372 (81.2)	86 (18.8)		
	1-5 cases	312 (68.1)	254 (81.4)	58 (18.6)	0.023	0.881
	6+ cases	146 (31.9)	118 (80.8)	28 (19.2)		
Type of healthcare	Primary	390 (34.3)	242 (62.1)	148 (37.9)	44.884	<0.001
	Secondary	164 (14.4)	70 (42.7)	94 (57.3)		

18

	Tertiary	478 (42.0)	231 (48.3)	247 (51.7)		
	Polyclinic	106 (9.3)	31 (29.2)	75 (70.8)		
Psychological symptoms						
DASS - Depression	Yes	368 (32.3)	196 (53.3)	172 (46.7)	1.185[c]	0.181
	No	771 (67.7)	378 (49.0)	393 (51.0)		
DASS - Anxiety	Yes	388 (34.1)	217 (55.9)	171 (44.1)	1.401[c]	0.007
	No	751 (65.9)	357 (47.5)	394 (52.5)		
DASS - Stress	Yes	271 (23.8)	154 (56.98)	117 (43.2)	1.404[c]	0.015
	No	868 (76.2)	420 (48.4)	448 (51.6)		
Vegetative symptoms						
Insomnia	Yes	211 (18.5)	120 (56.9)	91 (43.1)	1.377[c]	0.037
	No	928 (81.5)	454 (48.9)	474 (51.1)		
a, Chi-square; b, t statistic; c, Odds Ratio; +, 2 missing records						
DASS, The Depression, Anxiety, and Stress Scale (DASS-21); Insomnia Severity Index						

19

BMJ Open

Factors associated with Mental Health Outcomes across healthcare settings in Oman during COVID19: Frontline versus Non-frontline Healthcare Workers

SCHOLARONE™
Manuscripts

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

BMJ

I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Factors associated with Mental Health Outcomes across healthcare settings in Oman during COVID19: Frontline versus Non-frontline Healthcare Workers

Muna Alshekaili[1], Walid Hassan[1], Nazik Al-Said[1], Fatima Alsulaimani [1], Satish Kumar[2], Adhra Al-Mawali [2], Moon Fai Chan[3], Sangeetha Mahadevan[4], Samir Al-Adawi[4]

[1] Al Masarra Hospital, Ministry of Health, Wilayat Al Amerat, Muscat, Oman
[2] Centre of Studies & Research, Directorate General Planning, and studies, Ministry of Health, Oman
[3] Department of Family Medicine & Public Health, College of Medicine & Health Sciences Sultan Qaboos University, Muscat, Oman
[4]Department of Behavioral Medicine, College of Medicine & Health Sciences, Sultan Qaboos University, Muscat, Oman

Corresponding author
Dr. Samir Al-Adawi
Department of Behavioral Medicine, College of Medicine & Health Sciences
Sultan Qaboos University
P.O. Box 35, P.C. 123
Al Khoudh, Muscat, Sultanate of Oman
Phone : (+968) 2414 -1139
Mobile : (+ 968) 9938 -0246
Fax : (+ 968) 2441 -3419
Email: samir.al-adawi@fulbrightmail.org

All Authors' emails
Muna Alshekaili [m.alshekaili@gmail.com]
Walid Hassan [ebrahimw@mymail.vcu.edu]
Nazik Al Said [alsaidnazik@gmail.com]
Fatima Alsulaimani [um-alkhalil@hotmail.com]
Sathish Kumar Jayapal [sathish.kumar@moh.gov.om]
Adhra Al-Mawali [adhra.almawali@gmail.com]
Moon Fai Chan [moonf@squ.edu.om]
Sangeetha Mahadevan [sm5520@nyu.edu]
Samir Al-Adawi [samir.al-adawi@fulbrightmail.org]

Short Title: Mental Health Outcomes of HCWs in Oman during COVID19
Word count: 3,220

1

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Abstract

OBJECTIVE:
This study aims to assess and compare demographic and psychological factors and sleep status of frontline healthcare workers (HCWs) in relation to non-frontline HCWs.

DESIGN, SETTINGS, PARTICIPANTS AND OUTCOMES
This cross-sectional study was conducted from the 8th to the 17th of April 2020 using an online survey across varied health care settings in Oman accruing 1139 HCWS.
The primary and secondary outcomes were mental health status and socio-demographic data, respectively. Mental health status was assessed using *Depression, Anxiety, and Stress Scales* (DASS-21), and insomnia was evaluated by the *Insomnia Severity Index* (ISI). Samples were categorized into the frontline and non-frontline groups. Chi-square and t-tests were used to compare groups by demographic data. The Mantel-Haenszel odds ratio was used to compare groups by mental health outcomes adjusted by all socio-demographic factors.

RESULTS
This study included 1139 HCWs working in Oman. While working during the pandemic period, a total of 368 (32.3%), 388 (34.1%), 271 (23.8%), and 211 (18.5%) respondents were reported to have depression, anxiety, stress, and insomnia, respectively. HCWs in the frontline group were 1.5 times more likely to report anxiety (OR=1.557, p=0.004) stress (OR=1.506, p=0.016) and insomnia (OR=1.586, p=0.013) as compared to those in the non-frontline group. No significant differences in depression status were found between the frontline and non-frontline groups (p=0.201).

