FACTORS ASSOCIATED WITH DEPRESSION, ANXIETY, AND STRESS AMONG HEALTHCARE WORKERS IN KEDAH DURING EARLY RECOVERY MOVEMENT CONTROL ORDER OF COVID-19 PANDEMIC

By

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LIST OF ABBREVIATION

CI	Confidence Interval
CMCO	Conditional Movement Control Order
COVID-19	Novel Corona Virus 2019
DAS	Depression, Anxiety and Stress
DASS	Depression, Anxiety, and Stress Scale
df	Degree Of Freedom
GAD	Generalised Anxiety Disorder
HADS	Hospital Anxiety and Depression Scale
HCWs	Healthcare Workers
JEPeM	Human Research Ethics Committee
MCO	Movement Control Order
MOH	Ministry of Health
NMRR	National Medical Research Register
PHEIC	Public Health Emergencies of International Concern
OR	Odd Ratio
RMCO	Recovery Movement Control Order
ROC	Receiver Operating Characteristic
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences
TEMCO	Targeted Enhanced Movement Control Order
USM	Universiti Sains Malaysia
VIF	Variance Inflation Factor
WHO	World Health Organization

LIST OF SYMBOLS

α	Alpha
&	And
β	Beta
=	Equal to
<	Less than
>	More than
≥	More than or equal to
n	Sample size
%	Percentage
P	Population's proportion
Δ	Precision of estimation
m	Ratio between two groups
Z	Z-score

ABSTRAK

FAKTOR-FAKTOR YANG BERKAITAN DENGAN KEMURUNGAN, KEGELISAHAN, DAN TEKANAN DI KALANGAN PETUGAS KESIHATAN DI NEGERI KEDAH SEMASA PERMULAAN PERINTAH KAWALAN PERGERAKAN PEMULIHAN BAGI PANDEMIK COVID-19

Latar belakang: Kesihatan mental petugas kesihatan dipengaruhi oleh pandemik COVID-19 melalui pelbagai cara. Kemurungan, kegelisahan, dan tekanan kerap kali digunakan untuk menggambarkan status kesihatan mental di seluruh dunia.

Objectif: Kajian ini menganalisis anggaran kejadian dan faktor yang berkaitan dengan kemurungan, kegelisahan, dan tekanan petugas kesihatan di Kedah, Malaysia, semasa permulaan Perintah Kawalan Pergerakan Pemulihan (PKPP) bagi pandemik COVID-19.

Metodologi: Kajian rentas menggunakan data sekunder bagi 981 responden di antara 1 July 2020 sehingga 31 Ogos 2020 disampelkan secara rawak dari data survelan kesihatan mental petugas kesihatan dari Jabatan Kesihatan Negeri Kedah semasa PKPP dalam tahun 2020. Faktor sosio-demografi, ciri pekerjaan, dan latar belakang kesihatan diekstrak dan dianalisis menggunakan SPSS versi 26. Data dianalisis secara deskriptif diikuti dengan regresi logistik mudahdan berganda.

Keputusan: Anggaran kejadian kemurungan, kegelisahan, dan tekanan di kalangan petugas kesihatan di Kedah semasa permulaan PKPP bagi pandemik COVID-19 masing-masing adalah 8.4%, 17.1% dan 6.4%. Faktor yang berkaitan dengan kemurungan adalah usia (dalam tahun) (Adj. OR = 0,96; 95% CI: 0,93 hingga 0,99, nilai p <0,015), dan hospital sebagai tempat kerja (Adj. OR = 1,88; 95% CI: 1,19

hingga 2,97, nilai p = 0.007). Kegelisahan juga dikaitkan dengan hospital sebagai tempat kerja (Adj. OR = 1,91; 95% CI: 1,36 hingga 2,68, nilai p <0,001). Faktor-faktor yang berkaitan dengan tekanan adalah umur (dalam tahun) (Adj. OR = 0.96; 95% CI: 0.93 hingga 0.997, nilai-p = 0.035) dan mereka yang mempunyai tahap pendidikan ijazah / pascasiswazah (Adj OR = 8.43 95% CI: 1.95 hingga 36.37 , nilai p = 0.004).

Kesimpulan: Penemuan ini menunjukkan bahawa kesihatan mental petugas kesihatan di Kedah adalah terkesan semasa pandemik COVID-19. Survelan kesihatan mental yang sistematik dan berterusan membantu mengenal pasti petugas kesihatan yang terkesan. Masalah perubatan yang sedia ada tidak mempunyai kaitan dengan kesihatan mental petugas kesihatan.Kajian lanjut perlu bagi menentukan kesan pandemik dan meneroka punca kepada implikasi psikologi petugas kesihatan, serta bagaimana menguruskannya dengan berkesan.

