

Firefighters and mental health during COVID-19: A Malaysian study

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Abstract: The COVID-19 pandemic had an adverse impact on the mental health of frontline workers including firefighters. To better understand this occurrence, this cross-sectional study evaluated the prevalence of depression, anxiety, and stress among 105 operational team and elite team firefighters in Kota Bharu, Kelantan State, Malaysia before and after the pandemic. The Depression, Anxiety and Stress Scale-21 (DASS-21), a validated self-reporting survey tool, was used to assess symptoms of depression, anxiety, and stress among the survey respondents. Findings revealed that firefighters had an increased level of anxiety and depression during the post-pandemic period compared to the pre-pandemic period. However, there was a decrease in the stress levels (20%) reported by study participants. Respondents belonging to the operational team had a higher reported level of depression, anxiety, and stress than those from the elite team. This may be attributed the operational team being more exposed to the risk of COVID-19 infection on account of their routine and more voluminous workload. The findings of this study suggest that firefighters, in general, are at an increased risk of mental health problems as a result of the COVID-19 pandemic. Knowing this, it is important to consider these findings when addressing the prevention and management of mental health among firefighters. This includes providing additional support and devoting more resources to those who are most at risk for experiencing symptoms of mental health such as firefighters performing functions aligned with that of an operational team.

Keywords: depression; anxiety; stress; pandemic; COVID-19; firefighters

1. Introduction

The COVID-19 pandemic has had a significant impact on the mental health of first responders including firefighters. Serving on the front lines of the pandemic response has resulted in firefighters experiencing higher levels of stress and anxiety on account of their increased responsibility, management of those succumbing to COVID-19 and a lack of socializing during the pandemic on account of instituted measures to regulate individual movement in countries (Graham et al., 2021; Samsudin et al., 2022; Zvolensky et al., 2020). Due to the nature of their work which brings them into contact with those having COVID-19, firefighters are themselves at risk of contracting the virus, which can further exacerbate any mental health problems previously brought on by their job (Han and Jung, 2023; Samsudin et al., 2022). Indeed, the growing prevalence of mental health problems among firefighters is a serious concern that can lead to decreased job performance, increased absenteeism and suicide (Graham et al., 2021; Hatanaka et al., 2022; Klimley et al., 2018). Thus, it is a statutory—promulgated by enacted legislation—and moral obligation of governments

to identify and address the mental health problems of firefighters at the very earliest (Ehrlich et al., 2020; Hatanaka et al., 2022). Knowing this, it becomes critical to better understand the mental health well-being of first responders resulting from the pandemic (Vujanovic et al., 2021) to aid in the timely administering of intervention methods. These interventions could include, among other courses of action, providing firefighters with access to mental health services, training firefighters in stress management techniques, and creating a more supportive work environment for firefighters (Graham et al., 2021; Hatanaka et al., 2022).

The relatively high rate of depression and anxiety among Fire and Rescue Department Malaysia (FRDM) personnel can be attributed to their inability to cope with emotionally challenging situations that can result in mental health issues (Samsudin et al., 2021, 2022). As a result, they are likely to experience occupational stress due to organisational-related issues such as workload overload, unclear career progression opportunities, and lack of support systems (Sharif et al., 2021). This combination of factors significantly contributes to occupational stress among FRDM personnel.

A study by the Korean National Institute of Mental Health found that the prevalence of depression and anxiety among firefighters increased by 20% during the pandemic (Han and Jung, 2023; Riccardi et al., 2023). This finding corroborates previous works which concluded that firefighters were more likely to experience post-traumatic stress disorder (PTSD) than the general population (Graham et al., 2021; Smith et al., 2018; Wolffe et al., 2023). The COVID-19 pandemic has only compounded the known stressors faced by firefighters which stem from their serving on the frontline of the pandemic while simultaneously responding to routine fires, medical emergencies and other incidents (Samsudin et al., 2021). They have also been exposed to the virus, which has caused fear and anxiety (Samsudin et al., 2021). Against the backdrop of understanding the existence of mental health issues faced by firefighters, this study will examine the prevalence of depression, anxiety, and stress both before and after the COVID-19 pandemic among firefighting professionals in Kota Bharu, Kelantan State, Malaysia in particular.

The importance of this study resides in its aim to provide deeper insights into the mental health of firefighters in Kota Bharu, Kelantan State, and where findings will serve as a basis for proposing interventions to improve the mental well-being of firefighters from this geographic area and the entirety of Malaysia. To foster a more nuanced understanding of this topic, this study will examine any variation in the prevalence of mental health issues between two stratified groups of first responders—operational firefighters and elite firefighters. This approach will help with accurately identifying the factors that contribute to mental health problems in firefighters from each group, and to propose targeted interventions. To the best of our knowledge, this is the first study to examine the prevalence of mental health issues among firefighters in the Malaysian context, and with consideration to the function performed by firefighters based on their assigned organisational division (elite vis-à-vis operational). The authors anticipate that findings of this study will be novel and contribute to an improved understanding of mental health issues within this population.