CONCLUSIONS
To our knowledge, this is the first study to explore the differential impacts of the COVID-19 pandemic on different grades of HCWs. This study suggests that frontline HCWs are disproportionally affected compared to non-frontline HCWs, with managing sleep-wake cycles and anxiety symptoms being highly endorsed among frontline HCWs. As psychosocial interventions are likely to be constrained owing to the pandemic, mental health care must first be directed to frontline HCWs.

Keywords: Frontline Health Care Workers; COVID-19; Depression; Anxiety; Insomnia; The depression, Anxiety and Stress Scale; Insomnia Severity Index; Oman

2

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Article Summary

Methods

- The study accrued 1139 participants of which 574 were working as frontline HCWs (565 non-frontline workers) serving patients with COVID-19 in different categories of healthcare settings in Oman.

- The following tools used were used alongside the collection of demographic information: The depression, Anxiety and Stress Scale (DASS-21) and Insomnia Severity Index.

- Strengths: This nationally representative study is the first of its kind to investigate the differences in magnitude and the covariates of stress and distress between frontline and non-frontline healthcare workers in Oman.

- Limitations: The use of an online survey and the use of symptom checklists (DASS, ISI) which are typically no match for the 'gold-standard' interviews.

- It is also not clear whether the observed mental health outcomes constitute adjustment disorders/ acute stress reaction or present a chronic-type and thus irreversible psychological distress.

3

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

INTRODUCTION:

COVID-19, a new strain among the class of corona-virus, has been reported to have first manifested in humans in December 2019, subsequently triggering a global pandemic [1]. Among the countries affected, specifically in the Arabian Gulf, is Oman. On February 24th, 2020, Oman reported its first two cases testing positive for COVID-19. The initial report implicated the spread of COVID-19 in Oman via citizens who had travelled abroad [2]. More recently, the Ministry of Health (MoH) has reported an increasing number of people being diagnosed with COVID-19 with a few deaths and multiple recoveries [3]. On April 11, the results of mass testing by the MoH indicated approximately 500 cases per day that were confirmed to have COVID-19. This trend gradually showed only an upward trend with numbers surging up to over 1000 confirmed cases per day, indicating an increased number of cases who were becoming critically ill with some of them losing their lives [4,5]. With the ever-growing number of confirmed and suspected cases, the workload of healthcare workers (HCWs) has been overwhelming. The long and irregular hours of such continuous and heavy volumes of work have the potential to trigger stress and distress.

Empirical evidence suggests that stress associated with a period of tribulation tends to weaken the immune system, further increasing the risk of diseases [6]. Given this fact, in addition to having a high risk of contracting COVID-19, partly attributed to suboptimal protection [7,8], HCWs are prone to poor mental health outcomes [9,10] Therefore, early detection among HCWs has the potential to 'pre-empt' the development of intransigent, and an advanced pathology of mental health outcomes, thereby helping to reduce the less desirable trend of having compromised HCWs during a pandemic.

The prevalence of stress and distress during times of great tribulation and seismic political, social and economic situations have been extensively investigated [11]. Studies have shown a significant peak of poor coping, maladjustment and the development of emotional disorders in the wake of such unpredictable times [12]. With the current global pandemic of COVID-19, Holmes et al. [13] have emphasized the importance of giving priority to all three tiers of social, psychological, and biological health. As stress and distress have commonly been reported among healthcare workers, often outshining the rate observed in the general population [14-16], the question remains whether there are differences in magnitude and the covariates of stress and distress among those working on the frontlines and those who are not. This hypothesis has received scant attention.

4

While impressionistic reports on the psychosocial issues among healthcare workers have emerged in Oman [10], there is the dearth of studies that address these issues among a nationally-representative sample of healthcare workers. This study from Oman aims to fill this gap in the existing literature. Thus, this study assessed and compared the demographic and psychological factors and sleep status of frontline HCWs vs non-frontline HCWs. Understanding demographic factors that have the potential to tamper with relevant preventative measures and knowing if their magnitude is higher among frontline HCWs will help inform the urgent mechanisms that are needed to preserve the wellbeing and resilience of such subtypes of HCWs [13].

Methods

Setting and Participants

This cross-sectional study was conducted from 8th April to 17th April 2020 across varied health care settings in the country. Oman has a universal free healthcare system and is divided into primary, secondary, tertiary, and poly- clinics [17]. According to the MoH of Oman, the first point of contact with healthcare is primary healthcare. If the service seeker should require secondary or tertiary care, then they are referred or transported to the relevant catchment areas with secondary or tertiary care services.