KATA KUNCI: kesihatan mental, petugas kesihatan, pandemik COVID-19,

ABSTRACT

FACTORS ASSOCIATED WITH DEPRESSION, ANXIETY, AND STRESS AMONG HEALTHCARE WORKERS IN KEDAH DURING EARLY RECOVERY MOVEMENT CONTROL ORDER OF COVID-19 PANDEMIC

Background: Mental health of healthcare workers (HCWs) are affected by the COVID-19 pandemic in many ways. Depression, anxiety, and stress (DAS) often use to described mental health status worldwide.

Objective: This study analysed the prevalence and factors associated with DAS of HCWs in Kedah, Malaysia, during the early recovery movement control order (RMCO) of the COVID-19 pandemic.

Methodology: This cross-sectional study used secondary data of 981 respondents between 1 July 2020 and 31 August 2020, randomly sampled from mental health surveillance data of HCWs from the Kedah Health State Department during RMCO in 2020. Socio-demographic factors, occupational characteristics, and health backgrounds were extracted and analysed using SPSS version 26. The data were analysed using descriptive analysis followed by simple and multiple logistic regression.

Result: Prevalence of Depression, Anxiety and Stress of HCWs in Kedah during early RMCO of COVID-19 pandemic are 8.4%, 17.1% and 6.4% respectively. Factors associated with depression are age (in years) (Adjusted OR = 0.96; 95% CI: 0.93 to 0.99, *p*-value <0.015), and hospital as workplace (Adjusted OR = 1.88; 95% CI: 1.19 to 2.97, *p*-value = 0.007). Anxiety also associated with hospital as workplace (Adjusted OR = 1.91; 95% CI: 1.36 to 2.68, *p*-value < 0.001). Factors associated with

stress are age (in years) (Adjusted OR = 0.96; 95% CI: 0.93 to 0.997, *p*-value = 0.035) and those with degree/postgraduate education level (Adjusted OR = 8.43 95% CI: 1.95 to 36.37, *p*-value = 0.004).

Conclusions: These findings indicate that the mental health of HCWs in Kedah is affected during COVID-19 pandemic. Systematic, ongoing mental health surveillance helps identify those affected. The existing medical condition has no association with the HCWs' mental health. Further research is needed to ascertain the effect of pandemics and explore the root cause of psychological implications of HCWs and how to manage it effectively.

KEYWORD: mental health, healthcare workers, COVID-19 pandemic

CHAPTER 1

INTRODUCTION

1.1. Background

Novel coronavirus disease 2019 (COVID-19) pandemic has drawn concerns globally after it emerged from Wuhan City, Hubei Province, China, and primarily transmitted through person-to-person contacts and respiratory droplets (Guo *et al.*, 2020). The World Health Organization (WHO) declared the COVID-19 outbreak the Public Health Emergencies of International Concern (PHEIC) on 30 January 2020 following the recommendations by the Emergency Committee (WHO, 2020b). More than 140 million individuals had been infected as of 18 April 2021, with around 3 million deaths globally (WHO, 2021).

Malaysia reported its first case in Johor Bharu on 25 January 2020. It was an imported case in which three Chinese nationals who had previously visited Singapore had close contact with a confirmed case (New Straits Times, 2020; WHO, 2020a). The patients were treated and isolated at Selangor's Sungai Buloh Hospital (Borneo Post, 2020). Malaysia's first locally transmitted COVID-19 case was in Kedah on 6 February 2020 (Ahmad *et al.*, 2020). The patient was a 40-year-old female Malaysian who had no travel history to affected areas; however, she was in close contact with a 41-year-old elder brother, who just came back from Singapore for a conference, and later tested positive for the virus (CNA, 2020).

Earlier, Malaysia had responded by activating the National Crisis Preparedness and Response Centre (CPRC) under the Ministry of Health (MOH) Disease Control Division's Surveillance Section to ensure effective management of health-related disasters, outbreaks, crises, and emergencies (DOCE) (Ministry of Health Malaysia, 2020). Eventually, there was a need for workforce reinforcements and human resource mobilisation, especially with a sudden surge of new cases in Kuala Lumpur pertaining to a mass religious gathering in late February 2020. In addition, short-term relief also need to be provided for medical and health personnel at international entry points responsible for travellers screening. This human resource mobilisation within the MOH was a critical approach to maximise human resource capacity during the pandemic (Muhammad Nur Amir *et al.*, 2021). However, despite the proper strategic planning by the MOH earlier on, HCWs experienced longer working times and a lack of equipment (DG of Health, 2020a; Sze Kiat *et al.*, 2021).

In response to the COVID-19 pandemic in the country, the National Security Council as government authority had decided to impose a Movement Control Order (MCO) or lockdown from 18 March to 4 May 2020 (Bunyan, 2020; The Associated Press, 2020). The MCO was promulgated under the Prevention and Control of Infectious Diseases Act 1988 and the Police Act 1967 that; (i) prohibited mass assemblies and movements throughout the country, (ii) prohibited Malaysians travelling abroad, (iii) imposed a 14-day quarantine for those who have just returned from overseas, (iv) imposed restrictions on the entry of all citizen, (v) imposed the closure of all schools and educational institutions, and (vi) imposed the closure of all premises, government and private, except for those involved in essential services (Tang, 2020).

