

**PREVALENCE AND FACTORS ASSOCIATED WITH
NEGATIVE EMOTIONAL STATE OF STRESS AMONG ADULT
POPULATION
IN KEDAH, MALAYSIA DURING COVID-19 PANDEMIC**

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By

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LIST OF ABBREVIATIONS

Adj. OR/AOR	Adjusted Odds Ratio
ANS	autonomic nervous system
CI	Confidence interval
CMCO	Conditional Movement Control Order
DASS-21	Depression, Anxiety, Stress-21
Df	degree of freedom
HPA	hypothalamic-pituitary-adrenal
LR	Likelihood Ratio
MCO	Movement Control Order
MOH	Ministry of Health
NMRR	National Medical Research Registry
OR	Odd Ratio
RMCO	Recovery Movement Control Order
SDG	Sustainable Development Goals
SOP	Standard Operating Procedure
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization

LIST OF SYMBOLS

$<$	Less than
α	Alpha
β	Beta
$\%$	Percentage
n	Number of samples
m	Ratio between two groups

ABSTRAK

Prevalen dan Faktor berkaitan dengan Keadaan Emosi Negatif Stres Dalam Kalangan Penduduk Dewasa di Kedah, Malaysia Semasa Pandemik COVID-19

Latar Belakang: Pandemik COVID-19 mencetuskan peningkatan ketara dalam prevalens stres di seluruh dunia. Walau bagaimanapun, tahap dan faktor yang berkaitan dengan stres psikologi semasa COVID-19 dalam populasi tempatan tidak diterokai dengan secukupnya.

Objektif: Kajian ini bertujuan untuk menentukan prevalens dan faktor yang berkaitan dengan keadaan emosi negatif stres dalam kalangan penduduk dewasa di Kedah, Malaysia semasa wabak COVID-19.

Metodologi: Ini adalah semakan rekod retrospektif populasi dewasa berumur 18 hingga 60 tahun yang telah disaring untuk kesejahteraan kesihatan mental dari Januari 2021 hingga Mac 2022 di negeri Kedah. Persampelan rawak mudah telah digunakan untuk mendapatkan saiz sampel sebanyak 562. Status kesihatan mental peserta dinilai menggunakan platform dalam talian Depression, Anxiety, Stress Scale-21 (DASS-21). Analisis regresi logistik yang mudah dan berganda telah dijalankan untuk menentukan faktor yang berkaitan dengan keadaan emosi negatif stres.

Keputusan: Kelaziman keadaan emosi negatif stres ialah 45.7% (95% CI 41.6%, 49.8%). Majoriti daripada mereka tidak mengalami stres (54.3%), diikuti oleh stres yang teruk (12.3%), sederhana (11.9%), ringan (11.7%) dan stres sangat teruk (9.8%). Faktor-faktor penting yang dikaitkan dengan keadaan emosi negatif stres dalam kalangan penduduk dewasa di Kedah, Malaysia semasa pandemik COVID-19 adalah jantina, pekerjaan dan tempoh Perintah Kawalan Pergerakan (PKP). Perempuan mempunyai 3.04 kemungkinan lebih stres berbanding lelaki (Adj OR 3.035 95% CI:

2.007 hingga 4.591, p-value <0.001), menjadi mengganggu mempunyai 2.17 lebih peluang untuk mengalami stres berbanding bekerja (Adj OR 2.171 95% CI: 3.48% CI: 3.480 -nilai <0.001) dan berada di bawah MCO adalah 61.7% kurang berkemungkinan mengalami stres berbanding tidak berada di bawah MCO (Adj OR 0.383 95% CI: 0.264 hingga 0.555, nilai-p <0.001).

Kesimpulan: Prevalens keseluruhan keadaan stres emosi negatif dalam kalangan penduduk dewasa semasa wabak COVID-19 di Kedah adalah 45.7%, lebih tinggi daripada kajian lain. Menjadi wanita dan mengganggu dikaitkan dengan tekanan, manakala tempoh PKP merupakan faktor perlindungan terhadap tekanan. Dengan menyesuaikan intervensi dan strategi berdasarkan ciri dan kelemahan yang dikenal pasti kumpulan ini seperti terapi tingkah laku kognitif (CBT) dan intervensi berasaskan kesedaran, adalah mungkin untuk melaksanakan pendekatan yang lebih disasarkan dan memberi kesan untuk mengurangkan keadaan emosi negatif stres.

KATA KUNCI: Stres, penduduk dewasa, DASS-21, COVID-19, Perintah Kawalan Pergerakan

ABSTRACT

Prevalence And Factors Associated with Negative Emotional State of Negative Emotional State of Stress Among Adult Population in Kedah, Malaysia during COVID-19 Pandemic

Background: COVID-19 pandemic triggers significant increase in prevalence of stress worldwide. However, the extent and factors associated with psychological distress during COVID-19 in the local population are not adequately explored.

Objective: The present study aimed to determine the prevalence and factors associated with negative emotional state of stress among adult population in Kedah, Malaysia during COVID-19 pandemic.

Methodology: This is a retrospective record review of adult population aged 18 to 60 years old who were screened for mental health well-being from January 2021 until March 2022 in the state of Kedah. Simple random sampling was applied to obtain the sample size of 562. The participants' mental health status was assessed using the online platform Depression, Anxiety, Stress Scale-21 (DASS-21). Simple and multiple logistic regression analyses were conducted to determine the factors associated with negative emotional state of stress.