With persisting social distancing, the study proforma was disseminated using emails of representative HCWs working in different regions of the country [18]. The inclusion criteria consisted of the HCW workers designated to work in healthcare setting that dispense care for people with COVID-19. In Oman, HCWs generally work across three settings: MoH, Governmental Non-MoH sector and Private sectors. The present HCWs constitute only those affiliated with the MoH. The HCWs who were quarantined/on leave or did not provide informed consent for the present study or provided incomplete responses were all excluded.

Oman has eleven administrative regions known as governorates or *muhafazah* [18]. Concerted efforts were made to accrue participants from all such regions in the country. One relevant clinical department was randomly sampled from each chosen healthcare setting, and all HCWs in this department were asked to participate in this study. This study randomly selected one department under MoH from each governorate. According to the manpower statistics from the MoH in 2018, there are 39303 HCWs under MoH, so around 3573 (39303/11) HCWs worked for each governorate. In each governorate, there were about 9

5

units/departments, with about 397 HCWs (3573/9) working in each department. Hence, in total, 4367 HCWs (397 x 11) were sent the online survey and the resulting response rate stood at 1167/4367=26.7%.

The required sample size corresponding to an acceptable margin of error for proportion (0.1) was calculated. The proportion of HCWs with psychological comorbidity was estimated at 35%, based on an earlier SARS and COVID-19 outbreak report [9, 19, 20]. To allow for analysis of the relevant subgroups, the investigators of this study increased the sample size by 50 percent intending to reach at least 1070 participants. The study proforma was available in both Arabic and English and could be accessed via an online platform (google document) and any information about this study was in the form itself. All respondents provided informed consent. At the end of the study survey, 1160 healthcare workers returned a fully completed study proforma.

Outcomes and Covariates

The primary outcomes of this survey are psychological factors and self-reported sleeping problems. Psychological symptoms were collected by the depression, Anxiety and Stress Scale (DASS-21): DASS-21 is a self-report screening checklist designed to measure the negative feelings that are broadly categorized as depressive symptoms, anxiety, and stress [21]. Both the English and non-English (including Arabic) versions of DASS-21 have been found to have adequate internal consistency (Cronbach's alpha scores of > 0.7) [21, 22]. DASS-21 has also been used in Oman and reported to have adequate Cronbach's α for the three subscales. The present study used the following cut-offs: Depression >= 10; Anxiety >= 8; Stress >=16 [22]. We used the Insomnia Severity Index to solicit the presence of subject's self-reported sleeping problems. Insomnia Severity Index (ISI) is a 7-item self-report questionnaire tapping into the severity of insomnia with each item of the scale tap into (1) "perceived severity of difficulties initiating sleep", (2) "difficulties staying asleep", (3) "early morning awakenings", (4) "satisfaction with current sleep pattern", (5) "interference with daily functioning", (6) "noticeability of impairment attributed to the sleep problem", and (7) "degree of distress or concern caused by the sleep problem" [23]. Both English and non-English including Arabic versions of the ISI have been found to have adequate internal reliability (Cronbach's alpha scores of > 0.7 [24]. A 5-point Likert scale was used to rate each item (e.g., 0 = no problem; 4 = very severe problem), yielding a total score ranging from 0 to 28. A previous study suggested

6

that a cut-off score of 14 was deemed adequate for detecting clinical insomnia with a sensitivity of 82.4% and specificity of 82.1% [25].

Socio-demographic factors

The secondary outcome is the socio-demographic data (nationality, gender, age, marital status), type of medical setting (primary, secondary, tertiary care, or polyclinic) and whether they were directly engaged in clinical activities such as diagnosing, treating, or providing nursing care to patients with elevated temperatures or patients with confirmed Covid-19 infection. Those who responded as diagnosing, treating, or providing nursing care were identified as 'frontline HCWs'. Those participants who had no contact with the units assigned to handle services for COVID-19 patients were defined to constitute second-line workers or 'non-frontline HCWs'. Participants' job type (physician, nurse, and allied healthcare professional) was also sought. Allied healthcare professions included pharmacists and other medical staffing including laboratory technicians. Finally, the participants were also asked whether they had previously sought consultation for psychiatric disorders ('yes' / 'no').

Ethical Issues

This study adhered to the American Association for Public Opinion Research reporting guidelines [26]. Ethical approval was obtained before the commencement of the study from the local IRB, Directorate General of Planning and Studies, Centre of Studies and Research, Ministry of Health (MOH/ DGPS/CSR/20/2311). Written consent was sought from participants and they were told specifically that their involvement could be terminated if they wish so without undue consequences. The survey was anonymous, and confidentiality of information was assured.

Statistical Analysis

Data analysis was performed using SPSS statistical software version 23.0 (IBM Corp). Descriptive statistics were used to explore the profile of the samples in terms of their demographic and psychological outcomes. Samples were categorized into the frontline and non-frontline groups. Chi-square and independent t-tests were used to compare groups by socio-demographic. Mantel-Haenszel odds ratio was used to compare groups by

7

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

psychological and vegetable factors adjusted by HCWs' job type, and other socio-demographic factors. All significant tests were set at 5% alpha level.

