

Risk Factors of Musculoskeletal Disorders (MSDs) Among Kota Kinabalu, Sabah Firefighters: A Preliminary Study

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Abstract

This study examined the relationship between predictors such as demographical aspect, task characteristics, physical demands, work-life balance, workstyle, psychosocial factors, and MSDs among firefighters conducted at four fire stations under Kota Kinabalu Zone in Sabah (n=130). The questionnaires used in the present study consist of a demographical aspect, task characteristics scale, physical demands scale, work-life balance scale, workstyle scale, Work Organization Assessment Questionnaire, Mental Health Scale, and musculoskeletal disorders (MSDs). The data were analysed with the use of SPSS version 22.0. The results show that task characteristics, physical demands, work-life balance, workstyle, and Mental Health Scale were significantly related to MSDs among Kota Kinabalu, Sabah firefighters. While age and gender did not relate to MSDs. In addition, there was no relationship between other factors such as psychosocial factors and work-life balance on MSDs. Firefighters did experience MSD due to overweighted equipment, lack of rest, accidents, and traumatic events like death among victims or teammates, leading to depression and stress.

Keywords: Musculoskeletal Disorder, Mental Health, Stress, Work-Life Balance

Introduction

The workplace is unequivocally a key determinant of the health and safety of employees since they spend much of their time at work. High-risk jobs are usually connected with health-related problems and employees are exposed to workplace environment hazards (Lavender et al., 2000). Musculoskeletal disorders (MSDs) are also an outcome of high-risk jobs. Musculoskeletal disorders (MSDs) can be defined as the injury of the muscles, nerves, tendons, joints, cartilage, and spinal discs (Centers for Disease Control and Prevention (CDC, 2020)). Work-related musculoskeletal disorders (WMSD) are disorders caused by the work environment and the execution of tasks. As a result, work activities such as repetition were

related to MSDs (Bernard, 1997). In conclusion, MSDs arise from the frequency of injuries to soft tissues and arise from the incompatibility between a task's physical requirements and the human body's physical capacity (Bernard, 1997).

Firefighters are one of the medical emergency response team (Angle, 2005). They play the role of the first-line rescuers of the victims in natural disasters, fires, accidents, and more (Subramaniam et al., 2010). In a rescue mission, these firefighters are exposed to hazardous scenarios (Beaton and Murphy, 1993). More than 62,000 to 100,000 firefighters in the United States of America (USA) are injured during fire ground missions (Haynes & Molis, 2017). Factors leading to this injury are ageing problems, weak and fatigued muscle strength, and other external factors like overweighted and unergonomic equipment and ecological factors (Kong et al., 2013). Previous studies show that the functional movement of a firefighter on uneven surfaces is also one of the factors leading to the prevalence of musculoskeletal disorders (MSDs) (Orr et al., (2019).

The physical demands of firefighting are among the primary risk factors for MSDs in this profession. Firefighters are required to perform a wide array of physically demanding tasks, such as lifting and carrying heavy hoses, equipment, and injured individuals, often in challenging conditions (Gledhill, N., & Jamnik, V. K., 1992). These tasks place enormous stress on their musculoskeletal system and are frequently associated with acute and cumulative injuries. The frequent need to handle heavy equipment, pull hoses, and carry out physically intense operations can lead to overexertion injuries. Additionally, working in unpredictable environments, such as smoke-filled buildings, or performing tasks under time constraints during emergencies, further exacerbates the physical demands. Over time, these demands can take a toll on a firefighter's body, contributing to the development of MSDs (Dworsky, M., et al., 2021)

The prevalence of Musculoskeletal Disorders (MSDs) among firefighters is influenced not only by physical demands and job-specific factors but also by psychosocial factors. These psychosocial factors encompass various aspects of a firefighter's mental and emotional well-being, which can significantly impact their susceptibility to MSDs. Psychosocial factors, including job satisfaction and perceived organizational support, can have a significant impact on the prevalence of MSDs among firefighters (Tang, 2022). Job satisfaction, reflecting a sense of accomplishment, control, and social support at work, is associated with lower stress levels and better overall well-being (Muthukumar M et al., 2023). Firefighters who are dissatisfied with their jobs may experience higher stress, which can, in turn, increase the risk of MSDs.

