

Healthcare Workers Issues and COVID-19 Pandemic: A Review

Sağlık Çalışanlarının Sorunları ve COVID-19 Salgını: Bir Derleme

Anita Abd Rahman¹, Suhainizam Muhamad Saliluddin¹, Mohammad Farhan Rusli², Param Jeeth Singh A/L Pakar Singh³
Norazman Mohd Rosli³, Shamsul Azhar Shah⁴

¹Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia

²Department of Community Health, Faculty of Medicine and Health Sciences, International Islamic University Malaysia

³Kuala Lumpur and Putrajaya Federal Territories Health Department, Malaysia

⁴Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Kebangsaan Malaysia

ABSTRACT

Background: Since December 2019, COVID-19 pandemic has continued to grow it spread and has currently affected more than 200 countries and for the last four months, healthcare workers (HCW) has worked performed their duties endlessly, more than the norms at their respective health care facility. Therefore this review paper aims to describe healthcare workers issues in managing the current COVID-19 pandemic

Materials and Methods: Articles were chosen using a structured search via three electronic databases, namely PubMed, Scopus, and Direct Science coupled with a combination of keywords namely "healthcare workers" OR "health staff" AND "COVID19". Other inclusion criteria include full accessible, original studies in English language, published in peer-reviewed journals from December 2019 till 30th April 2020.

Result and Discussion: A total of 17 articles were chosen to be reviewed which can be further broadly categorised into three domains which are; physical effects, psychological effects and socioeconomic effects. COVID-19 infection among healthcare workers is not uncommon as they represent the essential human resources in managing the pandemic. Of the three effects, mental health burden ranging from anxiety to burnout was studied along with its risk and protective factors discussed. Socioeconomic factors describe how prevention and control measures adopted has given a toll to this vulnerable group.

Conclusion: Health-related effects and unforeseen factors has impacted healthcare workers such as the direct effect of the infection, issues related to the use of personal protective equipment, the spectrum of mental health burden as well as the socio-economic effects as a result of the demands faced by them in responding and providing healthcare needs.

Key Words: Healthcare workers, COVID-19, physical, psychological, socioeconomic

Received: 05.05.2020

Accepted: 05.12.2020

ÖZET

Amaç: Aralık 2019'dan bu yana, COVID-19 salgını yayılmaya devam etti ve şu anda 200'den fazla ülkeyi etkiledi ve son dört aydır sağlık çalışanları (HCW) görevlerini kendi sağlık hizmetlerindeki normlardan daha fazla bir şekilde yerine getirdi tesisi. Bu nedenle, bu derleme makalesi, mevcut COVID-19 salgını yönetimindeki sağlık çalışanlarının sorunlarını tanımlamayı amaçlamaktadır

Yöntem: Makaleler, "elektronik bakım çalışanları" veya "sağlık personeli" ve "COVID19" anahtar kelimelerinin birleşimiyle birleştirilmiş üç elektronik veri tabanı, yani PubMed, Scopus ve Direct Science aracılığıyla yapılandırılmış bir arama kullanılarak seçildi. Diğer dahil edilme kriterleri arasında Aralık 2019'dan 30 Nisan 2020'ye kadar hakemli dergilerde yayınlanan tam erişilebilir, orijinal İngilizce çalışmalar bulunmaktadır.

Bulgular: İncelenmek üzere toplam 17 makale seçildi; bunlar daha geniş olarak üç alanda kategorize edilebilir; fiziksel etkiler, psikolojik etkiler ve sosyoekonomik etkiler. Sağlık çalışanları arasında COVID-19 enfeksiyonu, pandemi yönetiminde temel insan kaynaklarını temsil ettikleri için nadir değildir. Üç etkiden anksiyeteden tükenmişliğe kadar değişen zihinsel sağlık yükü, riski ve tartışılan koruyucu faktörleri ile birlikte incelenmiştir. Sosyoekonomik faktörler, benimsenen önleme ve kontrol önlemlerinin bu savunmasız gruba nasıl zarar verdiğini açıklamaktadır.

Sonuç: Sağlıkla ilgili etkiler ve öngörülemez faktörler, enfeksiyonun doğrudan etkisi, kişisel koruyucu ekipman kullanımı ile ilgili konular, ruh sağlığı yükünün spektrumu ve taleplerin bir sonucu olarak sosyo-ekonomik etkiler gibi sağlık çalışanlarını etkilemiştir. sağlık ihtiyaçlarını karşılama ve sağlama konusunda karşı karşıya kalmıştır.