The MCO was followed by a Conditional Movement Control Order (CMCO) starting 4 May 2020 and subsequently a Recovery Movement Control Order (RMCO) beginning 10 June 2020 (Loo, 2020). The restrictions under the CMCO (starting on 4 May 2020) were the same as under the MCO, except that the activities of the economic sector were allowed under the latter, however, with strict adherence to standard operating procedures (SOP), such as physical distancing and documenting of customers' name and contact details (Bernama, 2020a; MKN, 2021).

Finally, during the RMCO, interstate travels and domestic tourism were allowed (Loo, 2020), and some religious activities at the mosques were permitted, with many restrictions and education facilities (Dzulkifly, 2020). On the other hand, the Targeted Enhanced Movement Control Order (TEMCO) has been imposed in specific areas for 14 days if a huge cluster emerged. During the time, all businesses were closed, access roads blocked, in or out movements not allowed, and all residents had to stay at home. Within each TEMCO area, the MOH set up a medical base to facilitate mass screening. Meanwhile, the authorities distributed food supplies to the residents (Sham, 2020).

COVID-19 cases in Kedah were reducing in trend during May 2020 and continue until June where RMCO took place (MOH, 2020b). There was a period in which there were no new COVID-19 cases reported for few weeks during RMCO in Kedah (MOH, 2020a). As of August 2020, several new clusters emerged in Kedah, starting with Sivagangga, followed by Tawar and Telaga clusters (Codeblue, 2020; DG of Health, 2020b).

The index case (Case 8,937) of the Sivagangga cluster was a Malaysian permanent resident who had returned from Sivagangga, a town in Tamil Nadu, India, on 13 July 2020. He was tested COVID-19 negative at the international entry point (Kuala

Lumpur International Airport). However, he did not comply with a 14-day Home Surveillance Order (HSO) (DG of Health, 2020c). This cluster later on escalated to neighbouring states Perlis and Pulau Pinang (Arifin, 2020; Rahman, 2020). Tawar cluster was started with a diagnosis of case 9113 on 11 August 2020, a 53-year-old Malaysian with a history of attending the funeral of close family members earlier that month (Sulaiman, 2020).

In response to the above clusters, HCWs from other districts in Kedah were mobilised in which cut across all levels of HCWs, from health attendants to public health specialists, and may require overnight stays for some personnel due to logistic issues, especially for mass screening in affected areas. As new cases are confirmed, their contacts need to be identified and screened as soon as possible, and contact tracing will become a priority and need to be urgently administered. The workload and work demands would increase exponentially, while referrals, treatments, and patient care cannot be ignored.

The high numbers of suspected and confirmed COVID-19 cases forced the health services to adapt to the situation and demanded that healthcare workers (HCWs) be multi-tasking. Apart from their ordinary and essential duties, the HCWs were involved in managing the COVID-19 pandemic in terms of diagnosis, patient care, treatment, and contact tracing. The pandemic would increase HCWs' work demands and limit their opportunity to rest and recover adequately, subsequently exposing them to a significant risk of adverse mental health implications (Mohd Fauzi *et al.*, 2020).

Mental health assessments of HCWs have become one of the MOH's main components of COVID-19 pandemic management (MOH, 2005, 2020c). The assessment or screening started in March 2020 with the activation of mental health psychosocial

support services (MHPSS) (Ibrahim *et al.*, 2020). Initially, the screening started with a weekly screening, then became monthly, intended to identify early symptoms of a mental breakdown among HCWs. However, since the commencement of the RMCO in June, all HCWs were encouraged to do the screening as needed, especially if they participated in mass screening activities or were mobilised to the other areas.

A Depression, Anxiety, and Stress Scale 21 (DASS-21) questionnaire was used in the screening programme. It is an online, self-administered web-based screening programme using the Google form format. In implementing the screening programme, the Kedah Health State Department provides the Google Form link to HCWs through their Head of Department via WhatsApp messaging. The screening programme involves no direct monetary cost, thus, helps its take-off.

1.2. Statement of problem

HCWs should have good mental health to face the COVID-19 pandemic, which comes with the additional risks of infection due to exposure at work, sudden increase of workload, and work demand. Unfortunately, HCWs are overburdened with extra tasks, and in some cases, out of station deployment. They also experience less time for rest and recovery due to working extra hours and freezing the annual leaves. All these issues may lead to mental health problems such as depression, anxiety, and stress (DAS) (J. Wang *et al.*, 2020). However, the impact of COVID-19 pandemics on HCWs' mental health in Malaysia is still not fully understood.