Next, an emerging body of research is uncovering a more complex picture, one in which the mental health of firefighters interacts with their susceptibility to MSDs. This exploration is essential as it highlights the need for a holistic approach to firefighter well-being. Firefighters are exposed to traumatic incidents, life-threatening situations, and the need to make quick, high-stakes decisions. This occupational stress can lead to psychological and emotional challenges, such as depression, and anxiety (Stanley et al., 2016). The relationship between mental health and MSDs among firefighters is not unidirectional. On one hand, mental health challenges may exacerbate the physical toll of the job. Stress, anxiety, and depression can lead to muscle tension and compromised physical well-being, making firefighters more susceptible to MSDs. On the other hand, the physical strains and injuries that firefighters experience can lead to mental health issues. The pain and limitations associated with MSDs can contribute to chronic stress and deteriorating mental health (Igboanugo, S et al, 2021).

Nonetheless, most of the studies that have been conducted on firefighters and engrossed in psychological well-being which is the source of occupational stressors (SOOS) (Malek et al, 2009; Malek et al, 2010). On the other hand, musculoskeletal disorders and psychological health disorders were affected by the physical workload of firefighters (Malek et al., 2010), environmental hazards, and human factors (Lusa et al., 2010). Other than the problem affecting the musculoskeletal system, and psychological health, there is also some synergy effect from the work experience of firefighters where they are required to face some physical workload (Malek et al., 2010), which exposes them to environmental hazards and human factors (Lusa et al., 2010). Some hazards will cause musculoskeletal disorders and psychological health problems like the psychological demands on the firefighters' tasks were reported to promote the application of unergonomic working postures (Pencis et al., 2009).

However, since most of the studies were conducted among firefighters in developed countries, it is argued that the predictors associated with MSDs among local firefighters in Malaysia would not be like those of their counterparts in developed countries. Given the problem, the purpose of this study is to examine the relationship between risk factors (demography, task characteristics, physical demands, work-life balance, workstyle, and psychosocial factors) in affecting musculoskeletal disorders among firefighters in Kota Kinabalu, Sabah, one of the states in Malaysia.

Significance of the study

This research assesses the relationship between several factors that contribute to musculoskeletal disorders (MSD) among firefighters. The findings of the research will help the Firefighters in Kota Kinabalu, Sabah to recognize the seriousness of work-related musculoskeletal disorders (WMSDs) resulting from their task characteristics, physical demands, workload, workstyle, and psychosocial factors.

The primary significance of this study lies in its potential to significantly enhance the well-being of firefighters. MSDs pose a substantial threat to firefighters' health, often leading to chronic pain, reduced mobility, and, in severe cases, early retirement. By identifying the risk factors associated with these disorders, this research provides a foundation for preventive measures and intervention strategies, thereby improving the overall quality of life for firefighters. Firefighters play a pivotal role in ensuring public safety, responding to emergencies, and mitigating disasters. Any health issue affecting their ability to perform their duties efficiently directly impacts public safety. A comprehensive understanding of MSDs and their risk factors among firefighters can lead to improved readiness and response during critical situations, ultimately safeguarding the communities they serve.

This study adds to the body of research focused on occupational health and safety, offering valuable insights that can benefit not only firefighters but also individuals in other physically demanding professions. The methodology and findings of this study may serve as a model for investigating the health and safety of firefighters.

In conclusion, the significance of this study extends beyond its immediate relevance to the firefighting community. It has the potential to positively impact the lives of firefighters, enhance their ability to protect the public, reduce healthcare costs, and contribute to the broader field of occupational health research. By shedding light on the risk factors and prevalence of MSDs among firefighters, this study paves the way for a safer and more effective firefighting profession and, ultimately, a safer society.

Literature Review

Azma et al., (2015) conducted a cross-sectional study among a sample of 144 in Iran and tested the relationship between musculoskeletal pain and work-related stress factors. The results show that risk factors like stress, job demands, control, and change exhibited are directly related to musculoskeletal disorders in some parts of the body like the neck, shoulder, back, and hip. In addition, Lusa, Miranda, Luukkonen, and Punakallio (2015) examined the causes of low back discomfort among 360 Finnish firefighters in which they followed a group of participants for 13 years and found that the rise of low backache from 16% to 29%, and the existence of lower back discomfort had risen from 28% to 40%.