2. Materials and methods

A cross-sectional study was conducted among firefighters at the Kota Bharu District and Pengkalan Chepa locality Fire and Rescue Stations. Kota Bharu district is the most populous district in Kelantan State and recorded the highest number of COVID-19 cases in 2021 (Abdullah, 2021). There are 22 fire stations across Kelantan State, of which one in Kota Bharu and one in Pengkalan Chepa are classified as Grade A. Grade A Fire stations are designated as high-response stations, meaning they are equipped to handle more complex incidents. Both Grade A and B fire stations perform the same responsibilities per the scope of the Fire and Rescue Department Malaysia (FRDM), but the primary difference is in the frequency of cases and volume of resources they possess.

Fire and rescue stations of Grade A and B classification consist of both operational and elite teams. Operational teams are comprised of firefighters assigned to carry out routine firefighting and emergency response duties. They work collaboratively to assess the situation, mitigate risks, conduct rescue operations, and provide immediate assistance to affected individuals. They are trained in basic firefighting techniques, first aid, and rescue procedures and are equipped with the necessary tools and equipment to perform their duties effectively.

Elite teams, on the other hand, are specialised groups of highly-skilled and experienced firefighters selected and trained to handle complex and challenging emergencies such as hazardous material (HAZMAT) team, Special Tactical Operation and Rescue of Malaysia (STORM) team and scuba team. Elite teams are typically assigned to handle high-risk operations including hazardous materials incidents, technical rescues, urban search and rescue, and specialised firefighting scenarios. They are equipped with advanced equipment and are trained to operate efficiently and effectively in demanding and high-pressure environments.

A convenience sampling strategy was employed in this study. Firefighters from operational and elite teams within the Kota Bharu and Pengkalan Chepa Grade fire stations were invited to participate during non-emergency periods where they experienced downtime. Researchers approached firefighters during designated rest times or shift changes to explain the study and obtain informed consent. Firefighters who were actively responding to emergencies or unavailable during these periods were excluded to minimize disruption to their work duties. Embedded at the beginning of the survey was a short description of the research purpose and instructions for answering the survey questionnaire. Respondents were assisted as needed with avoiding any misinterpretation of terminology and to facilitate their understanding. Before distributing the survey questionnaire, respondents signed the informed consent form verifying their willingness to participate in this study.

The participants were given a survey questionnaire containing two parts, including sociodemographic and the Depression, Anxiety and Stress Scale-21 (DASS-21) questions. Sociodemographic questions to understand their background and the Depression, Anxiety and Stress Scale-21 (DASS-21). The DASS-21 is a well-established and validated tool used extensively in research to assess the severity of depression, anxiety, and stress in adult populations. DASS-21 has become a popular choice due to its brevity, ease of administration, and strong psychometric properties.

Sociodemographic questions from the questionnaire requested participants to identify their age, gender, marital status, involvement in Elite team/unit, years of service, and assigned division (Cheng et al., 2023; Samsudin et al., 2021; Soteriades et al., 2022). Questions from the DASS-21 questionnaire employed a likert scale ranging from 0 to 4 to measure the participants ‘level of depression (7 questions), anxiety (7 questions) and stress (7 questions).’ The total number of questions within the survey instrument was 27, and the time taken for completion ranged from 5 to 15 minutes.

Data was analysed using descriptive statistics. The normal distribution of the data was determined using a box whisker and plot. Mean (*M*) and standard deviations (*SD*) were computed for normally distributed variables, and frequencies and percentages were computed for categorical variables. Data was analyzed to compare the percentage distribution of operational and elite teams towards depression, anxiety, and stress levels pre- and post-pandemic. The data collected during the transition to the endemic phase is compared with data pre-pandemic phase from earlier studies (Ainul Husna et al., 2021; Samsudin et al., 2021, 2022).

3. Results and discussion

A total of 105 firefighters participated in this study with 5% margin of error and 95% confidence level out of 140 populations. The majority of the respondents were married (97.1%) and male (96.2%). The respondents ranged in age from 23 to 57 years old, with the majority falling between the ages of 41 to 50 (48.6%). Many firefighters had worked between 21 and 30 years. The respondents were divided into two groups: the operational team (66.7%) and the elite team (33.3%). The operational team consisted of firefighters who were not assigned to any specialized units, while the elite team consisted of firefighters who were assigned to specialized units such as the HAZMAT team, the Emergency Medical Rescue Services (EMRS) team, and the water rescue Pasukan Penyelamat di Air (PPDA) team.

The results found in **Table 1** indicate that the majority of the respondents (62.9%) reported being in good mental health. However, a number of respondents (37.1%) reported some level of mental health problems. Anxiety was the most common mental health problem reported by the respondents, with 41% of respondents reporting moderate or severe anxiety. Depression was the second most common mental health problem reported by the respondents, with 20.0% of respondents reporting moderate or severe depression. Stress was the least common mental health problem reported by the respondents, with only 8.6% of respondents reporting moderate or severe stress.