Anahtar Sözcükler: Sağlık çalışanları, COVID-19, fiziksel, psikolojik, sosyoekonomik

Geliş Tarihi: 05.05.2020

Kabul Tarihi: 12.05.2020

ORCID IDs: A.A.R.0000-0002-4228-2259, S.M.S.0000-0003-3405-793X, M.F.R.0000-0003-2734-3188, P.J.S.A/L.P.S0000-0001-5318-8738, N.M.R.0000-0001-6349-3410, S.A.S.0000-0003-0635-1816

Address for Correspondence / Yazışma Adresi: Anita Abd Rahman, MD Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia. E-mail: anitaar@upm.edu.my

©Telif Hakkı 2020 Gazi Üniversitesi Tıp Fakültesi - Makale metnine <http://medicaljournal.gazi.edu.tr/> web adresinden ulaşılabilir.

©Copyright 2020 by Gazi University Medical Faculty - Available on-line at web site <http://medicaljournal.gazi.edu.tr/>

doi:<http://dx.doi.org/10.12996/gmj.2020.75>

INTRODUCTION

The advent of a Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) or currently known Coronavirus Disease-2019 (COVID-19), by World Health Organisation (WHO) on 11th February 2020 originating from mainland China during the winter of late December 2019 has spawned a global challenge after it became a public health emergency of international concern (PHEIC) on January 30, 2020, with more than 200 countries throughout the world battling against the millennia pandemic COVID-19. According to the WHO report (as of 20th April 2020), the current outbreak of COVID-19 has affected over 2,314,621 people and killed more than 157,847 people. Figure 1 shows the affected countries or region with COVID 19 cases from 14th April 2020 till 20th April 2020.

As the pandemic grew, one of the practice to contain and mitigate the spread is through the concept of lockdown or movement control order. This forces people to work from home. However, this practice does not apply those working in the healthcare sector as it is the heart of combatting any disease pandemic situation. Rather than work from home, healthcare workers (HCW) are very much needed to work and perform duties more than the norms at their respective health care facility. Some task required to be done by HCW are activities related to screening and detection of the infection, provision of in-patient medical management and instituting prevention and controls measure to safeguard and improve the health of the population.

From the public health prevention and control perspective till the hospital management of the infection, HCW without a doubt is the essential human resources. With that in mind, whether HCW is considered by some as either the front liners or the last defence mechanism, the past four months has taken a toll as its capacity is being stretched to the maximum in many aspects as increasing efforts has been implemented to break the chain of the COVID-19 transmission.

However, to date, there is still limited data and statistics of publications and national situation reports that provides actual information on the number of the healthcare worker (HCW) with this infections even though local and international news of HCW being the victims of COVID-19 either through the hospital or community-acquired infection is being highlighted or heard of. On the contrary, some studies have published certain health effect related to HCW while managing COVID-19 infection such as stress, anxiety and other mental health disorders. Apart from that other issues such as shortage of Personal Protective Equipment (PPE) supply have also been discussed. Nonetheless is thought that other relevant issues need to be explained and highlighted as well. This additional information on HCW is crucial in trying not only to understand the pathophysiology of the infection towards the HCW but to determine what are the predisposing factors exposing HCW towards such hazard and what other health effects that the HCW faced. This knowledge will be useful in informing the specific infection prevention and control measures as part of a sustainable healthcare system. With this in mind, this paper aims to review the literature concerning healthcare workers issues in managing the current COVID-19 pandemic.