Results: The prevalence of negative emotional state of stress was 45.7% (95% CI 41.6%, 49.8%). The majority of them did not have stress (54.3%), followed by severe stress (12.3%), moderate (11.9%), mild (11.7%) and very severe stress (9.8%). The significant factors associated with negative emotional state of stress among adult population in Kedah, Malaysia during COVID-19 pandemic were sex, occupation and Movement Control Order (MCO) period. Female has 3.04 odds more stress compared to male (Adj OR 3.035 95% CI: 2.007 to 4.591, p-value <0.001), being unemployed

has 2.17 more odds to experience stress compared to being employed (Adj OR 2.171 95% CI: 1.480 to 3.185, p-value <0.001) and being under MCO were 61.7% less likely to have stress compared to not being under MCO (Adj OR 0.383 95% CI: 0.264 to 0.555, p-value <0.001).

Conclusion: The overall prevalence of negative emotional state of stress among adult population during COVID-19 pandemic in Kedah was 45.7%, higher than other studies. Being female and unemployed were associated with stress, while the MCO period was a protective factor against stress. By tailoring interventions and strategies based on the identified characteristics and vulnerabilities of these groups such as cognitive behavioral therapy (CBT) and mindfulness-based interventions, it is possible to implement more targeted and impactful approaches to alleviate negative emotional states of stress.

KEYWORDS: Stress, adult, DASS-21, COVID-19, Movement Control Order

CHAPTER 1

INTRODUCTION

1.1 Background

The World Health Organization (WHO) defined health as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (World Health Organization, 2022). A person's thinking, perception, and behaviour are all influenced by their mental health, which includes components of emotional, psychological, and social well-being (Centers for Diseases Control and Prevention, 2021). The United Nations Sustainable Development Goals (SDGs), specifically objective 3.4, recognise the importance of mental health for maintaining a high standard of living. The aim is to reduce premature mortality caused by noncommunicable illnesses by one-third by 2030 through prevention interventions and effective treatment, while also promoting mental health and well-being (United Nations in Malaysia, 2022). However, mental health issues are on the rise globally that raise major concern and become a challenge in tackling it. The current mental health crisis has been sparked by a number of variables, including economic and social disparities, public health emergencies such as COVID-19, humanitarian emergencies such as conflict and forced relocation, and the climate catastrophe (World mental health report: transforming mental health for all., 2022).

Following COVID-19 emergence in December 2019 in Wuhan, Hubei Province, China, the World Health Organisation (WHO) declared it a global pandemic on March 12, 2020 as a result of its rapid global spread (Elengoe, 2020). It has ravaged many countries including Malaysia, Since the discovery of the first COVID-19 case in Malaysia on 25th January 2020, the virus has wreaked havoc throughout the country,

causing extensive disruptions and difficulties (Elengoe, 2020). The five domains of WHO COVID-19 Strategic Preparation and Response Plan were all incorporated into Malaysia's crucial measures to curb the COVID-19 pandemic. The domains included aspects such as whole-of-government coordination, cordon sanitaire/lockdown measures, ensuring equitable access to services and support, establishing effective quarantine and isolation systems, and implementing pertinent legislation and enforcement (Ang *et al.*, 2021). Various phases of the Movement Control Order have been implemented by the Malaysian government (MCO) nationwide from 18 March 2020 to curb the spread of the COVID-19 infection in Malaysia (Abd Rahman *et al.*, 2022). The Standard Operating Procedures (SOPs) related to these MCO phases were associated with various consequences on the mental health among the population.

The MCO, Conditional Movement Control Order (CMCO), and Recovery Movement Control Order (RMCO) have been enacted by the Malaysian government in an effort to curb the transmission of the COVID-19 virus (Abd Rahman *et al.*, 2022). MCO is a phase where Malaysians was enforced with stay-at-home orders and only essential services are allowed to be operated (Aziz *et al.*, 2020). There were three phases of MCO since it was first implemented. The MCO 1.0 was implemented from 18 March 2020 until 3 May 2020 (Ministry Of Finance, 2021). MCO 2.0 was from 13 January 2021 until 4 March 2021, but depending on the COVID-19 status in each state where it alternates between MCO, CMCO, and RMCO. The MCO 3.0 was from 12 May 2021 until 28 June 2021 (Malaysia Ministry of Health, 2021). CMCO is the period of partial opening of the economic sector, where in 2021 it was implemented from 5 March 2021 until 18 March 2021. RMCO is where the economic, education, religious, hospitality, and tourism sectors return to normal operations but with strict application of SOPs (Hashim *et al.*, 2021). RMCO was initially imposed from 1

January 2021 until 31 March 2021 but due to surge of COVID-19 cases, MCO 2.0 was implemented. The RMCO was re-imposed nationally from 19 March 2021 until 17 May 2021. However, in Kedah state, there were a few districts that still underwent CMCO during that period, namely Kuala Muda district (19 March 2021 until 17 May 2021) and Kulim district (19 March 2021 until 31 March 2021) (Malaysia Ministry of Health, 2021). Figure 1.1 summarizes the phases of MCO in Malaysia during that period.