Table 1. Level of depression, anxiety, and stress among firefighters (*n* = 105).

DAS	Depression <i>n</i> (%)	Anxiety <i>n</i> (%)	Stress <i>n</i> (%)
Normal	66 (62.9)	43 (41)	92 (87.6)
Mild	20 (19.0)	16 (15.2)	6 (5.7)
Moderate	18 (17.1)	32 (30.5)	7 (6.7)
Severe	1 (1.0)	9 (8.6)	-
Extremely severe	-	5 (4.8)	-

The results from **Table 2** show that the mean level of depression was significantly higher in the operational team ($M = 0.61, SD = \pm 0.89$) than in the elite team ($M = 0.37, SD = \pm 0.60$), $p = 0.05$. This suggests that operational team members were more likely to report feeling depressed than elite team members. The mean level of anxiety was also significantly higher in the operational team ($M = 1.36, SD = \pm 1.26$) than in the elite team ($M = 0.91, SD = \pm 1.04$), $p = 0.08$. This indicates operational team members as being more likely to report feeling anxious than elite team members. The mean level of stress was not significantly different between the operational team ($M = 0.24, SD = \pm 0.60$) and the elite team ($M = 0.09, SD = \pm 0.37$), $p = 0.12$. This suggests there to be no difference in the likelihood of operational and elite team members reporting feeling stressed.

The operational team had significantly higher levels of mental health problems than the elite team. For example, 7.1% of the operational team members reported extremely severe anxiety, compared to 0% of elite team members. Additionally, 20.0% of the operational team reported moderate or severe depression, compared to 1.0% of the elite team. It is indicated that the levels of mental health problems among the firefighters had changed since the COVID-19 pandemic. For example, the percentage of firefighters reporting moderate or severe anxiety increased from 34.3% before the pandemic to 41.0% after the pandemic. Additionally, the percentage of firefighters reporting moderate or severe depression increased from 17.1% before the pandemic to 20.0% after the pandemic.

Table 2. The mean difference in the level of depression, anxiety and stress between operation and elite team.

Variable	Unit	Mean (SD)	Mean diff. (95% CI)	t statistic (df)	p-value
Level of depression	Operation	0.61 (0.89)	0.286 (-0.004, 0.576)	1.955 (93.63)	0.05
	Elite	0.37 (0.60)			
Level of anxiety	Operation	1.36 (1.26)	0.443 (-0.047, 0.933)	1.79 (103.00)	0.08
	Elite	0.91 (1.04)			
Level of stress	Operation	0.24 (0.60)	0.157 (-0.033, 0.347)	1.64 (98.00)	0.10
	Elite	0.09 (0.37)			

The results also demonstrate that the levels of depression, anxiety, and stress within operational team members increased after the COVID-19 pandemic. The percentage of operational team members who reported feeling extremely severe anxiety increased slightly from 6.9% before the pandemic to 7.1% after the pandemic and the percentage of operation team members who reported feeling severe anxiety increased from 3.4% before the pandemic to 8.6% after the pandemic. It was also discovered that the percentage of operational team members who reported feeling moderate anxiety increased from 17.4% before the pandemic to 20.0% after the pandemic. In contrast, the levels of depression, anxiety, and stress among elite team members decreased after the COVID-19 pandemic. The percentage of elite team members who reported feeling severe anxiety decreased from 1.0% before the pandemic to 0% after the pandemic while the percentage of elite team members who reported feeling moderate anxiety decreased from 9.1% before the pandemic to 0%

after the pandemic. The percentage of elite team members who reported feeling stressed decreased from 1.0% before the pandemic to 0% after the pandemic.

4. Discussion

This study investigated the prevalence of depression, anxiety, and stress among firefighters in Kota Bharu, Kelantan State, Malaysia. A total of 105 firefighters participated in the study, and the findings are consistent with previous studies that have reported high rates of mental health problems among firefighters (Isaac and Buchanan, 2021; Wolffe et al., 2023). The study also found that the prevalence of depression, anxiety, and stress was significantly higher in the post-pandemic period than in the pre-pandemic period. This finding is consistent with other studies that have found that the COVID-19 pandemic has had a negative impact on the mental health of firefighters (Cheng et al., 2023; Graham et al., 2021; Hatanaka et al., 2022).

The results of this study suggest that operational team members are more likely to experience depression, anxiety, and stress than elite team members. Additionally, the levels of depression, anxiety, and stress within the operational team increased after the COVID-19 pandemic, while the levels of depression, anxiety, and stress among the elite team decreased after the COVID-19 pandemic. These findings suggest that operational team members may be at greater risk for mental health problems than elite team members. Further research is needed to understand the reasons for these differences and to develop interventions to improve the mental health of operational team members.