1.3. Rationale

Mental health during COVID-19 pandemic is very important to all, especially in regards for specific groups such as HCWs. Their mental health needs to be addressed seriously and timely, because any mental health problem affects physical health and well-being, and might lead to psychosomatic problem, burn-out and subsequently will affect the productivity and quality of health services. Mental health problem among HCWs also might be overlooked or been ignored. Thus, understanding the pandemic's effect on HCWs' mental health may guide the MOH in ensuring sound mental health among healthcare workers.

Besides that, earlier studies on mental health among HCWs in Malaysia were conducted during the early phase of the COVID-19 pandemic, had a different setting, target population, and locations, which might be translated into different restrictions, workloads, and disease trends. Thus, the mental health outcome can be compared and then related to the situation. Research Questions

Based on the above discussion, the following are the research questions that this study attempts to address.

1. What impact does the COVID-19 epidemic have on the mental health of Kedah's HCWs?
2. Is there any association between sociodemographic, occupational, and health characteristics and HCWs' state of mental health in Kedah?

1.4. Objective

1.4.1 General Objective

To study the mental health status of Health Care Workers in Kedah during early Recovery Movement Control Order.

1.4.2 Specific Objectives

1. To describe the prevalence of depression, anxiety, and stress (DAS) of HCWs in Kedah during early RMCO of the COVID-19 pandemic.
2. To determine factors associated with DAS among HCWs in Kedah during early RMCO of the COVID-19 pandemic.

1.5. Research Hypothesis

Sociodemographic, occupational characteristics, and underlying health conditions are significantly associated with DAS among HCWs in Kedah during the early RMCO of the COVID-19 pandemic.

CHAPTER 2

LITERATURE REVIEW

This study uses online databases and search engine, namely Scopus, PubMed, Google Scholar, Springer link, Web ISI and Science Direct, to search for literature. Various search techniques were used, including the usage of Boolean operators such as "AND," "OR," and "NOT.". Mental health, healthcare workers, COVID-19, variables linked, depression, anxiety, and stress were the keywords utilised.

2.1. Mental Health

Mental health is an essential constituent of overall health, closely linked to physical health and well-being. The WHO defines mental health as "a state of well-being in which the individual realises his or her abilities, can cope with the normal stresses of life, can work productively and fruitfully, and can make a contribution to his or her community" (WHO, 2004a). Mental health is not only associated with the absence of mental disease; it also involves emotional, psychological, and social well-being, the essence of positive feelings, and good individual and social life functions (Hardy *et al.*, 2003).

Good mental health is described as well-being that helps people cope with life's everyday pressures and function productively(Fusar-Poli *et al.*, 2020). On the other hand, psychological distress is described as the unique and unpleasant emotional state that an individual experiences in reaction to a particular stressor or demand that causes injury, whether temporarily or permanently, to the person (Ridner, 2004).

Psychological distress is considered a significant predictor for progression towards mental illness, and if not intervene, it will soon impede the person's capacity to perform regularly and contribute to society later on (Pellerin and Cloutier, 2018; Sutin *et al.*, 2018). Furthermore, psychological distress, especially depression, was found to predict absenteeism. In their study, Hardy *et al.* (2003) found that a higher level of distress is associated with higher absenteeism in terms of the number of days and times.

Mental health problems are the critical cause of disability globally, contributing considerably to the global overall disease burden (Whiteford *et al.*, 2013). Many social, biological, and environmental conditions influence mental health, such as gender, age, socioeconomic status, educational background, and religion (Duchaine *et al.*, 2017; World Health Organization and Calouste Gulbenkian Foundation, 2004).

2.2. Mental Health among HCWs

Everyone, especially HCWs, needs to have good mental health to function and contribute to society. However, HCWs might experience psychological distress symptoms at some point in their career due to bureaucracy/organisation factors and an imbalance of expectations, competency, or social support at work. The symptoms are manifested by a shift from a steady baseline emotional state to anxiety, depression, stress, demoralisation, irritability, aggression, self-depreciation, or burnout, resulting in deterioration in the quality of life and service provisions (Lebares *et al.*, 2018; Massé, 2000).

Increased workload, interaction with suffering and dying patients, and organisational problems and conflicts were identified as stress factors among HCWs (Lief *et al.*, 2018; McVicar, 2003). In Malaysia, the prevalence of DAS among interns in MOH hospitals nationwide in 2017 is 26.2%, 39.9%, 29.7%, respectively (Ismail *et al.*, 2020).

Sometimes mental health issues among HCWs could be overlooked, possibly due to the high regard for the medical profession (Reger *et al.*, 2020). HCWs in Denmark were at a higher risk of committing suicide than other occupational categories, which might indicate a higher prevalence of the psychiatric disorder (Hawton *et al.*, 2011). They tend to ignore their health issues, frequently fail to seek proper care, and most likely hesitant to seek help for mental health issues due to stigma.