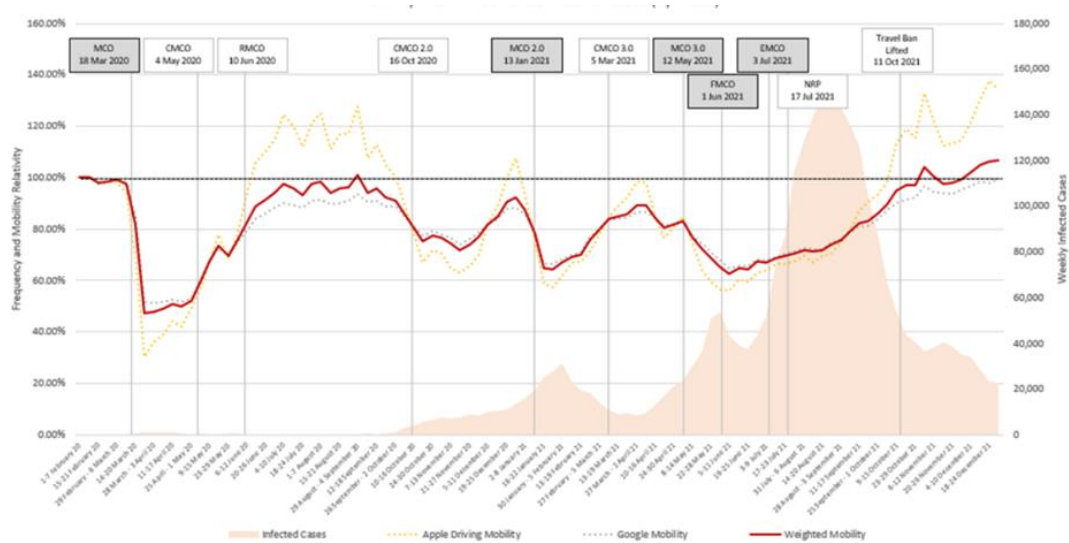


Figure 1.1 Phases of MCO in Malaysia (ASM Covid-19 working group, 2022)

Globally, the emergence of COVID-19 has precipitated or exacerbated significantly more severe mental health problems. The prevalence of clinically significant level of mental distress in the general population increased from 18.9% in 2018–19 to 27.3% in April 2020, one month into UK lockdown (Pierce *et al.*, 2020). In Malaysia, there was a spike in depressed, anxiety, and stress symptoms among the 18-year-old and older population studied between 12 May and 5 September 2020 using the online DASS-21 questionnaire (Wong *et al.*, 2021). Psychological effect during the pandemic can be triggered by fear and anxiety that can lead to stress and depression due to the overwhelming of the catastrophic impact of the COVID-19 (Mariam and Saro, 2021). Being in quarantine, grieving the loss of loved ones due to COVID-19,

enduring lockdown measures that halt all work activities, or confronting various challenges related to the pandemic or lockdown, such as work-related issues, financial difficulties, relationships, and housing issues has resulted in increased rates of post-traumatic stress, depression, anxiety, insomnia, perceived stress, and adjustment disorder symptoms among the general population of Italy (Rossi *et al.*, 2020).

Different groups of the population are affected differently by the pandemic's impact on mental health. Throughout the COVID-19 crisis, particularly in the early stages of the epidemic, specific groups, including women, young adults (typically aged 18 to 34, depending on the study), and individuals with pre-existing mental or physical health conditions, have demonstrated a greater susceptibility to poor or worsening mental health (GOV.UK Office of Health Improvement & Disparities, 2022). In a systematic review and meta-analysis conducted in Bangladesh, those who smoked more frequently had a significantly higher stress and depression scores; those with a higher secondary or undergraduate education had a lower risk of stress than those with a graduate education; and multiple COVID-19-related symptoms were associated with a greater likelihood of experiencing increased levels of stress and anxiety than a single symptom (Hosen *et al.*, 2021). Another study also found that people who experienced quarantine and those with confirmed or suspected COVID-19 reported greater symptoms of stress (Shi *et al.*, 2020).

The implementation of MCO was associated with a negative change in overall population mental health. Since it was first imposed in March 2020, Malaysians were instructed primarily to stay indoors, encompassed restriction of movement and only essential services are allowed to be operated (Aziz *et al.*, 2020). A variety of factors, including the extended duration of quarantine, fears of contracting the infection, feelings of frustration and monotony, limited supplies, insufficient information,

financial difficulties, and social stigma, influenced the psychological effects of quarantine (Brooks *et al.*, 2020). The World Health Organisation (WHO) listed potential health effects of the virus, public health and social measures, unemployment and financial instability, as well as disinformation and uncertainty, as stressors associated to COVID-19 (World mental health report: transforming mental health for all., 2022).

Anxiety, depression, post-traumatic stress disorder (PTSD), and stress rates have increased globally among both the general population and healthcare professionals during the COVID-19 pandemic (Wang *et al.*, 2021). Stress is one of the most significant difficulties for psychologists, psychiatrists, and behavioural scientists worldwide and it can diminish the efficacy of psychological interventions due to impairments in concentration, decision-making, and the mental health professional's capacity for effective client communication (Salari *et al.*, 2020b). The definition of stress is any internal or external stimulus that triggers a biological response. (Yaribeygi *et al.*, 2017). Stress can result in a variety of pathophysiological effects in individuals, and those who are exposed to stress, such as those living in difficult circumstances such as the COVID-19 pandemic, experience significant effects on their psychological functioning and well-being (Hu *et al.*, 2021).

Prolonged stress increases the likelihood of mental health issues, such as anxiety and depression (Centre for Addiction and Mental Health (CAMH), 2023). Mental illnesses that are not treated may lead to Significant concerns included social problems with friends and family (69.2%), suicidal ideation (56.3%), financial difficulties (51.0%), discontinuation from education or employment (50.4%), and a decline in academic performance (49%) (Ibrahim *et al.*, 2020). Pre-existing mental health problems have been exacerbated by the COVID-19 pandemic, reported by

parents who perceived stress and also has increased in frequency of abrasive words, increased discipline, conflicts and screaming with children since the pandemic (Gadermann *et al.*, 2021). Parental stress during the quarantine is significantly associated with children's psychological problems that impacts on emotions and behaviour of children (Spinelli *et al.*, 2020). The primary risk factors for suicidal ideation are low social support, elevated levels of physical and mental exhaustion, self-reported poor physical health among frontline medical personnel, sleep disturbances, quarantine-related exhaustion, feelings of isolation, and mental health issues (Farooq *et al.*, 2021).