As seen in **Figure 1**, the level of depression among firefighters was relatively low, with most respondents reporting normal or mild levels of depression. However, operational team members had a higher percentage of firefighters reporting moderate to severe depression than the elite team. This may be attributed to the greater likelihood of operational team members being exposed to traumatic events, such as fires and car accidents. This is consistent with a study by (Pennington et al., 2018) which found that depression among 35 firefighters increased with time after their involvement with responding to a natural disaster.

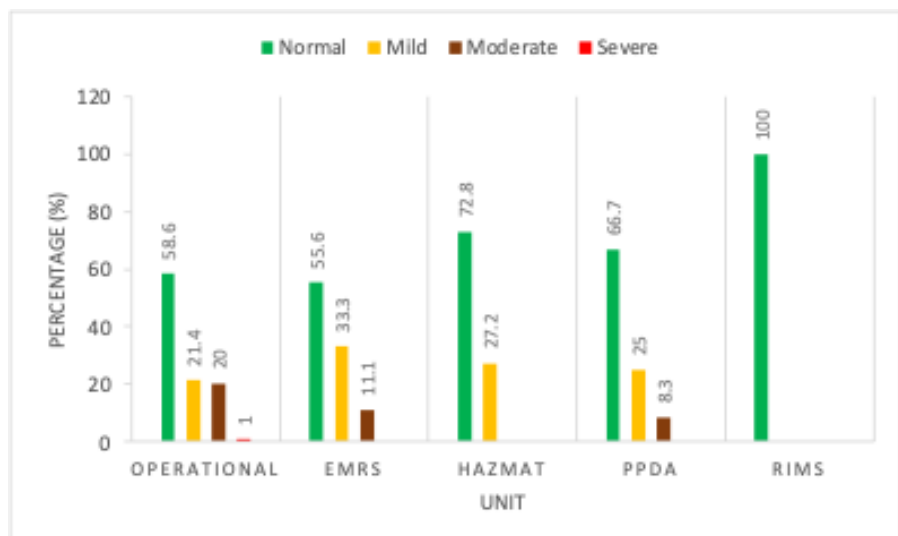


Figure 1. Level of depression ($n = 105$).

Anxiety as shown in **Figure 2** was the most common mental health symptom reported by firefighters, with a significant percentage of respondents (34%) reporting moderate to severe anxiety. This is likely due to the stressful nature of the job, which often involves dealing with dangerous situations and helping people in distress. This is further backed by the Chief Director of the Fire and Rescue Department’s (JBPM) prediction that firefighter responsibility will become more difficult in the future, which may be the root cause of the respondents’ elevated levels of anxiety and depression (Utusan and Online, 2015). This is also in accordance with previous studies which found that the mental health of firefighters in Japan and Taiwan increased during COVID-19 pandemic (Cheng et al., 2023; Hatanaka et al., 2022).

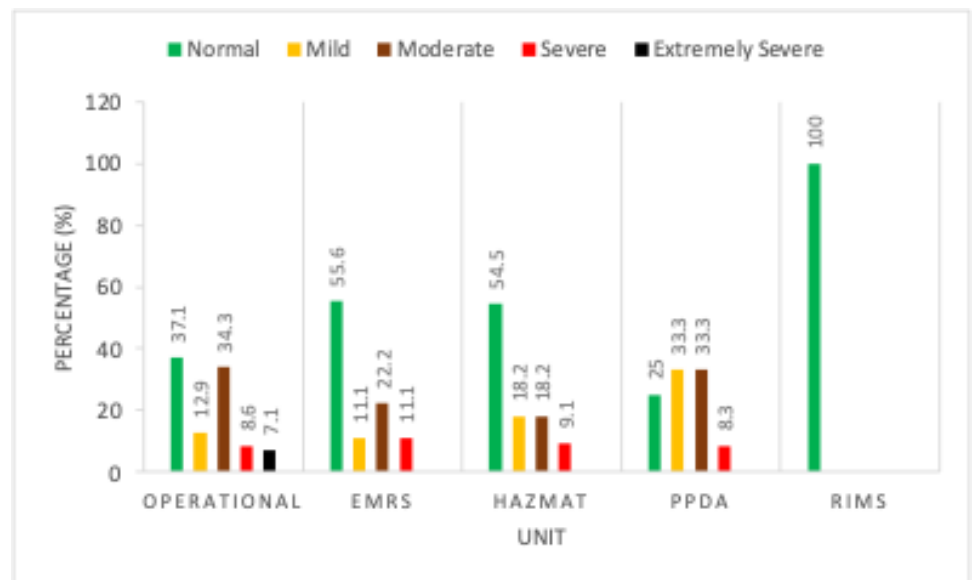


Figure 2. Level of anxiety ($n = 105$).

Stress levels among firefighters was generally low, with no respondents reporting severe or extremely severe levels of stress. This may be due to firefighters having developed effective coping mechanisms for managing stress. These coping mechanisms include personal coping—such as taking leave or travelling—and social coping such as relying on co-workers for emotional support (Samsudin et al., 2022).