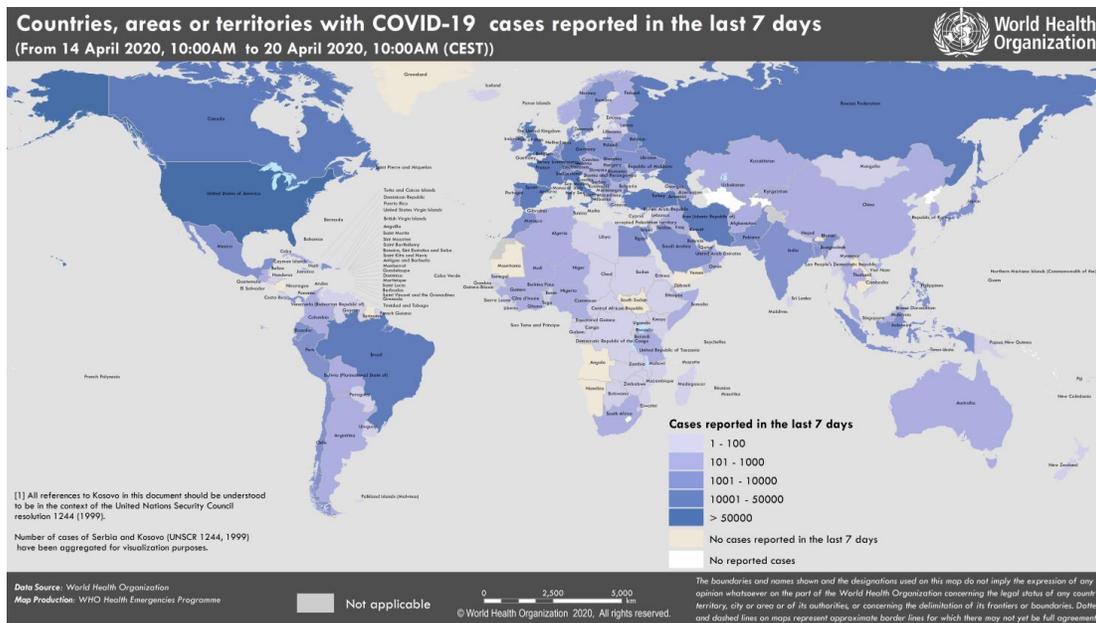


Figure 1. Countries, territories or areas with reported confirmed cases of COVID-19, as of 20th April 2020 (World Health Organisation, WHO) (1).

MATERIALS and METHODS

A structured search regarding the intended topic was conducted by three electronic databases, namely PubMed, Scopus, and Direct Science in April 2020. Also, an internet search using Google Scholar search engine to locate additional studies was performed. The above databases were searched using the following search criteria and a combination of keywords and search term which includes “healthcare workers” OR “medical staff” AND “COVID-19” OR “coronavirus”.

The second group of keywords consisted of “health issues” OR “health effect”. The first group of search terms were combined with the second group to identify the studies. The inclusion criteria were original studies in the English language, published in peer-reviewed journals from December 2019 to 30 April 2020, with accessible full articles. We excluded studies that were reviews or editorials, non-peer-reviewed review literature such as technical reports and web-based guidelines as well as a short communication, editorial or correspondence. The search strategy is summarised in Figure 1.