There is also strong evidence that psychological stress raises the risk of illness, especially infectious disease, and that the effect is widespread across a variety of pathogens (O'Connor *et al.*, 2021). Recent research indicates that stress increases vulnerability to COVID-19 infection and exacerbates the severity of symptoms (Ayling *et al.*, 2022). Elevated stress perception is related with significantly higher production of numerous cytokines, including IL6, TNF, and IFN, each of which is crucial for initiating an immunological response that could promote severe unfavorable consequences to SARSCoV2 infection (Lamontagne *et al.*, 2021).

The COVID-19 pandemic has certainly had a significant influence on individuals by the ongoing stress, fear, grief, and uncertainty and the vulnerability of the mental health illness is varied among the population. While restrictions can be an effective public health measure for preventing the spread of viruses such as COVID-19, to protect the physical and mental health of individuals, a coordinated reaction is necessary. Thus, early identification of at-risk groups for the emerging mental health illness can assist policy maker to create an appropriate intervention to promote mental health wellbeing during future public health emergencies.

1.2 Statement of the problem

Throughout the COVID-19 pandemic, the prevalence of various mental health issues, including depression, anxiety, stress, sleep difficulties, and other psychological disorders was shown to be greater than previously reported (Lakhan *et al.*, 2020). Negative emotions are defined as feelings that make people feel unfavourable or sad and prompt a negative reaction towards a specific thing or person (PositivePsychology.com, 2019). Stress is one of the many negative emotional states, along with anxiety, depression, sadness, worry, guilt, shame, anger, and envy (Leung and Lee, 2014). The pandemic COVID-19 and MCO are stressful events affecting all individuals at different stages. According to a recent Gallup survey, four out of ten adults globally stated they felt a lot of anxiety or stress, making the world more stressed out in 2021 (Voice of America (VOA), 2022).

Overall, it was determined that the MCO's implementation in Malaysia during COVID-19 pandemic was effective in reducing the transmission of the virus (Tang, 2022). However, being isolated or having limited access has a negative impact on a person's mental health, primarily due to boredom, irritation, and financial loss (Wan Mohd Yunus *et al.*, 2020). The state of stress may contribute to poor physical health that includes enhance the susceptibility to contracting COVID-19 diseases and its severity (Ayling *et al.*, 2022). It may also affect the parenting skill that will negatively impact child's behaviour and mental health (Spinelli *et al.*, 2020). The presence of disease associated with stress was related with an increased likelihood of overall mortality and mortality specifically attributable to unnatural causes that may be preventable (Tian *et al.*, 2022).

There are few available data on the effects of the COVID-19 pandemic on mental health status of Malaysians, including extended isolation measures and economic

downturn (Wong *et al.*, 2021). This study was conducted in the state of Kedah, Malaysia. According to the NHMS 2015 main report, 30.3% of adults with mental health problems were those who lived in rural area and the prevalence in Kedah was 26.7% (Institute for Public Health, 2022). A previous study conducted among primary school teachers in Kedah, Malaysia in 2020 also found a majority of them (73.7%) have been experiencing psychological distress (Ganaprakasam *et al.*, 2021).

Thus, based on these findings, it is vital to conduct an additional study on the prevalence of stress among the general population of Kedah during COVID-19 pandemic. It may help to further expand the mental health programs with a focus on reducing the gap in the burden of mental health problems.

1.3 Rationale of the study

Stress is a common experience in daily life that affects people of all ages, but it can have particularly detrimental effects on adult health and well-being. This study's results will offer insights on the level of stress during the COVID-19 pandemic and MCO period. This study can assist in assessing the impact of current mental health programs and identify best practices for preventing or treating mental health problems.

This study can identify the people at risk of experiencing stress during the COVID-19 pandemic by predicting the associated factors of stress. It is still applicable currently as this country is expected to have another wave of COVID-19 infections in coming weeks with the new variant circulate. This can allow for early detection and intervention to prevent the onset of more severe mental health problems. Early detection and prevention can also help reduce the personal and societal costs of mental

health problems. This information can also be used to develop targeted interventions and allocate resources to address the specific needs of different populations.

Chronic stress can have negative effects on physical and mental health, as well as on social and economic outcomes. A cohort study conducted in Sweden showed that there was an association between stress-related disorders and mortality (Tian *et al.*, 2022). The findings of this study can be used to develop policies and strengthen mental health programs to prevent or reduce stress's complications and can improve the overall well-being of individuals and populations, potentially reducing healthcare costs and improving productivity.

1.4 Research questions

1. What is the prevalence of negative emotional state of stress among adult population in Kedah during COVID-19 pandemic?
2. What are the factors associated with negative emotional states of stress among adult population in Kedah during COVID-19 pandemic?

1.5 Objectives

1.5.1 General objective

To study the prevalence and factors associated with negative emotional state of stress among adult population in Kedah, Malaysia during COVID-19 pandemic

1.5.2 Specific objectives

1. To determine the prevalence of negative emotional state of stress among adult population in Kedah during COVID-19 pandemic
2. To determine the associations between socio-demographic, clinical factors and MCO period with the negative emotional state of stress among adult population in Kedah during COVID-19 pandemic

1.6 Research hypotheses

There are associations between socio-demographic, clinical factors and MCO period with negative emotional state of stress among adult population in Kedah during COVID-19 pandemic.