In Canada, Negm et al. (2017) studied the prevalence and distribution of musculoskeletal disorders in firefighters were influenced by age and tenure. The researchers distributed a pain body diagram to the respondents to specify the musculoskeletal disorders' location and pain intensity. The result showed that firefighters older than 42 years old tend to suffer more severe lower extremity and back problems. Firefighters with more than 15 years of service also show a lower score in LEFS which refers to lower extremity and back problems. Older firefighters tend to have more than 1 MSD episode than firefighters with no MSDs.

On the other hand, B. Le et al. (2020) conducted a study on non-lethal injury among 914 firefighters from 2 fire departments, one from the western region and another from the east. The data was collected over two years and analysed to find out the primary factors leading toward the injury and the injured body region. According to the result, the age group from 40 years old to 49 years reported the most injury cases (38.3%), while the most reported cases of injury were "overexertion and bodily reaction. The researcher also found out that the most reported injured body region was the multiple-body region. This group of researchers also suggested the authority that more data collection based on non-fatal injuries and disorders of firefighters should be conducted to control the potential risk factors.

Further, Demiralp et al., (2019) studied musculoskeletal disorders among 77 firefighters from the capital of Turkey. The researchers used the Nordic Musculoskeletal Questionnaire to identify the discomfort in body regions. They also included demography factors, work, and work environment in their questionnaire. The researchers found out that the most reported pain region was the upper back and back region which had the most severe pain among other body regions. The risk factor causing the pain was the overweight equipment used in their training and missions.

Whilst García-Heras et al., (2022) conducted a study on chronic pain among Spanish Wildland firefighters. This study consists of 203 male and 18 female Wildland firefighters. According to the result, there was more than 60% of respondents reported suffering from chronic pain, and more than 45.5% of them reported that they were suffering from chronic pain in multiple body regions at the same time. The researchers stated that age and length of service are the factors leading to chronic pain. In addition, the weight of the protective equipment also increased the prevalence of chronic pain among these respondents. Lastly, gender and job position also affect the location of chronic pain. The researchers mentioned that female firefighters tend to have a higher rate of prevalence of chronic pain in their lower limbs.

Research Methodology

Sampling Method

A cross-sectional study was used as a research design for the study that aimed to gather the data from a firefighter in 4 different fire stations (Kota Kinabalu, Lintas, Tuaran, and Penampang) registered under zone Kota Kinabalu, Sabah. A simple random sampling method was applied in choosing the respondents. 130 questionnaires were valid and used for the final analysis.

Research Questions

1. Is there a relationship between gender and ageing with the MSDs among firefighters in Kota Kinabalu, Sabah?
2. Is there a relationship between risk factors (Physical demand, Psychosocial Factors, Work-life balance, Mental Health, Workstyle, Task Characteristics) with MSDs among firefighters in Kota Kinabalu, Sabah?

Respondents

Table 1.

Respondents' Background

Variables	N (%)
Gender	
Male	118 (90.8)
Female	12 (9.2)
Age	
21-30	32 (24.6)
31-40	76 (58.5)
41-50	16 (12.1)
51-60	6 (4.8)

There were 250 sets of questionnaires distributed to the respondents but only 130 of them were valid for the final analysis. There were 90.8% (118) male respondents and 9.2% (12) are female. The respondents were mostly aged between 31-40 years old (58.5%). The respondent's background is shown in Table 1.

Research Instruments

Scale for Physical Job Experience

A 12-item scale was used to measure the job experience in exposure to job-related physical hazards with the use of a five-point scale point scale (1= never or hardly ever, 2=seldom, 3=sometimes, 4=often, 5= almost all the time) (Macdonald et al., 2007). Items included such questions as "Repeating a common task or action several times within every second or minute". The reliability for this scale was $\alpha = .844$.

Scale for Psychosocial Factors

The respondents were given the Work Organization Assessment Questionnaire (WOAQ) (Griffiths et al., 2006) was used to find out the psychosocial factors in the workplace. This scale consists of 26 items (job control, job satisfaction, perceived stress level, and social

support). This is a 5-point scale point scale (from 5=very good, 4=good, 3=not a problem, 2=slight problem, 1=major problem). One of the items was, "Reward and recognition". The Cronbach's alpha for this scale was $\alpha = .939$.