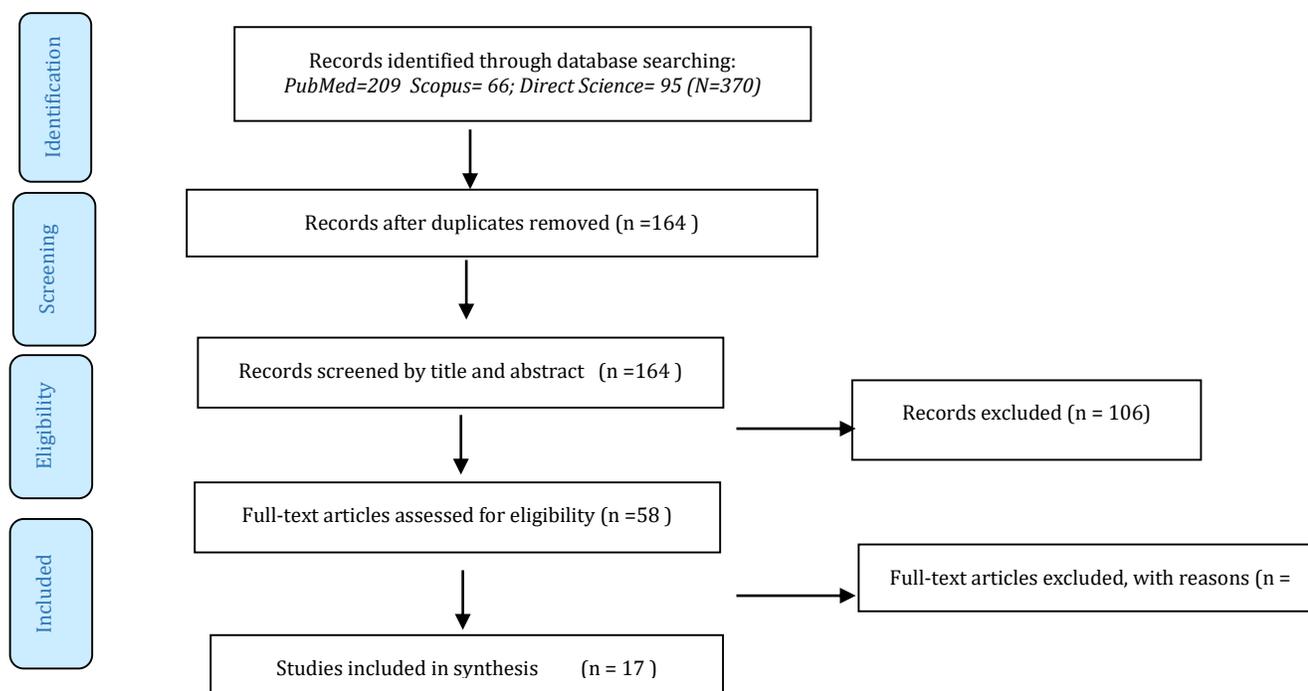


Figure 1: PRISMA flowchart for systematic search

RESULTS and DISCUSSION

As described earlier, a total of 17 articles were finally chosen to be reviewed which can be further broadly categorised into three domains which are; physical effects, psychological effects and socioeconomic effects.

Each category of effect is further discussed below. To ease reader viewing, Table 1 summarises all articles review based on each effect categories.

Table 1: Summary of the article review to describe the health-related issues among HCW during COVID-19 pandemic.

No.	Author	Country	Category of Effects		
			Physical	Psychological	Socioeconomic
1.	Wang et al., 2020	China	✓	-	-
2.	MMWR, 2020	United States	✓	-	-
3.	Remuzzi & Remuzzi, 2020	Italy	✓	-	-
4.	Lan et al., 2020	China	✓	-	-
5.	Ong et al., 2020	Singapore	✓	-	-
6.	Yan et al., 2020	China	✓	-	-
7.	Kang et al., 2020	China	-	✓	-
8.	Tan et al., 2020	Singapore	-	✓	-
9.	Natsu et al., 2020	Japan	-	✓	-
10.	Shacham et al., 2020	Israel	-	✓	-
11.	Xiao et al., 2020		-	✓	-
12.	Wu et al., 2020	China	-	✓	-
13.	Schwartz et al., 2020	Taiwan	-	-	✓
14.	McKibbin, 2020	Taiwan	-	-	✓
15.	Bayham & Fenichel, 2020	Hong Kong	-	-	✓
16.	Kavoor et al., 2020	Australia	-	-	✓
17.	Lippert, A.	United States	-	-	✓

Physical effect

For physical health effect, six articles were chosen to be reviewed.

COVID-19 infection

While there have been regular reporting of total cases and deaths at country and global level, to date, there is still lack of information being published on the actual incidence rate or prevalence of COVID-19 infection among HCW or even the general frontliners. However, three articles were found to be useful to be

reviewed. In a single-centre case series study in Wuhan, out of 138 patients, approximately 29% of all patients were HCW presumed to be a hospital-acquired infection.

Of the infected health care workers, 31 (77.5%) worked on general wards, 7 (17.5%) in the emergency department, and 2 (5%) in the Intensive Care Unit (2). While data from the Morbidity and Mortality Weekly Report revealed that based on reported cases to CDC, the US from 12th February 2020 till 9th April 2020, there were 9,282 (19%) HCW infected with COVID-19 and 27 deaths (3).

The demographic distributions of that HCW with infection were of middle age group, female and slightly half of them (55%) had a history of contact with COVID-19 patient in health care settings. Even though 4,436 of the HCW reported having at least one symptom either fever, cough, or shortness of breath, most HCP with COVID-19 was not hospitalized. This result shows HCW are both prone to the community or hospital-acquired COVID-19 infection (3).

In Italy, Lombardy is one of the regions that was badly hit with COVID-19. From late February 2020 till early March 2020, nearly 20% (350) HCW who worked all round have become infected. Based on modelling prediction analysis, the national health system has reached its maximum full capacity by middle March 2020. While COVID-19 is predicted to further rise exponentially, the government need to ensure that there are enough resources, including personnel, hospital facilities to safely meet urgent future needs of overburden or understaffing (4).