2.3. Mental Health of HCWs in Pandemic

During the COVID-19 pandemic, HCWs have been exposed to high infection risks, patient mortality, moral quandaries, enormous workloads, and persistent uncertainty about the pandemic wave(Cabarkapa *et al.*, 2020). The workforce mobilisation and deployment to higher-risk front-line duties, frequently changing personal protective equipment (PPE) guidelines, would interrupt standard work processes and procedures, subsequently impact the mental health of HCWs (De Kock *et al.*, 2021). The pandemic would increase the workload of healthcare personnel while limiting their ability to relax and recover sufficiently, placing them in danger of adverse mental health effects (Mohd Fauzi *et al.*, 2020).

Studies on mental health problems among frontline HCWs during and after a viral epidemic outbreak found that anxiety, depression, acute stress, post-traumatic stress disorder, and burnout were the most commonly observed clinically relevant mental health symptoms (Serrano-Ripoll *et al.*, 2020). A study in Hong Kong found that the country's HCWs were at a high risk of developing anxiety, depression, stress during the SARS outbreak (Wu *et al.*, 2005).

A study found that 33% of the HCWs in Singapore experienced anxiety, 14.6% traumatic stress, and 32.6% stigmatisation during the pandemic (Q. Chew *et al.*, 2020). In China, the prevalence of depressive, anxiety, and stress symptoms among HCWs working in hospitals and managing Covid-19 patients was alarming - 50.4% had depressive symptoms, 44.6% anxiety, and 71.5% stress (Lai *et al.*, 2020). Locally, a study among medical doctors in Selangor's government health facilities found that the prevalence of DAS amid the COVID-19 pandemic were 31%, 29.7% and 23.5%, respectively (Mohd Fauzi *et al.*, 2020).

2.4. Assessment of Mental Health

There are several approaches and modalities used in the mental health screening of HCWs. The selection of the tool depends on its psychometric properties, constructs, cultural acceptance, costs, and target population (Firdaus and Nor Sheereen, 2011; Khaiyom *et al.*, 2019).

Many studies use the Depression, Anxiety, and Stress Scale 21 (DASS-21) questionnaire to measure psychological distress among HCWs worldwide during the COVID-19 pandemic (Alshekaili *et al.*, 2020; N. Chew *et al.*, 2020; Ng *et al.*, 2020). It is a shorter version of Lovibond's DASS-42 questionnaire and is a free-to-use global

screening tool. DASS-21 is a qualitative measure of distress along the axes of DAS (Lovibond and Lovibond, 1995; Osman *et al.*, 2012). This psychometrically sound questionnaire with good reliability and validity has been used in clinical and non-clinical populations across cultures (Crawford *et al.*, 2009; Oei *et al.*, 2013). DASS-21 also has comparatively culture-free objects, as they do not include any cultural or religious elements (Musa *et al.*, 2007). DASS-21 is not a diagnostic questionnaire, but rather a mental health screening approach and symptom severity measurement (Lovibond and Lovibond, 1995; Oei *et al.*, 2013). It is widely used by researcher and clinician in Malaysia (MOH, 2005; Musa *et al.*, 2009; Nordin *et al.*, 2017; Simin *et al.*, 2020).

Another tool used for mental health assessment is the forty-year-old self-assessment questionnaire known as Hospital Anxiety and Depression Scale (HADS). It has good psychometric qualities to assess the level of psychological distress. It measures overlap anxiety and depression constructs (McManus, Sally & Meltzer, Howard & Brugha, Traolach & Bebbington, Paul & Jenkins, 2009; Stern, 2014; Zigmond and Snaith, 1983). Even though HADS has been translated to Malay and validated, this less popular questionnaire is not freely accessible. There have been limited studies that proved its cultural acceptance in Malaysia compared to DASS-21 (Abd Rashid *et al.*, 2010; Lian *et al.*, 2019; Yahya and Othman, 2015).

The freely available Patient Health Questionnaire (PHQ-9) is another tool that measures mental health. It is a self-administered questionnaire with excellent psychometric qualities that assesses the severity of depressive symptoms and identifies suicidal ideation in adults (Kroenke *et al.*, 2001; Sahimi *et al.*, 2021). The questionnaire has been translated to Malay and is valid for depression screening.

However, there is limited data on its cultural compatibility (N Azah *et al.*, 2005; Sherina *et al.*, 2012). Other tools include GAD-7 (Generalised Anxiety Disorder-7) and GHQ (General Health Questionnaire). These single-construct, public domain questionnaires have also been validated and translated to Malay (Cheah *et al.*, 2020; Yusoff, 2010); however, they are not widely used compared to the above screening tools.

2.5. Risk factors of Depression, Anxiety and Stress

2.5.1 Sociodemographic factors

A study in Kuala Lumpur (Ghawadra *et al.*, 2019) shows that single and widowed nurses have higher DAS levels than married nurses. Furthermore, nurses between the ages of 26 and 30 have a higher rate of depression than nurses of other ages. Middle-aged nurses, divorced or widowed, rarely or not living with family members were at higher risk for DAS during the COVID-19 pandemic in China (Zhaorui Liu *et al.*, 2020).