CHAPTER 2

LITERATURE REVIEW

The COVID-19 crisis increased stress exponentially among the general population across the world. Several associated risk factors have been identified that contribute to the presence of stress among the population in various studies. The articles related to this topic have been searched using Google Scholar, PubMed, and Scopus databases. The keywords used were ‘stress,’ ‘psychological distress,’ and ‘mental health’ and ‘factors affecting stress,’ ‘COVID-19,’ etc. This chapter is organized into the following subheadings: Overview of stress, impact of stress, economic burden of stress, mental health and mental health promotion and prevention strategies in Malaysia, global and national prevalence of stress during COVID-19 pandemic, stress assessment instrument, the factors associated with stress, and conceptual framework.

2.1 Overview of stress

Stress can be defined as a state of worry or mental tension caused by a difficult situation (World Health Organization, 2023). UNICEF has defined stress as ‘a common feeling we get when we feel under pressure, overwhelmed or unable to cope’ (UNICEF, 2023). A variety of physical symptoms can be induced by stress, which can influence a person's physical health. These can manifest as headaches or vertigo, muscle tension or discomfort, gastrointestinal issues, chest pain or an elevated pulse rate, and sexual difficulties, cognitively (focusing difficulties, difficulties making decisions, a sense of overload, constant worry, and memory lapses), and behaviourally (being irritable and impulsive, sleeping excessively or insufficiently, either overeating or undereating, avoiding certain locations or individuals, increasing alcohol consumption or frequency of smoke.) (NHS, 2022).

The stress response is an innate, typical, and adaptive reaction to stressors that has evolved to assist the body in regaining its equilibrium and returning to its non-stressed homeostatic state. It is combated by a complex array of cognitive, physiological, and behavioural reactions. Acute stress reactions can stimulate the autonomic nervous system response, hypothalamus-pituitary-adrenal (HPA) responses, and result in an increase in inflammatory protein levels in the absence of pathogens, a phenomenon known as sterile inflammation. The autonomic nervous system (ANS), inducing both sympathetic (a rise in heart rate and decrease in heart rate variability, enhancing blood flow to muscle tissues, and increasing central body temperature.) and parasympathetic nervous system responses (inhibits the sympathetic nervous system's effect on the tissues by secreting of acetylcholine). In order to maintain the high heart rate caused by stress, the parasympathetic nervous system can withdraw after the first time that both the sympathetic and parasympathetic nervous systems are simultaneously activated (Kivimäki and Steptoe, 2018).

The HPA axis, a crucial hormonal response system to stress, may be implicated in this process, especially stress hormones known as glucocorticoids and notably cortisol (Stephens and Wand, 2012). The stimulation of glucocorticoids, as well as norepinephrine and epinephrine, aids in the adaptation to stress by increasing sympathetic activity through the stimulation of glucose release and gluconeogenesis, as well as the cardiovascular and pulmonary functions are stimulated, resulting in elevated heart rate, blood pressure, and breathing. This energy mobilization, along with alterations in alertness and behaviour, enables the organism including human beings, to satisfy the metabolic requirements associated with a danger response and facilitates the return to homeostasis (Goel *et al.*, 2014). The HPA axis is an essential system to support survival since it ensures that an organism reacts appropriately to

altering environmental demands. A state of cacostasis or allostasis, with a range of clinical symptoms, can result from the dysregulation of the stress system, the HPA axis and ANS in conjunction with intense and/or chronic stress (Tsigos *et al.*, 2000), leading to significantly higher levels of self-rated stress, psychological discomfort, and abnormal illness behaviour compared to those without.

Stress can be characterised depending on several factors, including the nature of the stressor (physiological or psychological), the impact on the individual (positive eustress or negative distress), and the duration of exposure to the stressor (acute or short-term, chronic or long-term) (Shahsavarani *et al.*, 2015). Physiological stress can result from situations and circumstances that affect the body as well as its natural activities such as the physical changes associated with puberty, the fast growth of adolescents, ageing, childbirth, illness, menopause, inadequate nutrition, accidents, and sleep disturbances (Eredoro Christian O and Egbochuku Obiageli O, 2019). The mental and emotional traits of a person may be a source of psychological stress, the mindset an individual has, the way an individual reasons and evaluate things, as well as the way an individual interpret and perceive are some examples of these traits. Positive stress or eustress would boost a person's feelings of happiness or motivation and it becomes helpful since it helps the individual better his or her life by increasing creativity, productivity, self-esteem, and health (Eredoro Christian O and Egbochuku Obiageli O, 2019). Negative stress or distress is the result of an individual's incapacity to meet the demands imposed on him or her by a stressor. In reaction to transient stimulation, acute stress is characterized by the body's stress system activates for a brief amount of time (Office of Planning Research & Evaluation, 2017). Chronic stress is characterized by prolonged exposure to stressors, which can be caused by major life

events or by the accumulation of minor stressors from which an individual is unable to recover (JourneyWell, 2010).

Resilience (the ability to cope with stress) is an indicator of a person's potential to adapt to the psychological and physiological responses that comprise the stress response. The HPA axis needs to be activated fast in response to stress so that the body can quickly deactivate it once the threat or stress has passed. This is how people are most resilient (Alim *et al.*, 2012). There are several factors affecting individual resilience such as the impact of personal factors (including personality characteristics, an increased sense of purpose, and self-determination), individual responses to professional conditions (professional shielding and self-reflection), environmental and organisational factors (workplace culture), and efficient educational interventions (resilience seminars)(Huey and Palaganas, 2020).