Patient and Public Involvement

It was not appropriate or possible to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research

Results

This cross-sectional study was conducted using an online survey from the 8th to the 17th of April in 2020 across different health care services in Oman. In total, we received 1167 questionnaires of which 28 were determined to be incomplete on examination. Thus, we only included 1139 records for further analysis.

Demographic and psychological outcomes of the study samples

In Table 1, among the 1139 HCWs, 228 (20.0%) are males, and 911 (80.0%) are females. Their average age was 36.3 ± 6.5 (Mean ± SD) and range from 21 to 65 years. The majority are Omani (n=981, 86.1%) and are married (n=987, 86.9%). A total of 574 (50.4%) were directly involved in diagnosing, treating, and taking care of confirmed or suspected cases of COVID19 (frontline group). There were 390 (34.2%), 164 (14.4%), 478 (42.0%), and 106 (9.3%) were working in primary, secondary health care, tertiary health care as well as polyclinics respectively. Among those HCWs, 384 (33.7%), 449 (39.5%), and 305 (26.8) were physicians, nurses, and allied health profession, respectively. Concerning psychological outcomes, 368 (32.3%), 388 (34.1%), 271 (23.8%), and 211 (18.5%) respondents reported symptoms of depression, anxiety, stress, and insomnia, respectively while working during the pandemic period.

Comparison of frontline and non-frontline staff on demographic and psychological factors and self-reported sleeping problems

In Table 1, significant differences were found between the two presently defined cohorts of HCWs - frontline and non-frontline groups. The frontline group comprised of members younger in age (36.3 ± 6.5, p=0.004) with more of them being non-Omani (n=94,

8

59.5%, p=0.014), physicians and nurses (n=490, 58.8%, p<.001), not married (n=90, 60.4%, p=0.008), handled COVID-19 cases (n=372, 81.2%, p<.001), and working in primary health care setting (n=242, 62.1%, p<.001) as compared to the non-frontline group. With regard to psychological outcomes, members of the frontline group were 1.5 times more likely to have anxiety (OR=1.557, p=0.004) and stress (OR=1.506, p=0.016) as compared to the non-frontline group. In considering insomnia, the frontline group was 1.5 times more likely to experience the same (OR=1.586, p=0.013) as compared to the non-frontline group. No significant differences in depression status were found between the two groups (p=0.201).

Discussion

Various mechanisms to come to grip with the COVID-19 pandemic, including travel restrictions, quarantines, and curfews which, in turn, have severely disrupted the social and economic activities of the society, nation, or for that matter the world [27], have been proposed. While the impact of socio-economic activities due to COVID-19 has been widely acknowledged in the countries of the Arabian Gulf [28], what has been overlooked is the fact that healthcare workers (HCWs) are in the frontline in the COVID-19 pandemic which, in turn, would suggest the importance of examining their resilience in the light of those challenges.

Being a "once-in-a-century pandemic" [29], some of the misgivings affecting HCWs include the fear of contracting a lethal virus and spreading it to the rest of their social network, lack of evidence-based prevention and intervention, lack of essential protective gear and the fact that the pandemic requires protracted shifts with a high volume of patients with different degrees of pathology and severity [30-43]. This would imply that HCWs are now working in a uniquely hazardous situation and are thus vulnerable to stress and distress. In addition to operational stresses, some preliminary studies have suggested that psychosocial dysfunctions are rife among HCWs [31,35]. A recent systematic literature review and meta-analysis covering the literature of the pre-pandemic COVID-19 period suggest that 7.0% to 75.2% of HCWs are burned out [36]. This huge discrepancy in the prevalence of burnout hinges on country-specific factors, applied instruments and cut-off-criteria for burnout symptomatology [37]. The prevalence of burnout among HCWs appears to outstrip the general population [38]. Similarly, in addition to burnout, the prevalence of depressive symptoms, anxiety, and stress among HCWs are also higher than the general population [14,15, 16]. However, since the higher level of stress and distress among HCWs as compared to the general population has been a trend

9

existing even before the pandemic, it not clear whether the emerging high level of mental health outcomes owes its onset to COVID-19. One approach to disentangling this issue is to compare mental health outcomes between frontline HCWs vs non-frontline HCWs. This study had therefore embarked on the assessment and comparison of demographic and psychological factors and sleep status of frontline versus non-frontline HCWs.

The present study accrued 1139 HCWs from different parts of the country. As the HCWs in Oman are predominantly female [39], this study is in line with the observed 'effeminization' of healthcare as 80.0% of the present participants were female. Approximately 50% fulfil the present definition of 'frontline HCWs' who, in their clinical practices, diagnose, treat, and take care of confirmed or suspected cases of COVID-19 in their respective clinics across the country. The cohort consisted of physicians, nurses, and allied health professionals.