There is also evidence that American female college students experienced higher levels of DAS than males (Mahmoud *et al.*, 2012). Similarly, during the initial COVID-19 pandemic, Australian females experienced higher DAS levels than males (Gurvich *et al.*, 2020). It is also found that younger HCWs experienced a higher level of DAS than their older counterparts. The former also faced a greater risk for psychological impact during public health crises than the latter (Arcury-Quandt *et al.*, 2019; Tee *et al.*, 2020).

2.5.2 Occupational characteristics and health background

Working station, type of workplace, and category of health care workers were associated with psychological distress, especially during the COVID-19 pandemic. For example, surgery residents in San Francisco, California, were susceptible to severe distress, burnout, or psychosomatic diseases (Lebares *et al.*, 2018). A study conducted in Oman discovered that frontline HCWs are 1.5 times more likely than the non-frontliners to suffer anxiety, stress, and insomnia (Alshekaili *et al.*, 2020). A study among healthcare professionals in Delhi, India, found that stress correlates with overweight and obesity (Sharma *et al.*, 2016). Another study in Saudi Arabia during the pandemic found increased anxiety among HCWs significantly associated with chronic disease and smoking (Alenazi *et al.*, 2020).

A study of HCWs in China shows that the following factors are associated with DAS: working in high-risk departments, experiences with treatment for infectious disease in COVID-19 designated hospitals, non-infectious disease hospitals, and higher-level hospitals (Zhaorui Liu *et al.*, 2020). Similarly, a study conducted in Singapore revealed an increased risk of mental health outcomes among medical residents who experience social isolation during the COVID-19 pandemic(Q. Chew *et al.*, 2020).

2.6. Conceptual framework

Based on the literature review, the COVID-19 pandemic impacts the mental health of healthcare personnel. DAS are significant common reported mental health problems. Sociodemographic, occupational characteristics, and health backgrounds are factors associated with DAS (Figure 2.1). Sociodemographic factors include age, gender, marital status, ethnicity, religion, living arrangement, and socioeconomic status. Occupational characteristics consist of working position, workplace, and working station. Health background includes smoking status, medical comorbidity, and overweight or obesity.