Spirituality also plays a role in cultivating resilience. In the context of Islamic religion, religious practices is an example of spirituals known as '*taqwa*', by having faith in Allah could encourage the reframing of negative cognitions to change emotional states, which could promote the application of reappraisal (Wahyudi and Partini, 2018). A study showed that there is association between mental health and resilience, where increased resilience improved mental health (Wu *et al.*, 2020). Optimism, self-esteem, and self-efficacy promote resilient (Srivastava, 2011), which can be utilized for problem solving and planning to cope with stress. Resilience serves as a protection against a variety of mental health illnesses, hence mental health education and interventions could be tailored for cultivating resilience among adults in the face of adversity.

2.2 Impact of stress

Acute stress may not have a negative impact on health. However, persistence of stressors may impose psychological, behavioural, and biological consequences. Stressful life experiences are linked to an increased incidence of depression. Both episodic, or acute, and chronic stresses have been shown to have this association (Liu and Alloy, 2010). Important correlates of suicide risk during the COVID-19 pandemic are COVID-19 stresses and psychological stress response, where there was a correlation between the economic recession and an increase in the risk of suicide (Wu *et al.*, 2022).

Experiencing or having encountered high and prolonged stress levels typically results in social withdrawal and aggressiveness (Sandi and Haller, 2015). More parental perceived stress is connected with higher COVID-19 related stresses, as well as high anxiety and depressed symptoms. Furthermore, as parental stress levels increase, parents may be more prone to practice strict parenting, thus raising the likelihood of child abuse (Brown *et al.*, 2020). A child's behavioural and emotional issues are indirectly impacted by a parent's stress due to the parent's stress acting as a mediator (Spinelli *et al.*, 2020).

Studies on viral challenges and epidemiology imply that psychological stress raises greater susceptibility to viral illness and infection. Immune responses to viral vaccinations and the reactivation of latent viral infections that can unexpectedly become active and symptomatic after protracted periods of dormancy, in some cases spanning years, are influenced by biopsychosocial factors (Ayling *et al.*, 2022). Prior research provides suggestive evidence that people who consistently experience moderate or high levels of stressful life events over an extended period may be at risk for an increased mortality rate. Chronic background stress or underlying

cardiovascular disease, in addition to acute episodes of stress experienced in daily life, can lead to dysregulation of the autonomic nervous system, which in turn can lead to an acute clinical event, such as sudden cardiac death (La Rovere *et al.*, 2022). Cancer development has been associated to prolonged stress because it frequently exposes people to the corticosteroids and catecholamines released by the HPA axis (Moore *et al.*, 2022).

Patients with diseases caused by stress (PTSD, acute stress reaction and adjustment disorder and other stress reaction) had a higher risk of total mortality over the complete period of follow-up, compared to either unaffected individuals or their asymptomatic full siblings were followed for an average of 9.42 years (Tian *et al.*, 2022). More doctor visits and illness are linked to stress. Around 60–80% of visits in primary care may contain a stress-related component and counselling for stress management may involve longer visits (Nerurkar *et al.*, 2013).

2.3 Economic burden of stress and mental health

The United States loses \$300 billion annually due to ‘accidents, employee absences, staff turnover, decreased productivity, and expenses for medical care, legal concerns, and insurance’ that are brought on by stress (Healthline, 2005-2023). The total economic burden attributable to PTSD in the United States in 2018, according to projections, was \$232,2 billion, or an average of \$19,630 per person with PTSD. The total excessive expenditures were allocated as follows: \$189.5 billion (81.6%) in the civilian population and \$42.7 billion (18.4%) in the military population, or \$18,640 and \$25,684 per person with PTSD in the civilian and military populations, respectively. The additional burden on the civilian population was predominantly

attributable to direct healthcare costs (\$66 billion) and unemployment costs (\$42.7 billion). In the military population, disability costs (\$17.8 billion) and direct healthcare expenditures (\$10.1 billion) were primarily responsible for the excess burden (Davis *et al.*, 2022). Treatment of stress-related conditions in the NHS demands more than 165,000 bed days annually, at a cost of £71.1 million to the government (New Economic Foundation, 2018). Occupational stress in Hong Kong has a total yearly economic cost ranging from HK\$4.81 billion to HK\$7.09 billion (Siu *et al.*, 2020). In 2018, it was predicted that mental health issues at work cost Malaysia's economy RM14.46 billion (CodeBlue: Health is a human right, 2020).

2.4 Mental health promotion and prevention strategies in Malaysia

Despite a consistent increase in funding for mental health treatment over the past few decades, there has been no decline in the number of people suffering from mental illness. Compared to exclusively relying on treatment, preventive approaches are acknowledged to be more cost-effective, and they also promote a more efficient use of resources for mental health. The Ministry of Health Malaysia has implemented the following initiatives that can be categorized as health, education, youth, and elderly (Ministry of Health, 2023).

The Ministry of Health Malaysia offering mental health services at 1161 primary healthcare, 58 hospitals, MENTARI (used to be known as 'Pusat Kesihatan Mental Masyarakat') and the mental institution (Ministry of Health, 2023). In primary healthcare, among the services offered are for promoting mental health, early detection and treating common mental illness. Alternatively, in general hospital, the services provided include acute inpatient care, emergency department services, consultation-

liaison services, planned and unscheduled outpatient care, and specialty care (Midin *et al.*, 2018).