Scale for Work-life balance

The work-life balance Scale was applied in this study to test the level of work-life balance among the respondents. This scale consists of a 22-item 5-point scale (from 1= strongly disagree to 5= strongly agree). One of the examples for this scale was "I spend working time to manage my family members". Alpha (α) of .892 was recorded for the scale.

Scale for Mental Health

Mental Health Scale was used to measure the level of mental health of the respondents. There were 10 items with a 5-point scale (point scale (0=never or hardly ever, 1=seldom, 2=sometimes, 3=often, 4=almost all the time). One of the items was "Easily feeling board?". The Cronbach's Alpha was $\alpha = .940$.

Scale for Workstyle

The workstyle scale was used to assess the workstyle of the respondents for the past 6-months. The questions of this scale were rated by a 5-point Likert scale from 1 never to 5 very often. One of the items was "I did not attend work because my colleagues will look down on me.". The Cronbach's alpha was $\alpha = .934$.

Scale for Task Characteristics

Task characteristics of this research were measured by using the Experience of Work and Life Circumstances Questionnaire developed by (Van Zyl and Van der Walt, 1991). The original subscale was made up of 14 items but was reduced to 10 by expert opinion. These items were rated with a 5-point Likert scale ranging from 1 very low to 5 very high. One of the questions was "Work Shift". The Cronbach's alpha for this scale is $\alpha = .798$

Scale for MSDs

To identify the prevalence of MSDs, the respondents were asked to self-rate the musculoskeletal discomfort experienced for the past 6 months with a yes or no response (Oakman et al., 2014). Next, the respondents who answered "yes" are required to self-rate the frequency and the level of severity of discomfort from 5 areas of the body (neck and shoulder, hand and fingers, arms, middle to lower back, hip, bottom, legs, and feet). The level of frequency of MSDs was recorded on a scale from 0=never to 4=almost always, and the severity of MSDs from 1= from mild to 3=severe. For the study, the scale of Cronbach's alpha was $\alpha = .878$.

Data Analysis

All the data was gathered and analysed quantitatively. Reliability and validity were carried out to test the validation of the scale used. The relationship of demographics, task characteristics, physical demand, workload, workstyle, and psychosocial factors with Musculoskeletal Disorder (MSD) was using Pearson Correlation.

Finding And Discussion

Respondents' Background and MSDs

Table 2.

Relationship between respondents' background and MSDs

Variables	Gender	Age	MSDs
Gender	-		
Age	-0.44 (.622)	-	
MSDs	.050 (.573)	.084 (.342)	-

Table 2 shows the results of the Pearson's Correlation between Respondents' Background and MSD. The results show that both gender ($r=0.50$, $p>0.05$) and age ($r=.084$, $p>0.05$) had no relationship with MSDs among the respondents.

Risk Factors (Job Experience, Psychosocial Factors, Work-life balance, Mental Health, Workstyle, Task Characteristics) and MSDs

Table 3.

The relationships between risk factors (Physical Demands, Psychosocial Factors, Work-life balance, Mental Health, Workstyle, Task Characteristics) and MSD.

Variables	Jobs Experience	Psychosocial Factors	Work-life Balance	Mental Health	Workstyle	Task Characteristics	MSDs
Job Experience	-						
Psychosocial Factors	-.063 (.473)	-					
Work-life Balance	.379** (.000)	-.295** (.001)	-				
Mental Health	.288** (0.001)	-.331** (0.001)	.588** (.000)	-			
Workstyle	.404** (.000)	-.348** (.000)	.473** (.000)	.660** (.000)	-		
Task Characteristics	.364** (.000)	-.161 (.067)	-.282** (0.001)	.377** (.000)	.492** (.000)	-	
MSDs	-.161 (.067)	.061 (.494)	-.161 (.067)	-.212* (.016)	-.345** (0.000)	-.271** (.002)	-

**Correlation is significant at 0.01 level. Sig. (2-tailed). () =p-value

Table 3 shows the relationships between risk factors (Job Experience, Psychosocial Factors, Work-life balance, Mental Health, Workstyle, and Task Characteristics) and MSDs. Psychosocial factors ($r=.061$, $p>0.05$) and work-life balance ($r= -.161$, $p>0.05$) did not correlate to MSDs. On the other hand, Mental Health ($r= -.212$, $p<0.05$), Workstyle ($r=-.345$, $p<0.05$), and Task Characteristics ($r= -.271$, $p<0.05$) associated with MSDs.