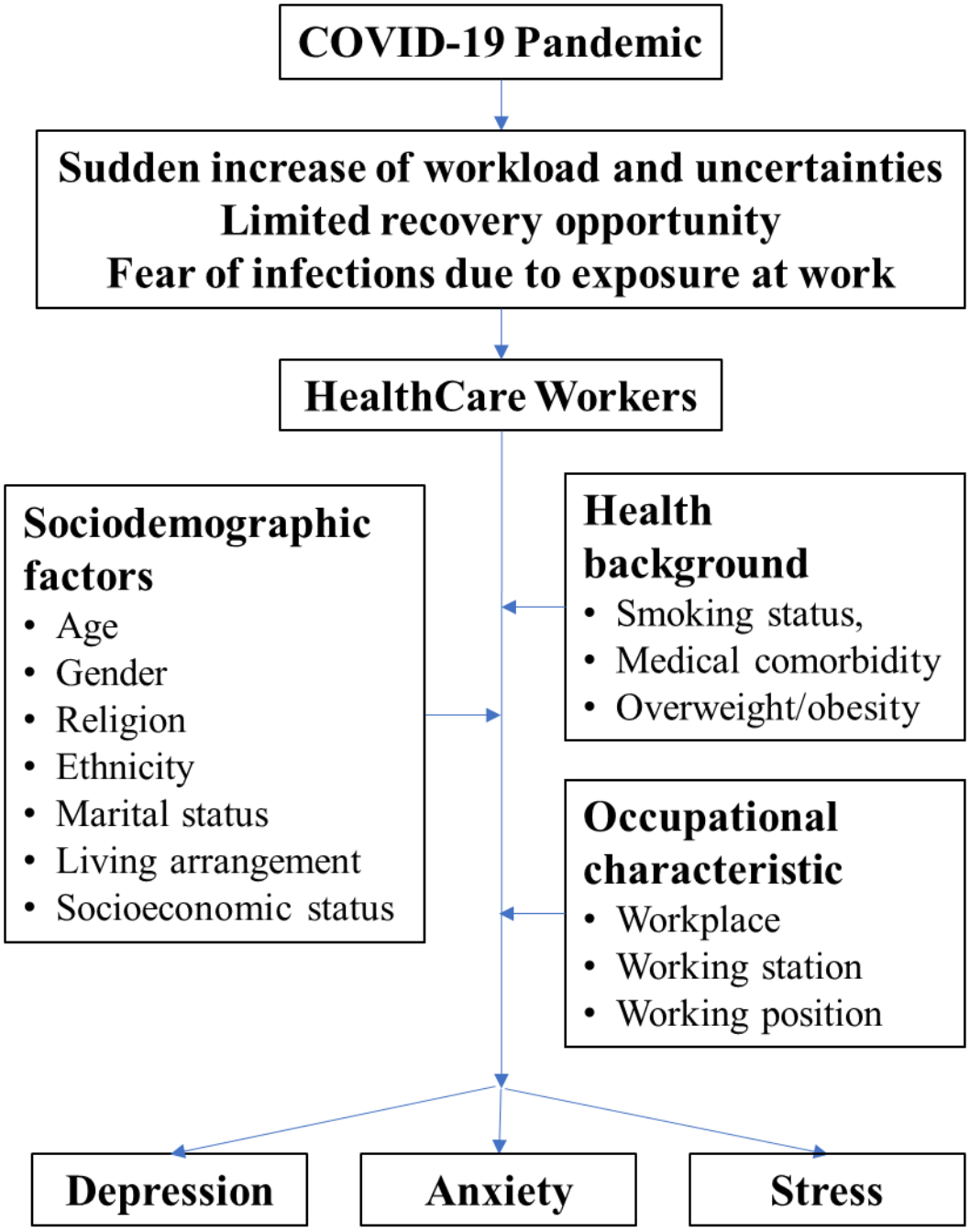

Figure 2.1 Conceptual framework of the study.

CHAPTER 3

METHODOLOGY

3.1. Study area

Kedah, Malaysia.

3.2. Study design

Cross-sectional study using surveillance data (ongoing mental health screening) of HCWs from Kedah Health State Department.

3.3. Study period

The study was conducted within six months, from November 2020 till April 2021.

3.4. Study population.

3.4.1 Reference population

HCWs in Kedah.

3.4.2 Target population

HCWs working in MOH facilities in Kedah.

3.4.3 Source population/sampling pool

HCWs underwent mental health screening.

3.5. Sampling frame

All response list of mental health screening of HCWs in MOH facilities in Kedah from 1 July – 31 August 2020.

3.6. Study criteria

3.6.1 Exclusion Criteria

- Pre-existing mental illness.
- Screening data with one or more missing variables.

3.7. Sample size calculation

The sample size was calculated to determine the prevalence of DAS of HCWs in Kedah during early RMCO using the following formula for estimation of a single proportion:

$$\mathrm{n}=\left(\frac{\mathrm{Z}_{(1-a/2)}}{\Delta}\right)^{2} P(1-\mathrm{P})$$

P = prevalence of anxiety among HCWs. Based on Ismail *et al.* (2020), P = 40%. Assuming a 95% confidence level, Z= 1.96 and the precision, Δ = 0.05.

A calculation using the estimation of single proportion formula gives a sample size of 369. Due to the possibility of data entry errors, missing values, and outliers, an additional 10% of the calculated sample size (37) was added to the sample, totalled 406. Prevalence of depression and stress on that study were 26.2% and 29.7% respectively. Calculated sample size using same formula with additional 10% gives a sample size of 323 and 352.Thus, to address Objective 1, a sample size of 406 would be sufficient.

The sample size calculation to determine factor associated with DAS among HCWs in Kedah during RMCO was calculated using the PS Software (dichotomous – two proportion formula). An additional 10% were included in the calculation for the possibility of data entry errors, missing values, and outliers.

Table 3.1: Sample size calculation to determine factor associated with depression

Associated Factors	**P_0**	**P_1**	**m**	**n**	**n(m+1) +10%**	**Reference**
Female	0.35	0.25	1	349	768	(Gurvich *et al.*, 2020)
Nurse	0.28	0.37	1	446	981	(Zhaorui Liu *et al.*, 2020)
Frontline HCWs	0.55	0.40	1	441	970	(Alshekaili *et al.*, 2020)

P_0 = Proportion of non-exposure with depression based on literature review
P_1 = Estimated proportion of exposure with depression
m = ratio between two groups
Power of study 80%
$\alpha = 0.05$

Table 3.2: Sample size calculation to determine factor associated with anxiety

Associated Factors	P_0	P_1	m	n	n(m+1) +10%	Reference
Female	0.21	0.35	1	174	382	(Gurvich *et al.*, 2020)
Nurse	0.14	0.25	1	221	486	(Zhaorui Liu *et al.*, 2020)
Frontline HCWs	0.56	0.45	1	341	750	(Alshekaili *et al.*, 2020)

P_0 = Proportion of non-exposure with anxiety based on literature review
P_1 = Estimated proportion of exposure with anxiety
m = ratio between two groups
Power of study 80%
$\alpha = 0.05$

Table 3.3: Sample size calculation to determine factor associated with stress.