Skin dermatitis

As COVID-19 is a novel viral infection with its whole knowledge on its infectivity and is evolving, the hierarchy of control has adopted the use of Personal Protective Equipment (PPE) as the mainstay for prevention and control among HCW. A prevalence study done among 526 HCW comprising of doctors and nurses in a tertiary hospital in Hubei, China found that 97% of these HCW had complained of some form of skin dermatitis affecting the area where PPE had direct skin contacts such as the nasal bridge as a result of wearing the N95 face mask and/or goggle (83.1%), dryness/tightness (70.3%) and desquamation(62.2%) in the hands. The odds risk of having skin dermatitis due to N95 or goggle use of more than 6 hours also increases by two times compared to those who wore at shorter intervals (N95 masks: OR=2.02; 95% CI, 1.35-3.01); goggles: OR=2.32; 95% CI, 1.41-3.83). Even though this is part of the enhancement in infection-prevention measures, skin insult was most probably due to the hyper-hydration effect of prolonged wear of PPE, friction, epidermal barrier breakdown, and contact reactions. Hence, this provides the right time opportunities to review the standard precaution practices and strengthen the occupational and safety health practices in averting workplace diseases and injuries (5).

The previous finding was also consistent with that among 330 HCWs working at fever clinics and inpatients ward of COVID-19 cases 71% of them reported self-perceived skin barrier damage. The main symptoms were burning, itch, and stinging while the most commonly reported types of eruptions were dryness or scales, papules or erythema, and maceration. In terms of the duration and frequency, more than half (56.7%) of those HCWs wore PPE for over 6 hours per day while 66.1% of them washed their hands more than 10 times a day (6).

Headache

One interesting cross-sectional study done in a tertiary hospital in Singapore found that out of 158 HCW, 128 (81.0%) reported de novo PPE-associated headaches when they wore either the N95 face mask, with or without the protective eyewear. The location of the headache corresponded to the contact areas from the face mask or goggles and their corresponding head straps with the majority (87.5%) complained a sensation of pressure or heaviness at the affected sites. The odds of headache increase by four folds when wearing PPE more than 4 hours (OR=3.91; 95%CI 1.35-11.31). A possible explanation was due to the mechanical effect of donning objects with tight bands or straps around the head that causes compression of pericranial soft tissues. One good note is that this type of headache seems to be transient with the majority (88.3%) claims that symptoms resolved within 30 minutes post doffing PPE (7).

Psychological effect

HCW are known to prone to psychological due to the nature of work that involves caring for sick. In the case of COVID-19 pandemic that affects a large number of infected patients, thus creating a stressful environment.

In the early phase of the viral pandemic, a group of researchers studied the impact of mental health among 994 medical and nursing staff working in Wuhan. The instrument used were the Patient Health Questionnaire (PHQ-9), the 7-item Generalized Anxiety Disorder (GAD-7), the 7-item Insomnia Severity Index (ISI) and the 22-item Impact of Event Scale-Revised (IES-R) to evaluate depression, anxiety, insomnia and distress, respectively. Majority of participants had subthreshold and mild mental health disturbances (36.9% and 34.4% respectively). Meanwhile, the risk factors of exposure during work affected HCW mental health and the availability of mental healthcare services provided by psychologists and psychiatrists were limited.

Even though findings on the mental health disturbances was marginal in the early wakes of COVID-19 infection, the ongoing mental health of HCW needs to be assessed to attenuate the possibility of escalating complications (8).

A cross-sectional comparative study that examines psychological distress, depression, anxiety, and stress experienced by 470 health care workers in Singapore during the COVID-19 outbreak between medically and non-medically trained hospital personnel (clerical staff, administrator and maintenance workers found that there were 68 (14.5%) participants screened positive for anxiety, 42 (8.9%) for depression, 31 (6.6%) for stress, and 36 (7.7%) for clinical concern of Post Traumatic Stress Disorder (PTSD).

The prevalence of the psychological impact was lower than those in the published literature from previous disease outbreaks and this could be due past Severe Acute Respiratory Syndrome (SARS) experience that improved mental preparedness and enhanced a more definitive infection control measures (9).

In Japan, a study tried to determine from a different angle on the prevalence of fear, worry, and workplace harassment related to COVID-19, and their impact on employees' mental and physical health. Amongst 1,421 HCW almost 80% of them reported strong or some global fear and worry about COVID-19 infection while nearly half of them was also the concern of job instability. Significant predictors of high global fear and worry about COVID-19 were being female (OR= 2.51; 95% CI, 1.87 – 3.36), having at least one child (OR=1.47; 95% CI, 1.02 -2.11), and having any chronic physical condition such as Diabetes, Hypertension, Cerebrovascular Diseases (OR=1.57; 95% CI 1.05 – 2.34). As for workplace harassment, only 2.3% of HCW had experienced such incident related to COVID-19 such as being the target of sarcastic comments, being harassed⁽⁸⁾, being accused of poor preparedness for the prevention or being forced to self-isolate at home (10).