A comparison between operational and elite team firefighters found that the mean level of depression, anxiety, and stress of the operational team was significantly higher than the elite team. This is potentially attributed to the operational team typically having a more routine workload and response to calls which can lead to increased stress levels and burnout. The FRDM received a total of 126,779 emergency calls involving 28,489 fires, 88,762 rescues, and 9407 for special tasks in December 2022. This demonstrates that operational team members are constantly exposed to high-stress situations, which can eventually take a toll on their mental health (FRDM, 2022; Rosliza, 2023). The operational and elite teams were also distinguished by their varying degrees of experience. Elite teams may have more inconsistent training schedules that alternate between extended periods of idleness and bursts of intense effort. This can lead to feelings of uncertainty and anxiety, as the team members may not know what to expect from one day to the next.

4.1. Comparison of depression, anxiety and stress among operational and elite teams between pre and post COVID-19 pandemic

The results of this study suggests that the anxiety and depression levels of firefighters have increased since the COVID-19 pandemic when compared to pre-pandemic studies as represented in **Figures 3** and **4**. This is likely attributed to the pandemic creating a new set of stressors for firefighters, including the fear of contracting COVID-19; the stress of working in an environment where social distancing was difficult; and the emotional toll of responding to calls involving COVID-19 patients. The pandemic also led to increased isolation for firefighters, as they were unable to socialise with their colleagues or the public in the same way that they could before the pandemic. This isolation can lead to feelings of loneliness, depression and anxiety. The depression levels among firefighters from both teams is rising. There is an increase of moderate depression among operational team members following the pandemic. Compared to the pre-pandemic period, members of the EMRS unit also reported experiencing moderate depression post-pandemic.

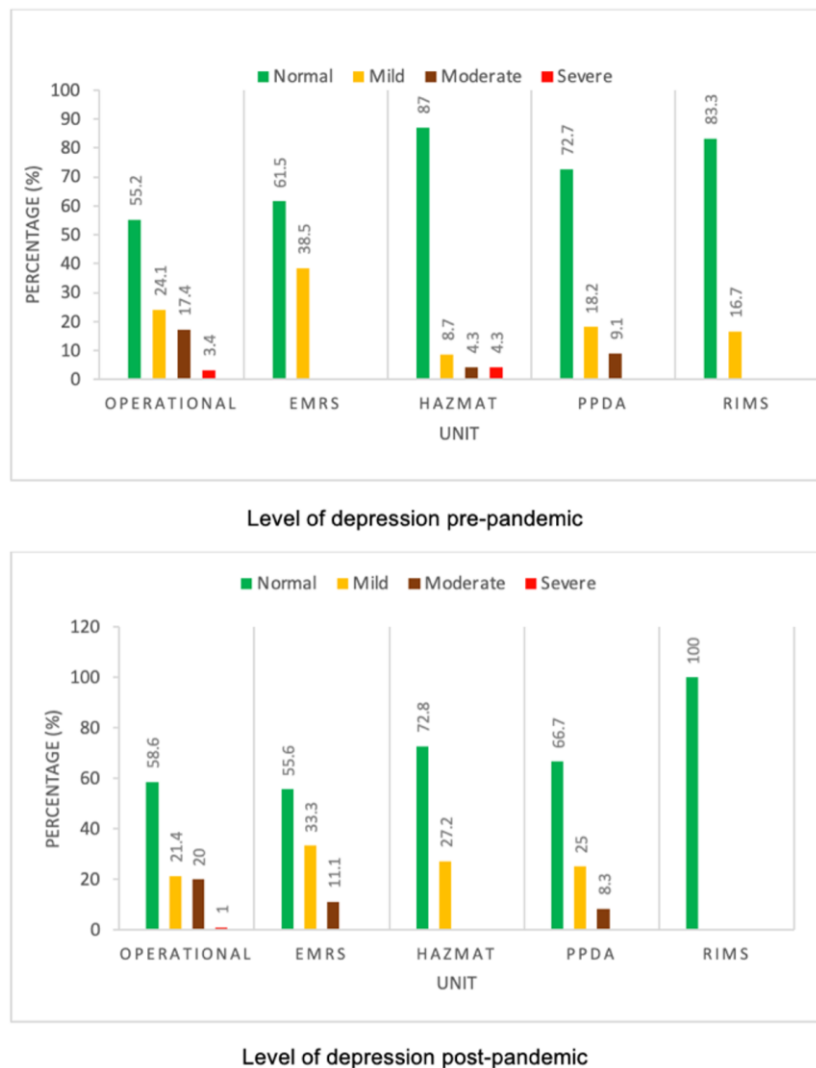


Figure 3. Level of depression pre and post COVID-19 pandemic among firefighters.