Discussion

The Relationship between Gender and Ageing with MSDs

One of the purposes of this research is to find out the rate of prevalence of MSD among firefighters in zone Kota Kinabalu. The prevalence of MSDs was 32.3% for both males and females. The present study found no association between gender and MSDs. Women usually had been excluded from studies regarding firefighters because the number of females among firefighters is too low (Ngem et al., 2017). Although our sample includes 12 females, only 3 of them reported suffering from MSDs. However, the use of a small sample size would lead to unstable prevalence predictions (Ngem et al., 2017). Although the number of female respondents in this study is low, the researchers still include them because it fulfils the minimum requirement for the sample size of the study. Moreover, the researchers wish to

increase the awareness of the public toward the health issues of female workers. Female workers in Malaysia are facing a huge number of MSD problems as they are not only working full-time but also participating in numerous household tasks (Maakip et al., 2020).

Furthermore, Watkins et al., (2019) stated that there were more than 23% of women firefighters suffer from MSDs which include pain in upper and lower limbs and back injuries. The reason the experience of MSDs among female firefighters is usually caused by lower muscle strength compared to males because both genders had to carry the same equipment during their missions, for example, personal protective equipment, and breathing apparatus which weighed around 23kg (Roy & Lopez, 2013; Vu et al., 2017; Watkin et al., 2019).

Previous research found that age is one of the factors that affect MSDs. However, in our study, age did not relate to MSDs. Age is a controversial factor in affecting MSDs. Previous studies such as Ngem et al., (2017) found that the average firefighter (those aged more than 45.4 years old) tends to suffer from multi-regional MSD, and firefighters aged 42 years or older also have a higher frequency of discomfort in the neck and upper and lower limbs than those who are younger than 42 years old. These findings would suggest that the evaluation for the MSDs among firefighters should be done early to find out any serious injury in the upper extremity region.

On the other hand, Cloutier et al. (2000) stated that older firefighter individual tends to experience less work-related injury because these individuals are more experienced in avoiding accident than their younger counterpart. Further, Cloutier, (1994); Cru and Dejours, (1983); Dejours, (1993) also supported this statement by stating that older firefighters are highly experienced in the development of strategies for protecting themselves during their tasks compared to those with fewer experienced firefighters. Leroux et al. (2005) stated that there are many cases where individuals aged around 18 years old are facing the problem of musculoskeletal disorders due to psychological distress and traumatic events in their lives.

Risk Factors Affecting MSDs

Task Characteristics and MSDs

Task Characteristics at the workplace are one of the risk factors that contribute to MSDs among firefighters in Kota Kinabalu. This is in line with Kim et al. (2013) finding that reported work demands and physical environment are some of the risk factors that lead to MSDs. The physical demands of the task such as firefighters having to use some unergonomic (and unnatural) position in conducting a rescue mission and the heavy protective gear that they must wear increase the intensity and pressure on the musculoskeletal system to support their movement and action of the firefighters.

Cole et al., (2005) stated that high intensity of physical exercise and psychological demands show a positive relationship between the strain and musculoskeletal injuries. Moreover, Kodom-Wiredu (2019) also stated that task characteristics like long hours of standing, conducting rescue missions, answering stressful calls, and facing traumatic scenes can be assessed toward the prevalence of musculoskeletal disorder (MSD) among firefighters. Job characteristics of firefighter like conducting a fire rescue mission can easily contribute to musculoskeletal pain in their body.

Soares et al., (2008) stated that individuals who work under extreme conditions especially overly high or low temperatures will experience a higher prevalence of lower-extremity musculoskeletal pain. Fassa et al., (1996) stated that extreme temperature contributes toward the unbalance of homeostasis and leads to metabolic derangements causing inflammation within the musculoskeletal and difficulty in rebuilding muscle.

Moreover, individuals who work under high temperatures experience a higher prevalence rate of musculoskeletal pain because while working under high temperatures the body demands more blood, oxygen, and nutrients from the musculoskeletal to release heat from the body through perspiration which increases the tension of the heart (Grandjean et al., 1997).