Meanwhile, another cross-sectional study conducted among 338 Israeli dentists and dental hygienists found that the risk of elevated psychological distress was 11.5% (39) of the respondents. Further analysis showed that elevated psychological distress was found among those who have background illness (OR=3.023; 95% CI: 1.186–7.705); p = 0.021), fear of contracting COVID-19 from a patient (OR=2.110 (95% CI: 1.236–3.603); p = 0.006), and higher subjective overload (OR 1.073; 95% CI: 1.010–1.141); p = 0.022). On the other hand, respondents who had lower psychological distress were associated with being in a committed relationship (OR=3.023; 95% CI: 1.186–7.705); p = 0.021) and having higher self-efficacy seems to a protective effect (OR=0.898, 95% CI: 0.833–0.968); p = 0.005) (11). Previous findings were in line by others such as Xiao et al., 2020 that did a period prevalence study among 180 medical staff not only focusing on anxiety and social support but extended to measure sleep quality and self-efficacy. It was concluded that the sleep quality of the medical staff was low. Social support based Social Support Rate Scale (SSRS) had significant positive, correlation with self-efficacy [General Self-Efficacy Scale (GSES)] (r=0.405, P<0.01) as HCW with high self-efficacy can maintain relatively stable emotions even under pressure. Anxiety had also significant positive correlation with stress (r=0.397, P<0.01) but on the contrary, there were There were a significant negative association between anxiety and self-efficacy (r=-0.351, P<0.01, anxiety and stress scores, r=-0.277, P<0.01, and the PSQI scores (r=-0.483, P <0.01. This shows that levels of anxiety were significantly associated with the levels of stress, which negatively impacted self-efficacy and sleep quality (12).

On the other end, an in-press study had determined the outcome of burnout based on Maslach Burnout Inventory (the gold standard for evaluating burnout) among 190 HCW in Wuhan China surprisingly found that physicians and nurses on the frontline (FL) wards had a lower frequency of burnout (13% vs. 39%; P < 0.0001) and were less worried about being infected compared and those working in usual wards (UWs) with ratio FL to UWs=1:1). Nonetheless, both groups concur that they were worried about the prolongation of the COVID-19 crisis. The possible explanation to such findings is that those frontliners had a greater sense of control of their situation, better personal accomplishment as well as having access to more timely and accurate information such as the implementation of new policies and procedures (13).

Socioeconomic effect

Another relevant effect that should be discussed is the socioeconomic effect on HCW due to COVID-19 pandemic. As the name implies, socioeconomic can be described as the relation with social and economic factors that generally looks at certain determinant factors such as health care, environmental exposure and health behaviour. Five studies have found to fit this theme.

Schwartz et al., 2020 describes the effect based on lesson learned in Taiwan during the SARS response that focuses on the safety of HCW and their willingness to work. Findings showed that the level of anxiety among them risen in reaction to cases of HCWs falling ill or dying and in turn, HCW became increasingly reluctant to work. To make things worst, overworked and under-resourced HCW leads to degradation of health care services. Shortage of HCW due to combined factors of anxiety, dropouts, infections and others may develop into a cascading effect that has both individual and systematic impact on the socio-economic level of the HCW's. This cycle may, in turn, convert to a vicious cycle that will ultimately collapse the health care system (14).

Based on the low-end pandemic modelling on the Hong Kong Flu is expected to reduce global GDP by around \$52.4 trillion while a higher scale end outbreak similar to the Spanish flu reduces global GDP by over \$99trillion in 2020 (15). The trickling effect of the economic collapse on the healthcare worker will be severe. If taken at the end, funds may not be available to cover wages/claims of HCW's. Moreover, compensation for all the infected HCW's may be jeopardized as funds may not be enough while the supply of PPEs and other health-related equipment required by the HCW might be depleted.

While the practice of school closure as part of social distancing is one the method used to curb COVID-19 infection through reduction of the pathogen-induced mortality, this particular control measure in the absence of other child-care options can be challenging for HCW. One article described the impact of school closures for COVID-19 on the US health-care workforce. Data analysis was based on the Current Population Survey monthly survey of approximately 60 000 US household, jointly administered by the US Census Bureau and the Bureau of Labor Statistics. Approximately 28.8% (95% CI 28.5–29.1) of HCW had an obligation to care for a child aged 3–12 years. The professions with the highest proportion of unmet child-care obligations were nurses (22.3%) followed by diagnostic-related technologists and technicians (19.2%), medical assistant (17.8%), physician well as surgeons (15.6%) (16). Because of this, it affects the health care labour supply in terms of absenteeism and productivity.