To tap into the levels of depression, anxiety, and stress, the *Depression, Anxiety, and Stress Scale* (DASS-21) was used. Of the present cohort, comprised of both frontline and non-frontline HCWs, 32.3% endorsed case-ness for depressive symptoms, 34.1% for anxiety, and 23.8% for stress. In Singapore among HCWs using DASS-21, Tan et al. [40] have reported 8.9% case-ness for depression, 14.5% for anxiety, and 6.6% for stress. Using different screening tools, Lai et al. [9] have reported 50.4%, 44.6%, and 71.5% symptoms of depression, anxiety, and distress respectively

while Wang et al. [20] reported 61.6% of their sample of HCWs indorsed self-reported sleep problems, 22.6% anxiety symptom and 35% depressive symptoms among HCWs in Hubei province in China Lai's study indicated that 34.0% of their sample had an elevated score of insomnia which appears to be lower compared to the prevalence of 38·9% among HCWs investigated as part of the studies included in their systematic review and meta-analysis [35]. Putting these studies together and within the background of the general population, other than the lower rate of depression in Singapore, the magnitude of mental health outcomes appears to be higher among HCWs when compared to the general population. In the general population, the prevalence of depression, anxiety, and insomnia have been estimated to be 11.1% [14], 5.3%, 7.3% [15], and 10% - 30% [16] respectively. Low mental health outcomes among HCWs in Oman and Singapore could be attributed to the preparedness phase the country underwent as the first cases were registered much later than when the World Health organization declared COVID-19 a global pandemic [1]. While studies on the status of mental health outcomes and sleep status have been forthcoming from different parts of the world,

10

many of them are single-center [10] and regional studies [9] with some of the catchment areas not being defined [40]. A study with a nationally representative sample of HWCs taking into account both the frontline and non-frontline are therefore warranted.

The second aim of the present study was to compare demographic and psychological outcomes among frontline and non-frontline HCWs. The present data suggest that frontline HCWs are likely to be younger, single, physicians or nurses working in primary healthcare and are required to handle COVID-19 cases. The majority of frontline HCWs were non-Omani, a trend that is worth contemplating. Despite the effort to 'Omanize' the healthcare infrastructure, foreign nationals still form the bulk of HCWs in Oman [41]. The COVID-19 pandemic has resulted in travel restrictions and an expected economic recession, resultant job security, and being cut off from their country of origin for the migrant population [42]. It remains to be seen whether these factors have rendered non-Omani HCWS to be more vulnerable to the presently observed mental health outcomes.

In psychological outcomes, compared to non-frontline HCWs, frontline HCWs were more likely to endorse anxiety symptoms and stress. A similar trend was observed with insomnia. Interestingly, the depressive symptoms did not emerge as being significant in the equation employed to differentiate between frontline vs non-frontline HCWs. Oman is characterized by a collectivistic society that is in direct contrast to western individualistic societies [43]. In such a society, anxiety symptoms ('I experienced trembling in the hands') and stress ('I felt that I was using a lot of nervous energy') tend to be perceived to be a veneer of physical symptoms and are therefore likely to be endorsed. In contrast, depressive symptoms ('I felt down-hearted and blue') are thought to be more of a weakness of character than a manifestation of 'disease'. As psychological outcomes are increasingly recognized to emerge as a consequence of COVID-19 [13], more studies are needed to decipher the culturally-specific idioms of distress intimately tied to mental health outcomes during the pandemic.

Limitations

Most psychosocial studies of this nature tend to have many limitations owing to the amorphous variables under scrutiny. Firstly, conducting a national wide survey requires proper logistics which was not feasible during the lockdown. An online survey is known to marred by the fact that it tends to accrue a selective population who are technologically savvy and more

familiar with the evolving 'internet culture' [44]. Notwithstanding such a view, this study appears to have reached its targeted population based on the estimated sample size. Oman has established that > 71% of the total population (4.6 million) has access to internet services [44]. Secondly, DASS-21 and ISI are no match for the 'gold-standard' interviews such as those that follow the *Diagnostic and Statistical Manual of Mental Disorders* and World Health Organization *Composite International Diagnostic Interview* (CIDI). However, quick symptom checklists such as DAS-21 and ISI are the only viable tools to conduct such a study given the current circumstances [9]. Related to this, future studies could employ objective measures solicit the presence of sleep architecture.   Lastly, time factors are also considered important for quantifying the presence of psychological disorders. Within this view, it not clear whether the observed mental health outcomes constitute adjustment disorders/ acute stress reaction or present a chronic-type and thus irreversible psychological distress. Follow-up studies in this regard are therefore warranted.

Conclusion:

COVID-19, a new strain among the class of Coronavirus, has recently gripped all corners of the world triggering a global public health emergency. Within the background of high rates of poor coping among HCWs even before the pandemic, studies are needed to explore how frontline HCWs fare compared to non-frontline HCWs in this regard. This study highlighted and appeared to be congruent with other studies in suggesting that the COVID-19 outbreak has triggered a higher rate of depressive symptoms, anxiety, and insomnia among HCWs. In comparing frontline and non-frontline HCWs, the present data suggested that frontline HCWs were likely to be younger non-Omani physicians or nurses who were single, and working in primary healthcare. It is therefore paramount to offer timely psychological intervention for the HCWs to promote coping and resilience among these vulnerable HCWs.