Associated Factors	P_0	P_1	m	n	n(m+1) +10%	Reference
Female	0.27	0.11	1	105	231	(Gurvich *et al.*, 2020)
Living alone	0.20	0.35	9	78	858	(Q. Chew *et al.*, 2020)
Nurse	0.18	0.30	1	214	429	(Zhaorui Liu *et al.*, 2020)
Overweight/ obesity	0.55	0.40	1	186	410	(Sharma *et al.*, 2016)

P_0 = Proportion of non-exposure with stress based on literature review
P_1 = Estimated proportion of exposure with stress
m = ratio between two groups
Power of study 80%
$\alpha = 0.05$

Base on sample calculation shown in Table 3.1,

Table 3.2, and Table 3.3, sample size of 981 was estimated to be sufficient to address Objective 2. As this is the largest sample size, 981 respondents were observed to achieve all study objectives.

3.8. Sampling method and subject recruitment

Initially, a list of HCWs working in the MOH's facilities in Kedah who took part in the mental health screening from 1 July to 31 August 2020 was obtained from the MOH. The total number of available respondents was 1104. Then, four respondents who did not fulfil the study criteria were omitted. Subsequently, a simple random sampling was applied to the final list using SPSS version 26.

3.9. Research tools and variables

Data was extracted from ongoing mental health screening of HCWs from Kedah Health State Department via a proforma checklist which includes all the dependent and independent variables (Appendix A).

Sociodemographic factors consist of age, gender, marital status, ethnicity, religion, living arrangements, household income.

Occupational characteristic consists of the type of workplace, working station, and working position.

Health characteristics consist of smoking status, comorbidity, and overweight or obesity.

3.9.1 Depression, anxiety, and stress scale (DASS) - DASS-21:

It is a globally used screening tool and a qualitative measure of distress along the axes of DAS (Lovibond and Lovibond, 1995).The tool has been translated and validated in many languages, including Malay (Musa *et al.*, 2009).

The internal consistency reliability coefficients for DASS-21 subscales (also termed as constructs) and full scale were high with Cronbach's alpha of 0.88 for depression, 0.82 for anxiety, 0.90 for stress, and 0.93 for total score (Osman *et al.*, 2012). In the validated Malay version, the Cronbach's alphas were 0.84, 0.74, and 0.79 for DAS, respectively (Musa *et al.*, 2007).

The tool contains 21 items or questions of Malay version Depression, Anxiety and Stress Questionnaire (DASS-21) (Appendix B), each measured using a 4-point Likert scale (from 0 to 3) to indicate the severity of the individuals' symptoms over the previous week. A higher score denotes a higher level of the respective subscale's symptoms.

The points are as follows:

0: Did not apply at all

1: Applied to some degree, or some of the time

2: Applied to a considerable degree or good part of the time

3: Applied very much or most of the time

Each construct (DAS) consists of seven items, and the corresponding question numbers (items) are as shown (Table 3.4).

Table 3.4: DASS-21 items by construct

	Depression	Anxiety	Stress
Question numbers	3,5,10,13,16,17,21	2,4,7,9,15,19,20	1,6,8,11,12,14,18

The scores for each item in each construct were summed up and further classified into five categories - normal, mild, moderate, severe, extremely severe (Table 3.5) (Lovibond and Lovibond, 1995).

Table 3.5: DASS-21 severity classification based on score.

Classification	Depression Score	Anxiety Score	Stress Score
Normal	0-5	0-4	0-7
Mild	6-7	5-6	8-9
Moderate	8-10	7-8	10-13
Severe	11-14	9-10	14-17
Very Severe	15+	11+	18+

3.10. Operational Definition

3.10.1 HCWs

Those involved in the screening process, managing and handling samples, contact tracing, human resource coordination, data management, treatment process, handling clinical waste, or any other activities related to managing COVID-19 cases.

3.10.2 Depression, Anxiety, and Stress

The classification of DAS is based on scores - if a score is more than the normal value, it will be classified as DAS ignoring its severity (Ibrahim *et al.*, 2020; Lovibond and Lovibond, 1995).

Depression is present when the DASS-21 score is more than five (mild/moderate/severe/very severe).

Anxiety is present when the DASS-21 score is more than four (mild/moderate/severe/very severe).

Stress is present when the DASS-21 score is more than seven (mild/moderate/severe/very severe).

3.10.3 Education level

Level of highest education level. Classified into three categories: Primary/secondary, Diploma, and Degree/postgraduate.

3.10.4 Living arrangement

Numbers of people living together at their residence including the HCWs.

3.10.5 Household income

Total income of all household members per month. Classified into four categories as in the mental surveillance data: <RM3,000, RM 3,000 to RM7,000, RM7001 to RM14,000 and >RM14,001.

3.10.6 Type of workplace

i. District Health Office: is made up of primary healthcare facilities, including Outpatient, Maternal and Child Health, Community and Rural clinics, Health Inspectorate Unit, Health Promotion Unit, Water Supply and Environmental Sanitation Unit, Disease Control Unit, and the management office.