During this particular pandemic, shortage of HCW became a real concern as many were either affected by the health issues that have been discussed earlier. At the same time, some countries have asked those in the private or those health care professionals who have retired to come and join the health task force to meet the human resource shortage. A study that looks into particular nursing care has described the implementation of a 'volunteer health practitioner system' that ensure sufficient nurses can be mobilized to provide good quality of nursing care (17). This registry is a useful system to be implemented by the authorities, as it will enable health care professional volunteers to make a comeback and practice in times of need.

As the country implement preventive and mitigation strategies such maintaining social distancing, restricting large gatherings, applying for movement control order either partial or complete lockdown that forces people to work from home, this has created changes in the routine working condition and environment. Healthcare workers have not been spared of the changes as not only they are now required to work even longer hours but has also created the need to be creative in executing and achieving the desired outcome such as remote consultation. In particular to COVID-19 pandemic, the prevalence of mental health-related issues among the general population increases as people are very concerned about it. The use of telemedicine as part of remote consultation has adopted the use of risk stratification to assess each patient risk and their disease status as part of striking balance between preventive measures to 'flatten the curve' and withstand the COVID-19 calamity (18). Therefore HCW needs to be prepared to adopt a 'New-Work Norm' working environment and strengthen their information technology capability and exploring each possible means in delivering health care services consistent with current industrialised revolution making it more efficiently and effectively.

As a recap, the article referred identified factors that can be grouped into three main effects. All these factors can conjointly be distinguished as the predisposing as well as the protective factors that other researches alike should dwell into to find a more comprehensive and definitive solution towards understanding health issues related to HCW during the COVID-19 pandemic and wider socioeconomic impacts associated with climate change in a particular heatwave event.

It is worth to note that despite several articles that can be found on the internet, the majority were either review paper, letter to editors, commentary, viewpoint or short communication. At least 80% of the chosen articles were cross-sectional study design.

Hence careful interpretation needs to be exercised in interpreting some of the mentioned studies as some have a relatively small sample size which can be influenced by biases while others used different instruments in assessing the health-related effects.

CONCLUSION and RECOMMENDATION

In summary, reviews have identified some of the health issues and unprecedented strain that have to affect HCW such as the direct effect of the infection itself, issues arising from the usage of PPE the spectrum of mental health burden and socioeconomic issues as a result of challenges faced in responding and providing health care services. While HCW often accepts the increased risk of infection as part of their chosen profession, it is evident that more studies are much needed to understand better and to optimize safety and health in the current crisis. Besides, the impact of prolonged COVID pandemic on physical health and emotional well-being HCW is necessary for the lesson learned and enhancing preparedness and response to a future pandemic or disaster management while preserving the right of HCW to practice safely and efficiently.

Conflict of interest

No conflict of interest was declared by the authors.