ARTICLE INFORMATION

Corresponding Authors: Dr. Samir Al-Adawi, Department of Behavioral Medicine, College of Medicine & Health Sciences, Sultan Qaboos University, P.O. Box 35, Al Khoudh 123, Muscat, Oman (samir.al-adawi@fulbrightmail.org)

12

Al Masarra Hospital, Ministry of Health, Wilayat Al Amerat, Muscat (**Alshekaili M., Hassan W., Al-Said N., alsulimani F.**); Centre of Studies & Research, Directorate General Planning and studies, Ministry of Health, Oman (**Kumar S., Al-Mawali A.**); Department of Family Medicine & Public Health, Sultan Qaboos University, Muscat, Oman(**Chan, Moon Fai**); Department of Behavioral Medicine, Sultan Qaboos University Hospital, Muscat, Oman (Mahadevan **S., Al-Adawi S.**)

13

References

1. Balkhair AA. COVID-19 Pandemic: A New Chapter in the History of Infectious Diseases. Oman Medical Journal. 2020 Mar;35(2):e123

2. The Arabian Stories. Coronavirus: Omanis banned from leaving the country. March 18, 2020.https://www.thearabianstories.com/2020/03/18/coronavirus-omanis-banned-from-leaving-the-country/

3. Oman Observer. Oman reports 463 new cases, total 7,257. 23/05/2020. https://www.omanobserver.om/oman-reports-463-new-cases-total-7257/.

4. Ministry of Health (2020). Directorate general of information technology. Sultanate of Oman. https://covid19.moh.gov.om/#/home.

5. Khamis, F., Al Rashidi, B., Al-Zakwani, I., Al Wahaibi, A. H., & Al Awaidy, S. T. (2020). Epidemiology of COVID-19 Infection in Oman: Analysis of the First 1304 Cases. Oman medical journal, 35(3), e141. https://doi.org/10.5001/omj.2020.60.

6. de Kloet E, Joëls M. Mineralocorticoid Receptors and Glucocorticoid Receptors in HPA Stress Responses During Coping and Adaptation. Oxford Research Encyclopedia of Neuroscience, 2020. Retrieved 23 May. 2020, from https://oxfordre.com/neuroscience/view/10.1093/acrefore/9780190264086.001.0001/acrefore-9780190264086-e-266.

7. Barranco R, Ventura F. Covid-19 and infection in health-care workers: An emerging problem [published online ahead of print, 2020 May 22]. Med Leg J. 2020;25817220923694. doi:10.1177/0025817220923694.

8. Jin YH, Huang Q, Wang YY, et al. Perceived infection transmission routes, infection control practices, psychosocial changes, and management of COVID-19 infected healthcare workers in a tertiary acute care hospital in Wuhan: a cross-sectional survey. Mil Med Res. 2020;7(1):24. Published 2020 May 11. doi:10.1186/s40779-020-00254-8.

9. Lai J, Ma S, Wang Y, et al. Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. JAMA Netw Open. 2020;3(3):e203976. Published 2020 Mar 2. doi:10.1001/jamanetworkopen.2020.3976

10. Badahdah AM, Khamis F, Mahyijari NA. The psychological well-being of physicians during COVID-19 outbreak in Oman [published online ahead of print, 2020 May 6]. Psychiatry Res. 2020;289:113053. doi:10.1016/j.psychres.2020.113053.

11. Shah K, Kamrai D, Mekala H, Mann B, Desai K, Patel RS. Focus on mental health during the coronavirus (COVID-19) pandemic: applying learnings from the past outbreaks. Cureus. 2020 Mar;12(3).

12. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, Ho RC. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in china. International Journal of Environmental Research and Public Health. 2020 Jan;17(5):1729.

13. Holmes EA, O'Connor RC, Perry VH, et al. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. Lancet Psychiatry. 2020;7(6):547-560. doi:10.1016/S2215-0366(20)30168-1.

14. Bromet E, Andrade LH, Hwang I, et al. Cross-national epidemiology of DSM-IV major depressive episode. BMC Med. 2011;9:90. doi:10.1186/1741-7015-9-90.

15. Baxter AJ, Scott KM, Vos T, Whiteford HA. Global prevalence of anxiety disorders: a systematic review and meta-regression. Psychol Med. 2013;43(5):897-910. doi:10.1017/S003329171200147X.

16. Roth T. Insomnia: definition, prevalence, etiology, and consequences. J Clin Sleep Med. 2007;3(5 Suppl): S7-S10.

17. Mataria A, Hajjeh R, Al-Mandhari A. Surviving or thriving in the Eastern Mediterranean region: the quest for universal health coverage during conflict. Lancet. 2020;395(10217):13-15. doi:10.1016/S0140-6736(19)33061-2.

18. Al Riyami A, Elaty MA, Morsi M, Al Kharusi H, Al Shukaily W, Jaju S. Oman world health survey: part 1 - methodology, sociodemographic profile and epidemiology of non-communicable diseases in oman. Oman Med J. 2012;27(5):425-443.