Additionally, the pandemic led to an increased workload for firefighters compared to previous findings (Samsudin et al., 2021), as they were called upon to respond to more calls including those related to COVID-19. This increased workload can ultimately lead to burnout, fatigue and stress. The findings of this study are consistent with those of other studies that have examined the mental health of citizens—though not specifically firefighters—during the COVID-19 pandemic demonstrating the toll taken on the broader society. For instance, a study among Malaysian citizens revealed an increase in the prevalence of anxiety and depression during the pandemic (Yee et al., 2021). The data from this study is consistent with the findings of other studies examining the impact of the COVID-19 pandemic on the mental health of firefighters (Han and Jung, 2023; Riccardi et al., 2023).

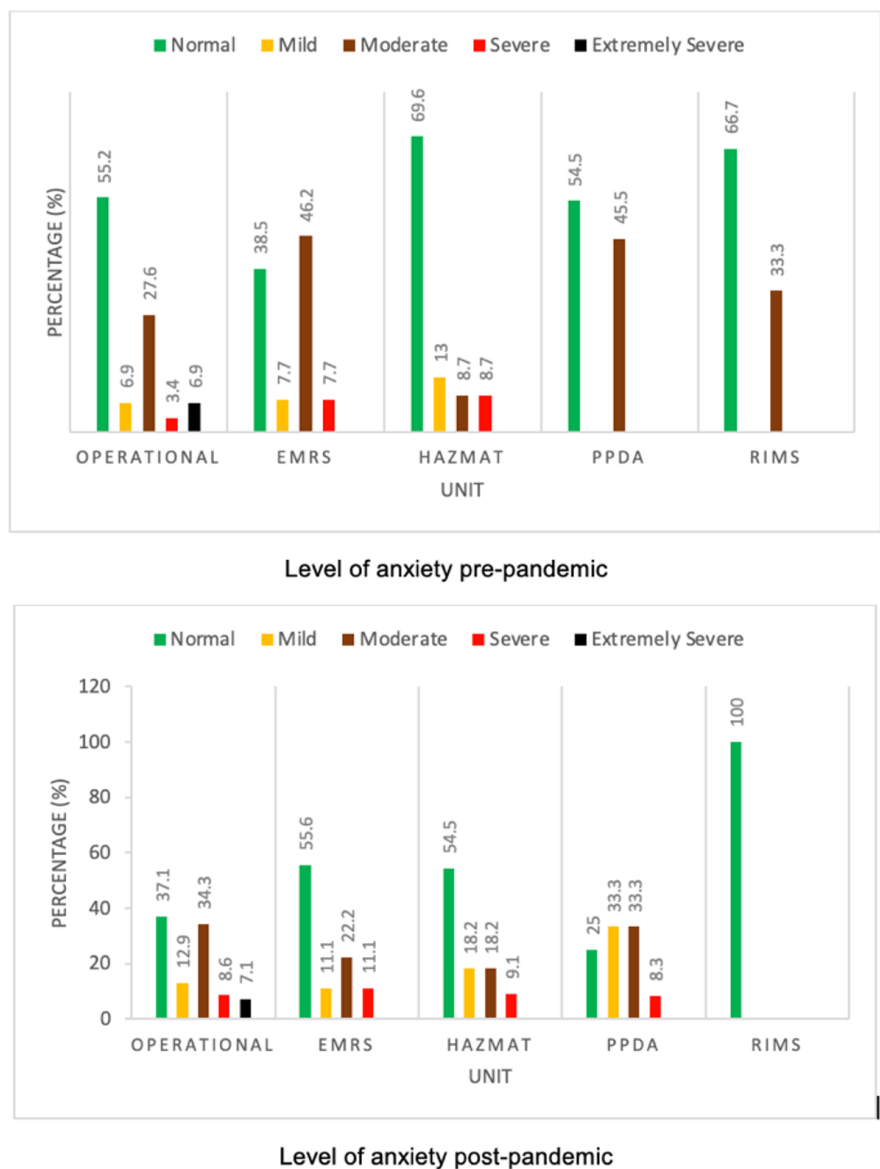


Figure 4. Level of anxiety pre and post COVID-19 pandemic among firefighters.

The findings of this study have important implications for the mental health of firefighters. Firefighters are at an increased risk of developing anxiety and depression, and this risk is likely to be even higher during the COVID-19 pandemic. It is important

for firefighters to have access to mental health resources, and for fire departments to implement programs to support the mental health of their personnel.

Finally, the results of this study, as seen from **Figure 5**, indicate that the stress level of firefighters from both the operational and elite teams decreased slightly after the COVID-19 pandemic when compared to findings from a pre-pandemic study which examined the psychological well-being of Malaysian elite firefighters as a result of their workload (Samsudin et al., 2021). This is a positive finding suggesting that firefighters were capable of coping with the stress of the pandemic. However, it is important to note that the reported moderate level of stress by operational team firefighters increased from 3.4% to 8.6%. This discovery is consistent with a study finding that avoidant coping techniques are associated with a greater risk of developing anxiety and depression (Han and Jung, 2023; Riccardi et al., 2023; Samsudin et al., 2022). The determination can be made that operational team firefighters may be employing avoidant coping mechanisms to manage stress, which may not be healthy in the long term. While a slight decrease in stress is encouraging, the increase among operational firefighters warrants further investigation. This is because avoidance coping, which might explain their lower reported stress levels, can be a double-edged sword. Over time, avoiding stressors can lead to a buildup of unaddressed issues and potentially worsen anxiety and depression down the line depression (Han and Jung, 2023; Laal et al., 2017; Samsudin et al., 2021).