REFERENCES

1. WHO, 2020. Coronavirus disease 2019 (COVID-19) Situation Report – 82. Retrieved from https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200411-sitrep-82-covid-19.pdf?sfvrsn=74a5d15_2 Retrieved on 30th April 2020.
2. Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., Zhang, J., Wang, B., Xiang, H., Cheng, Z., Xiong, Y., Zhao, Y., Li, Y., Wang, X., Peng, Z. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA*. 2020. 33: 1061-9.
3. MMWR. Characteristics of Health Care Personnel with COVID-19– United States, February 12–April 9, 2020. 69: 477-81.
4. Remuzzi, A., & Remuzzi, G. COVID-19 and Italy: what next? *The Lancet*. 2020. 395: 12225-8.
5. Lan J, Song Z, Miao X, Li, H., Li, Y., Dong, L., Yang, J., An, X., Zhang, Y., Yang, L., Zhou, N., Yang, L., Jiang, Cao, J.J., Wang, J., and Tao, J. Skin damage among health care workers managing coronavirus disease-2019. *J Am Acad Dermatol*. 2020. 82: 1215-6.
6. Yan, Y., Chen, H., Chen, L., Cheng, B., Diao, P., Dong, L., Gao, X., G, H., He, L., Ji, C., Jin, H., Lai, W., Lei, T., Li, L., Li, L., Li, R., Liu, D., Liu, W., Lu, Q., Shi, Y., Song, J., Tao, J., Wang, B., Wang, G., Wu, Y., Xiang, L., Xie, J., Xu, J., Yao, Z., Zhang, F., Zhang, J., Zhong, S., Li, H., & Li, H. Consensus of Chinese experts on protection of skin and mucous membrane barrier for health-care workers fighting against coronavirus disease 2019. *Dermatologic Therapy*. 2020. e13310.
7. Ong, J.Y.J, Bharantendu, C., Goh, Y., Tang J.Z.Y., Sooi, K.W.X., Tan, Y.L., Tan, B.Y.Q., Ong, T.S., Allen, D.M., Sharma, V.K. Headaches associated with Personal Protective Equipment – A Cross-Sectional Study among Frontline Healthcare Workers during COVID-19. *Headache*. 2020. 60:864-877
8. Kang, L., Ma, S., Chen, M., Yang, J., Wang, Y., Li, R., Yao L., Bai, H., Cai, Z., Yang, B. X., Hu, S., Zhang, K., Wang, G. & Liu, Z. Impact on mental health and perceptions of psychological care among medical and nursing staff in Wuhan during the 2019 novel coronavirus disease outbreak: A cross-sectional study. *Brain Behav Immun*. 2020.
9. Tan, B.Y.Q., Chew, N.W.S., Jin, M., Goh, Y., Teo, L.L.L., Zhang, K., Chin, H.K., Ahmad, A., Khan, F. A., Shanmugam, G. N., Chan, B. P.L., Sunny, S., Chandra, B., Ong, J.J.Y., Paliwal, P.R., Wong, L.Y.H. Sagayanathan, R., Chen, J.T., Ying Ng, A.Y., Teoh, H.L., Ho, C.S., Ho, R.C., & Sharman, V.K. Psychological Impact of the COVID-19 Pandemic on Health Care Workers in Singapore. *Ann Intern Med*. 2020. M20-1083.
10. Natsu, S., Reiko, K., Kanami, T. & Norito, K. Fear, Worry and Workplace Harassment Related to the COVID-19 Epidemic Among Employees in Japan: Prevalence and Impact on Mental and Physical Health. *The Lancet Public Health*. 2020. Retrieved from <https://ssrn.com/abstract=3569887> on the 30th April 2020.

11. Shacham, M., Hamama-Raz, Y. Kolerman, R., Mijiritsky, O., Ben-Ezra, M., & Mijiritsky, E. COVID-19 Factors and Psychological Factors Associated with Elevated Psychological Distress among Dentists and Dental Hygienists in Israel. *Int J Environ Res Public Health*. 2020 17(8). pii: E2900.
12. Xiao, H., Zhang, Y., Kong, D., Li, S., & Yang, N. The Effects of Social Support on Sleep Quality of Medical Staff Treating Patients with Coronavirus Disease 2019 (COVID-19) in January and February 2020 in China. *Med Sci Monit*. 2020 26: e923549.
13. Wu, Y., Wang, J., Luo, C., Hu, S., Lin, X.,BS, Anderson, A.E., Bruera, E., Xiaoxin Yang, X., Shaozhong Wei, S., & Yu Qian, Y. A Comparison of Burnout Frequency Among Oncology Physicians and Nurses Working on the Frontline and Usual Wards During the COVID-19 Epidemic in Wuhan, China. *Journal of Pain and Symptom Management*. 2020.
14. Schwartz, J., King, C.C. & Yen, M.Y. Protecting Health Care Workers during the COVID-19 Coronavirus Outbreak –Lessons from Taiwan's SARS response. *Clin Infect Dis*. 2020.
15. McKibbin, W., & Fernando, R. 2020. The global macroeconomic impact of COVID-19: Seven scenarios. *CAMA Working Papers 2020-19*, Centre for Applied Macroeconomic Analysis, Crawford School of Public Policy, The Australian National University.
16. Bayham, J. & Fenichel, E.P. Impact of school closures for COVID-19 on the US health-care workforce and net mortality: a modelling study. *The Lancet Public Health*. 2020.
17. Lippert, A. Skin damage among health care workers managing coronavirus disease-2019. *Journal of Nursing Regulation*. 2020. 11: 58-60.
18. Kavoor, A.R., Chakravarthy, K & John, T. Remote consultations in the era of COVID-19 pandemic: Preliminary experience in a regional Australian public acute mental health care setting, *Asian Journal of Psychiatry*. 2020. 51. 102074