Let's TALK *Minda Sihat* Media Campaign has been implemented by Ministry of Health Malaysia in line with the Mental Health Publicity Plan under the '*Agenda Nasional Malaysia Sihat*' in 2021. This campaign emphasizes the significance of emotional expression in reducing mental stress. Additionally, the Ministry of Health Malaysia has collaborated with The Ministry of Women, Family and Community Development for Mental Health and Psychosocial Support (MHPSS) services to offer better accessibility and responsiveness toward mental health conditions between the two agencies (Ministry of Health, 2023).

The Ministry of Health has recognized the importance of mental health and has taken steps to promote it by collaborating with multiple other ministries. For instance, in partnership with the Ministry of Education, the Ministry of Health had started a pilot project called 'Program Ekspresi Anak Remaja Lestari' (PEARL) to promote coping abilities and resilience among students.

In addition, Ministry of health has partnered with the Ministry of Youth and Sports of Malaysia to promote mental health through World Sports Day and World Mental Health Day. Moreover, the Ministry of Health provides mental health screening in primary care clinics and selected village clinics for early detection of mental illnesses in the elderly, such as dementia.

2.5 Global and national prevalence of negative emotional state of stress

Although there were an 25% increase in the number of people with a mental illness between 2000 and 2019, the (point) prevalence of mental disorders has stayed stable, at about 13%, due to the almost equal rate at which the global population has increased (World mental health report: transforming mental health for all., 2022). According to an article review between 2013 and 2015 that focused the review on work from the World Mental Health survey, the lifetime prevalence of posttraumatic stress disorder was 2.3% of people in South Africa, 2.2% of people in Spain, and 2.4% of people in Italy (Atwoli *et al.*, 2015).

An institution-based cross-sectional study using pretested interviewer-administered DASS-21 was conducted among 354 staff of Jimma University, Ethiopia in South Africa region, found a 28.2% prevalence of stress (Yeshaw and Mossie, 2017). In 2014, an online survey using similar tool have found around 22.1% of Australian midwives have stress (Creedy *et al.*, 2017). The prevalence rate of stress in the Asia region is approximately ranging from 7.9% to 62.9% of the population experiencing stress in the past year. It was revealed that 62.9% among 240 type-2 diabetes patients were suffering from stress, collected by means of DASS-21 in Pakistan in 2014 (Rehman, 2016). A systematic review conducted among selected Malaysian working population showed that mean prevalence of stress was 29.9% (Kassim *et al.*, 2018). The same tool has also been used among 384 undergraduate students in Melaka Manipal Medical College in 2014, with 16.6% was stress (Teh *et al.*, 2015). Similarly, a cross-sectional study conducted on 140 emergency department medical officers working at general hospitals from seven Malaysia regions has revealed the prevalence of stress of 7.9% (Yahaya *et al.*, 2018). All these studies have

shown that some countries reporting similar or even lower prevalence of stress before the onset of the COVID-19 pandemic.

The majority of studies that have examined psychological disorders during the COVID-19 pandemic have reported multiple symptoms of mental trauma, such as emotional distress, depression, stress, mood swings, irritability, insomnia, attention deficit hyperactivity disorder, post-traumatic stress disorder, and anger (Salari *et al.*, 2020a). According to a systematic review and meta-analysis, the pandemic increased the prevalence of stress, anxiety, and depression in the general population to 29.6%, 31.9%, and 33.7%, respectively (Salari *et al.*, 2020a). During the first 18 months of COVID-19, the prevalence of severe to extremely severe stress symptoms was 36% across Southeast Asia, including Malaysia, Indonesia, Thailand, and Singapore (Tay *et al.*, 2022).

Several studies utilized DASS-21 as a screening tool to evaluate the prevalence of stress. An online survey on the general population in Iran found that 63.4, 42.1, and 52.1% of population, showed symptoms of stress, anxiety, and depression respectively (Khademian *et al.*, 2021). Saudi Arabia has showed double the prevalence of stress among the adult population during COVID-19 pandemic compared to the previous studies which was 45% (Al Saleh *et al.*, 2021). Another general population-based study conducted in Northern Spain, the results indicate that stress was 26.5% and psychological symptoms have increased as the duration of the lockdown has increased (Ozamiz-Etxebarria *et al.*, 2020). Among the population Luzon Islands of the Philippines, 13.4% had moderate-to-severe stress levels (Tee *et al.*, 2020). In India, among general population, showed the level of stress was 11.6% (Verma and Mishra, 2020).

Some other studies have used different tools to screen for stress. The DASS-42 online questionnaire was used in Indonesia, where the stress prevalence of 25.4% was noted among the population during COVID-19 (Izzatika *et al.*, 2021). Among the general population of Korea, 5.1% had a high level of perceived stress during the COVID-19 pandemic, using the DASS-42 (Lee *et al.*, 2022). In a general population-based, online survey study using Acute Stress Disorder Scale survey was conducted in China showed that 24.4% of the population had acute stress during COVID-19 pandemic (Shi *et al.*, 2020). In a population-based survey study of general population in Brazil using an online Impact of Event Scale-IES-R scale survey, around 34% of general population in Brazil had symptoms of post-traumatic stress disorder (PTSD) (Goularte *et al.*, 2021).