19. Lee AM, Wong JG, McAlonan GM, et al. Stress and psychological distress among SARS survivors 1 year after the outbreak. Can J Psychiatry. 2007;52(4):233-240. doi:10.1177/070674370705200405.

20. Wang W, Song W, Xia Z, He Y, Tang L, Hou J, Lei S. Sleep Disturbance and Psychological Profiles of Medical Staff and Non-Medical Staff During the Early Outbreak of COVID-19 in Hubei Province, China. Front Psychiatry. 2020 Jul 22;11:733. doi: 10.3389/fpsyt.2020.00733. PMID: 32793014; PMCID: PMC7387679

21. Moussa MT, Lovibond P, Laube R, Megahead HA. Psychometric properties of an arabic version of the depression anxiety stress scales (DASS). Research on Social Work Practice. 2017 May;27(3):375-86.

15

22. Lee J, Lee EH, Moon SH. Systematic review of the measurement properties of the Depression Anxiety Stress Scales-21 by applying updated COSMIN methodology. Qual Life Res. 2019;28(9):2325-2339. doi:10.1007/s11136-019-02177-x.

23. Morin CM. Insomnia: Psychological assessment and management. New York: Guilford Press; 1993.

24. Suleiman KH, Yates BC. Translating the insomnia severity index into Arabic. Journal of Nursing Scholarship. 2011 Mar;43(1):49-53.

25. Gagnon C, Bélanger L, Ivers H, Morin CM. Validation of the Insomnia Severity Index in primary care. J Am Board Fam Med. 2013 Nov-Dec;26(6):701-10. doi: 10.3122/jabfm.2013.06.130064.

26. American Association for Public Opinion Research (AAPOR) reporting guideline. https://www.aapor.org/Publications-Media/AAPOR-Journals/Standard-Definitions.aspx.

27. Bedford J, Enria D, Giesecke J, et al. COVID-19: towards controlling of a pandemic. Lancet. 2020;395(10229):1015-1018. doi:10.1016/S0140-6736(20)30673-5.

28. Country/Territory Report - Oman.; 2020:1-49. http://ezproxysrv.squ.edu.om:2127/login.aspx?direct=true&db=awr&AN=143036153 &site=ehost-live&scope=site. Accessed May 29, 2020.

29. Gates B. Responding to Covid-19 - A Once-in-a-Century Pandemic?. N Engl J Med. 2020;382(18):1677-1679. doi:10.1056/NEJMp2003762

30. Senni M. COVID-19 experience in Bergamo, Italy. Eur Heart J. 2020;0:1–2. doi: 10.1093/eurheartj/ehaa279

31. Huang J, Liu F, Teng Z, et al. Care for the psychological status of frontline medical staff fighting against COVID-19 [published online ahead of print, 2020 Apr 3]. Clin Infect Dis. 2020;ciaa385. doi:10.1093/cid/ciaa385.

32. Jalili, M., Niroomand, M., Hadavand, F., Zeinali, K. & Fotouhi, A. (2020). Burnout among healthcare professionals during COVID-19 pandemic: a cross-sectional study. medRxiv, 2020.06.12.20129650.

33. Kisely, S., Warren, N., McMahon, L., Dalais, C., Henry, I., & Siskind, D. (2020). Occurrence, prevention, and management of the psychological effects of emerging virus outbreaks on healthcare workers: rapid review and meta-analysis. BMJ (Clinical research ed.), 369, m1642. https://doi.org/10.1136/bmj.m1642.

16

34. Chen, Q., Liang, M., Li, Y., Guo, J., Fei, D., Wang, L., He, L., Sheng, C., Cai, Y., Li, X., Wang, J., & Zhang, Z. (2020). Mental health care for medical staff in China during the COVID-19 outbreak. The lancet. Psychiatry, 7(4), e15–e16. https://doi.org/10.1016/S2215-0366(20)30078-X

35. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsi E, Katsaounou P. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis [published online ahead of print, 2020 May 8]. Brain Behav Immun. 2020; S0889-1591(20)30845-X. doi:10.1016/j.bbi.2020.05.026.

36. Erschens R, Keifenheim KE, Herrmann-Werner A, et al. Professional burnout among medical students: Systematic literature review and meta-analysis. Med Teach. 2019;41(2):172-183. doi:10.1080/0142159X.2018.1457213.

37. Rotenstein LS, Torre M, Ramos MA, et al. Prevalence of Burnout among Physicians: A Systematic Review. JAMA. 2018;320(11):1131-1150. doi:10.1001/jama.2018.12777

38. Dyrbye LN, West CP, Satele D, et al. Burnout among U.S. medical students, residents, and early career physicians relative to the general U.S. population. Acad Med. 2014;89(3):443-451. doi:10.1097/ACM.0000000000000134.

39. Mohamed NA, Abdulhadi NN, Al-Maniri AA, Al-Lawati NR, Al-Qasmi AM. The trend of feminization of doctors' workforce in Oman: is it a phenomenon that could rouse the health system?. Hum Resour Health. 2018;16(1):19. doi:10.1186/s12960-018-0283-y.