For operational team firefighters, findings indicate them as having higher levels of depression and anxiety with comparison to respondents belonging to elite teams. This is a concerning finding, as it suggests that firefighters belonging to operational team may be at a greater risk of experiencing mental health problems. It is possible that the operational team is exposed to more stressors than the elite teams, such as more dangerous callout situations where they are performing public disinfection, casualty involving positive COVID-19 patient and mortuary management. Moreover, it also sheds light on the possibility that operational team members may have less access to mental health support services and resources than the elite teams. Lastly, if services are available, operational team members may have less time to make use of those resources due to the greater frequency with which they are being dispatched and engaged in response work.

Overall, the results of this study imply that firefighters from both groups were able to cope with the stress of responding during the COVID-19 pandemic. However, operational team members reported higher levels of stress, anxiety, and depression than elite team members. This suggests that the operational team member firefighters may be at greater risk of experiencing mental health problems resulting from their function. It is recommended that leadership of FRDMs examine the root causes of higher stress, anxiety and depression among operational team member firefighters and explore potential solutions.

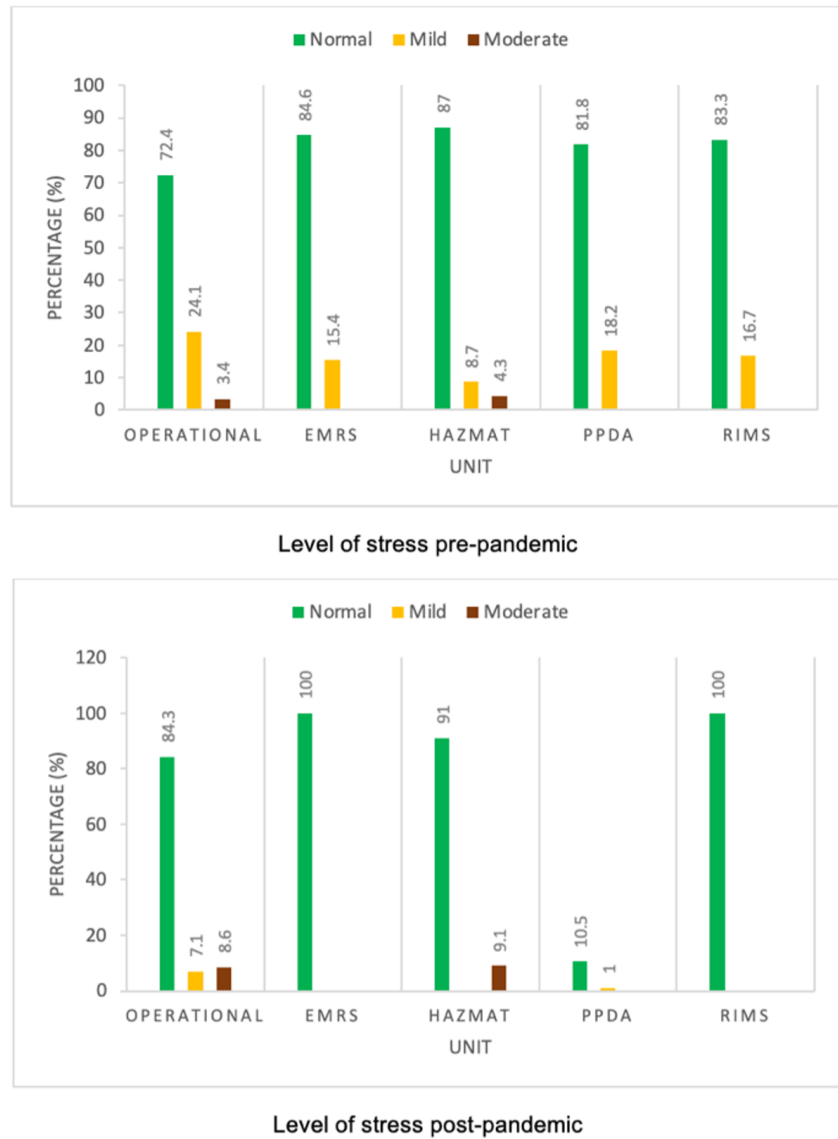


Figure 5. Level of stress pre and post COVID-19 pandemic among firefighters.

4.2. Implications for policymakers

The mental health of firefighters is paramount, yet the aftermath of the COVID-19 pandemic has revealed a concerning increase in anxiety and depression among these brave individuals. To address this pressing issue, policymakers must act on multiple fronts, implementing a five-pronged approach that prioritizes awareness, accessibility, coping skills, departmental support and ongoing research.