In Malaysia, a study was conducted among Malaysian adult population using DASS-21 through online platform (Google form). The participants were enlisted through social media and internet during the period of MCO. The reported prevalence of stress was 70% (Perveen *et al.*, 2020). Another study among Malaysian population aged 18 years and above by using an anonymous internet based DASS-21, across the four successive time periods in the 16-week data collection period showed that there was increased in stress symptoms in the first time period (12 May–7 June 2020) from 11.5% to 30.6% symptoms in the fourth time period (4 August–5 September 2020), but on average, stress symptoms was 12.5% (Wong *et al.*, 2021). Among six communities that were considered urban areas in the district of Seberang Perai Tengah, about 31.6% was stress during the emergence of the COVID-19 pandemic (Leong Bin Abdullah *et al.*, 2021). They were interviewed face-to-face to complete the DASS-21 questionnaire from July 2019 to August 2020. All the existing studies reported above

were conducted during the MCO period, and none had assessed the prevalence of stress in relation to the period during and after MCO.

There were studies conducted among the specific group of populations in Malaysia. All these studies utilized the DASS-21 questionnaire to obtain the prevalence of stress. A study was conducted among low-income community-dwelling adults in Kuala Lumpur, Malaysia from February to August 2019. They reported 20.6% prevalence of stress among this population (Lugova *et al.*, 2021). Another study conducted between 1 July and 31 August 2020 found that 6.4% of healthcare workers in Malaysia's Northwest was stress (Nordin *et al.*, 2022). Around 50.4% of undergraduate dentistry students in Malaysia experienced stress during the COVID-19 pandemics, which is twice the prevalence found in the study by Lugova *et al.* among medical students in a medical institute in Malaysia (George *et al.*, 2022). Among the medical university lecturers in Malaysia, 42.9% had mild-to-very severe stress during COVID-19 pandemic, which was assessed from 26 July 2021 to 26 October 2021 (Quek *et al.*, 2022).

Several studies have been undertaken to compare stress levels before and during the COVID-19 pandemic. In a study conducted in April 2020, 13.6% of United States adults had symptoms of significant psychological distress, compared to 3.9% in 2018 (McGinty *et al.*, 2020). A longitudinal study of psychological distress in the United States before and during the COVID-19 pandemic has been done, showed the past-month prevalence of major psychological distress in May 2020 was as high as the past-year prevalence at February 2019 (10.9% vs. 10.2%) (Breslau *et al.*, 2021). A study found that 50% of participants were more stressed during the lockdown in April 2020 compared to the pre-pandemic era, whilst 24% reported no change and 26% reported feeling less stressed in Switzerland (De Quervain *et al.*, 2020).

However, there were studies reported a different finding. Comparing the pre-COVID-19 period to the early phase of the COVID-19 pandemic, the odds of experiencing severe stress, sadness or despair, and suicidal thoughts was lower among Korean adolescents (severe stress: adjusted OR [aOR], 0.90 [95% CI, 0.83-0.97]; very severe stress: aOR, 0.65 [95% CI, 0.60-0.72]) (Kim *et al.*, 2021). No significant difference in mean Perceived Stress Scale (PSS) score was also detected in the mid-pandemic (2019–2021) cohort [19.4 (6.35)] when compared to pre-pandemic (2016–2018) [19.4 (6.63)] cohort of pharmacy students (p-value 0.472) at the University of California, San Diego (UCSD) Skaggs School of Pharmacy and Pharmaceutical Sciences (SSPPS), United States (Pham *et al.*, 2022). Overall, the stress levels before and during the COVID-19 pandemic have varied greatly among different countries, with some experiencing a significant increase in stress levels while others have remained relatively stable.

2.6 Stress assessment instrument

Instruments for measuring stress have been developed and validated extensively across several cultures. The Depression, Anxiety, and Stress Scale (DASS), Stress Overload Scale (SOS), and Perceived Stress Scale (PSS) are three scales of importance (Vohra *et al.*, 2019). The Depression, Anxiety, and Stress Scale - 21 Items (DASS-21) is an abbreviated variant of from a larger 42-item self-report instrument. It is designed to assess three interrelated negative affective states: depression, anxiety, and stress (Addiction Research Centre, 2023). The SOS is a 30-item assessment instrument designed to measure "stress overload," a condition described by stress theories as occurring when demands exceed available resources (Amirkhan, 2011). The respondent uses a 5-point Likert scale ranging from 1 (not at all) to 5 (a lot) to rate

subjective sentiments and thoughts experienced during the previous week (American Psychological Association, 2023). Cohen et al. (1983) created the 10-item Perceived Stress Scale (PSS-10) questionnaire consisting of perceived stress. It is frequently used to assess the stress levels of persons aged 12 and older, including adolescents and adults. The PSS-10 measures the extent to which individuals perceived their circumstances to be unpredictable, out of control, and overwhelming during the previous month (Consortium, 2023).

Lovibond and Lovibond developed the DASS-21, an instrument that is frequently used to measure anxiety and depression, and stress which has 42 items (Lovibond and Lovibond, 1995). The DASS-21 was created by selecting seven items with the highest loadings from each subscale of the original DASS (Jiang *et al.*, 2020). The depression scale evaluates dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/engagement, anhedonia, and inertia. The anxiety scale evaluates autonomic arousal, effects on skeletal muscle, situational anxiety, and subjective perception of anxious affect. The stress scale is responsive to chronic nonspecific levels of arousal. It measures difficulty relaxing, anxious alertness, and the propensity to be easily upset/agitated, irritable/overreactive, and impatient (Jiang *et al.*, 2020). The DASS has been translated into many languages to date, making it broadly accessible to researchers worldwide. Moreover, it was translated and validated into Bahasa Malaysia in 2007 (Musa *et al.*, 2007).

Cronbach's alpha coefficients of 0.94, 0.88, and 0.93 for depression, anxiety, and tension, respectively, indicated that the internal consistency of the DASS subscales was high (Nieuwenhuijsen *et al.*, 2003). 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 DASS-21 is a comprehensive tool that measures not only stress, but also depression and