40. Tan BYQ, Chew NWS, Lee GKH, et al. Psychological Impact of the COVID-19 Pandemic on Health Care Workers in Singapore [published online ahead of print, 2020 Apr 6]. Ann Intern Med. 2020; M20-1083. doi:10.7326/M20-1083.

41. Emerson C. Localization of the Nursing Workforce in the Sultanate of Oman. Case Studies in Global Health Policy Nursing. 2018 Jun 28:85.

42. Liem A, Wang C, Wariyanti Y, Latkin CA, Hall BJ. The neglected health of international migrant workers in the COVID-19 epidemic. The Lancet Psychiatry. 2020 Apr 1;7(4): e20.

43. Al-Adawi S. Adolescence in Oman. In Jeffrey Jensen Arnett, Editor. International Encyclopedia of Adolescence: A Historical and Cultural Survey of Young People around the World (2 Volume Set). New York: Routledge, 2006, pp.713-828.

44. Belwal R, Al Shibli R, Belwal S. Consumer protection and electronic commerce in the Sultanate of Oman. Journal of Information, Communication and Ethics in Society. 2020 https://doi.org/10.1108/JICES-09-2019-0110.38.

17

Table 1. Comparison of the frontline with non-frontline staff in association of demographic and psychological factors, and self-reported sleeping problems during the impacts of COVID-19 in Oman

Variables		Total (n=1139)	Frontline HCWs Yes (n=574)	Non-frontline HCWs No (n=565)		
		n (%)	n (%)	n (%)	Statistics[a]	*p*-value
Socio-demographics factors						
Age (Years)	Mean ± SD	36.3 ± 6.5	35.8 ± 6.1	36.9 ± 6.8	2.884[b]	0.004
Gender	Male	228 (20.0)	102 (44.7)	126 (55.3)	3.651	0.056
	Female	911 (80.0)	472 (51.8)	439 (48.2)		
Nationality	Omani	981 (86.1)	480 (48.9)	501 (51.1)	6.075	0.014
	Non-Omani	158 (13.9)	94 (59.5)	64 (40.5)		
Healthcare type	Physician	384 (33.7)	229 (59.6)	155 (40.4)	87.586	<0.001
	Nurse	449 (39.5)	261 (58.1)	188 (41.9)		
	Allied health	305 (26.8)	84 (27.5)	221 (72.5)		
Previous sought mental health consultation	No	1013 (89.3)	512 (50.5)	501 (49.5)	0.013	0.910
	Yes	122 (10.7)	61 (50.0)	61 (50.0)		
Marital status	Not married	149 (13.1)	90 (60.4)	59 (39.6)	6.930	0.008
	Married	987 (86.9)	482 (48.8)	505 (51.2)		
Number of COVID-19 cases were handled[+]	No	679 (59.7)	200 (29.5)	479 (70.5)	293.203	<0.001
	Yes	458 (40.3)	372 (81.2)	86 (18.8)		
	1-5 cases	312 (68.1)	254 (81.4)	58 (18.6)	0.023	0.881
	6+ cases	146 (31.9)	118 (80.8)	28 (19.2)		
Type of healthcare	Primary	390 (34.3)	242 (62.1)	148 (37.9)	44.884	<0.001
	Secondary	164 (14.4)	70 (42.7)	94 (57.3)		

18

	Tertiary	478 (42.0)	231 (48.3)	247 (51.7)		
	Polyclinic	106 (9.3)	31 (29.2)	75 (70.8)		
Psychological symptoms						
DASS - Depression	Yes	368 (32.3)	196 (53.3)	172 (46.7)	1.219[c]	0.201
	No	771 (67.7)	378 (49.0)	393 (51.0)		
DASS - Anxiety	Yes	388 (34.1)	217 (55.9)	171 (44.1)	1.557[c]	0.004
	No	751 (65.9)	357 (47.5)	394 (52.5)		
DASS - Stress	Yes	271 (23.8)	154 (56.98)	117 (43.2)	1.506[c]	0.016
	No	868 (76.2)	420 (48.4)	448 (51.6)		
Self-reported sleeping problems						
Insomnia Severity Index	Yes	211 (18.5)	120 (56.9)	91 (43.1)	1.586[c]	0.013
	No	928 (81.5)	454 (48.9)	474 (51.1)		
a, Chi-square; b, t statistic; c, Mantel-Haenszel odds ratio adjusted by all socio-demographic factors; +, 2 missing records						
DASS, The Depression, Anxiety, and Stress Scale (DASS-21)						

19

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6*
Bias	9	Describe any efforts to address potential sources of bias	6
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	NA
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	7-8
		(*b*) Describe any methods used to examine subgroups and interactions	7-8
		(*c*) Explain how missing data were addressed	7-8
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	8
		(*e*) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	NA

Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	8
Outcome data	15*	Report numbers of outcome events or summary measures	8
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	8-9
		(*b*) Report category boundaries when continuous variables were categorized	NA
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	9
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	11-12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12
Generalisability	21	Discuss the generalisability (external validity) of the study results	12
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	NA

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.