First, enhancing mental health awareness and screening is crucial. Routine mandatory screenings can help detect early signs of distress, allowing for prompt intervention and preventing further escalation. Educational workshops and training sessions aimed at both firefighters and their families can demystify mental health issues, equipping them with knowledge to recognize symptoms and navigate available support resources. Fostering open communication and reducing stigma around mental health within the fire department is also essential. Encouraging firefighters to seek help without fear of judgment or career repercussions is key to ensuring they receive the needed support.

Second, expanding access to mental health support services is vital. Providing on-site counsellors or therapists situated within the fire department creates a familiar and convenient environment for firefighters to seek professional help. Partnerships with local mental health organizations can broaden the scope of support, offering referrals, discounted services, or group support programs. Additionally, developing a teletherapy program facilitates remote access to mental healthcare, catering to firefighters with limited time or a preference for virtual consultations.

Third, equipping firefighters with stress management and coping skills empowers them to handle job-related pressure effectively. Integrating stress management techniques into training programs can equip them with relaxation exercises, mindfulness practices and healthy coping mechanisms. Promoting physical activity, a balanced diet and adequate sleep as natural stress relievers further bolsters their resilience. Moreover, creating peer support groups fosters a sense of community and provides opportunities for firefighters to connect with colleagues who understand their challenges and offer mutual support and encouragement.

Fourth, strengthening departmental support and resources creates a nurturing environment for firefighters experiencing mental health difficulties. Developing a comprehensive mental health policy establishes clear guidelines and protocols for supporting affected individuals, ensuring consistent and effective assistance. Offering flexible work arrangements, such as leave, reduced hours, or modified duties, accommodates mental health needs without jeopardizing job security. Fostering a supportive work environment based on understanding, empathy, and open communication is essential for promoting overall well-being within the fire department.

Finally, investing in ongoing research and evaluation ensures continuous improvement in mental health support for firefighters. Supporting further research on firefighter mental health allows for identifying specific factors contributing to anxiety and depression in this population, paving the way for the development of targeted interventions. Regularly monitoring the effectiveness of implemented programs helps to ensure they are meeting the needs of firefighters and allows for necessary adaptations. Disseminating research findings and best practices across fire departments and mental health professionals nationwide promotes knowledge sharing and facilitates the implementation of successful interventions, ultimately improving mental health support for firefighters across the country.

By implementing these five pillars of policy action, policymakers can play a crucial role in safeguarding the wellbeing of firefighters, ensuring they can continue serving their communities with courage and resilience while prioritizing their own mental health.

5. Conclusion and limitations

The present study investigated the levels of depression, anxiety, and stress among elite team and operational team firefighters in Kota Bharu, Kelantan State, Malaysia, before and after the COVID-19 pandemic. The findings revealed that firefighters had a high level of anxiety and depression, but a slightly lower level of stress, post-pandemic compared to pre-pandemic. This suggests that firefighters have a suitable

coping mechanism for managing their stress at work. However, the increased levels of anxiety and depression post-pandemic are a cause for concern, and further research is needed to explore the factors that contribute to these mental health problems in firefighters.

The findings of this study have a number of implications for practice. First, it is important to be aware of the increased risk of anxiety and depression in firefighters after the pandemic. Second, fire departments should provide mental health support services to firefighters, especially those who have been exposed to traumatic events. Third, fire departments should develop programs to help firefighters cope with stress. The findings of this study also suggest that the mental health of firefighters is a significant concern. Further research is needed to explore the factors that contribute to mental health problems in firefighters and to develop interventions to improve their mental health.

Based on the findings of this study, the following recommendations are made to address the mental health of firefighters. The FRDM should conduct further research to investigate the factors that contribute to stress, anxiety, and depression among firefighters and develop and implement mental health programs and resources for firefighters. Next, the FRDM should provide training to firefighters on stress management and coping mechanisms which include developing and implementing targeted mental health programs for firefighters, including training on stress management and coping skills. Lastly, FRDM should strive to establish a culture of openness and support for firefighters who are struggling with mental health problems.

This study acknowledges there to be some limitations. While high participation from respondents is commendable, the convenience sampling method may introduce selection bias. Firefighters who volunteered to participate might differ from those who were not available or declined, potentially affecting the representativeness of the sample. Additionally, the generalizability of the findings is limited by the focus on firefighters from only two Grade A stations in Kelantan. Future research employing a larger, more representative sample across diverse fire station types and locations would be valuable to further investigate these findings. A longitudinal design could provide deeper insights into trends in firefighters' mental health over time.

Author contributions: Conceptualization, AMCM and KS; methodology, KS and CS; validation, CS, AKH and MWA; formal analysis, AMCM and MWA; resources, MWA; data curation, AMCM and AHK; writing—original draft preparation, CS and KS; writing—review and editing, AHK and KS; visualization, AMCM; supervision, KS; funding acquisition, CS and KS. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest: The authors declare no conflict of interest.

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