Psychosocial Factors and MSDs

There was no relationship between the psychosocial factors and MSDs among the firefighters in the present study. This finding is like Hartvigsen et al. (2004) that stated no significant relationship between psychosocial factors and MSDs was found. On the other hand, Linton (2001) reported a strong relationship between psychosocial work factors and back pain. However, Oakman et al., (2014) argued that the contribution of psychosocial factors on MSDs must be related to other factors such as work-related stress.

Work-life Balance and MSDs

Previous studies reported that work-life balance affects MSDs (Maakip et al., 2015; 2017). However, the present study found no relationship between work-life balance and MSDs. One of the explanations for this is that most of the respondents were men. Thus, women experience more imbalance between work and life (Duxbury et al., 1994). Most women would prioritize balancing their family responsibilities with their job demands (Gutek et al., 1991); unlike men who compromise more easily between their work and life than women do (Tenbrunsel et al., 1995). Heidarimoghadam et al. (2022) stated that the increase in musculoskeletal disorders (MSDs) among workers is led by the increase in mental workload like fatigue. This is because tiredness will decrease the speed of contraction and relaxation of our muscles (Bigland-Ricthie et al., 1983).

Mental Health and MSDs

The result shows that mental health negatively affects MSDs among the firefighters in zone Kota Kinabalu. This shows that the lower the score of mental health, the higher the rate of MSDs among firefighters. Previous studies found that depression often leads to muscle pain among employees (Hannerz et al., 2021; Yi Ming et al., 2019). The pressure caused by depression elevates muscle tension and reduce oxygen and blood flow which causes the individual to feel pain in their muscle. Muscle pain and depression usually occur simultaneously in those who suffer from depression also experience MSDs (or muscle pain) at the same time (Gureje et al., 2001). The task for firefighters requires fast reaction but stress is present among them that would lead to hesitation which might cause a delay in time for time to react and expose them and their teammates to danger. Besides, the presence of depression among firefighters is also one of the major factors that lead to injuries (Elinson et al., 2004) like pain in the neck and lumbar of the firefighters (Carroll et al., 2004).

Furthermore, Kim et al., (2013) also reported that work-related stress and MSDs especially back pain among firefighters in Korea are correlated. Employees in the fire department tend to experience 2.1 times more depression than workers in the business administration department (Kim et al., 2013). In addition, they also concluded that firefighters with MSDs tend to suffer 1.86 times higher levels of depression than those who do not have MSDs. According to Myong et al., (2007), firefighters tend to be 2.1 times more stressed than a business administration staff, and Kim et al., (2003) added that firefighters who experience musculoskeletal problems tend to be 1.86 times more depressed than those who had not.

Workstyle and MSDs

The work style of the firefighters was also one of the predictors associated with musculoskeletal problems among firefighters in Kota Kinabalu. The workstyle was found negatively correlated with MSDs among firefighters in Kota Kinabalu which corresponds to Maakip et al., (2016) finding. One reason that contributes to this finding is that firefighters are required to be extremely fast in their reaction to reduce the casualties during rescue missions. Apart from rescue missions, the training of the firefighters and the maintenance of their vehicles and gears also required a high intensity of muscle strength. Fonseca et al., (2010) suggested that the pain in the neck, shoulder, or upper and lower back was affected by physical demands (carrying heavy things, unergonomic position, and more), dangerous training, and restless working style. Demiralp et al., (2019) also stated that overweighted equipment used by firefighters was the most crucial risk factor leading to back pain.

Conclusion And Further Research

This research was one of the few that examined the relationship between risk factors (Physical Demands, Psychosocial Factors, Work-life balance, Mental Health, Workstyle, and Task Characteristics) and MSD among firefighters in the local context, of Sabah, one of the states in Malaysia. The study shows that mental health, workstyles, and task characteristics correlated with MSDs. While age and gender did not relate to MSDs. In addition, there was no relationship between other factors such as psychosocial factors and work-life balance on MSDs. Psychosocial factors would only affect MSDs if there were other factors such as work-related stress that were present in the relationship between psychosocial factors and MSDs. Work-life balance also shows no relationship with MSDs since firefighter is a male-dominated occupation since males tend to compromise more toward their career than their female counterparts.

The study provides a turning point for future research particularly in Sabah to be conducted on this occupational group (i.e., firefighters) to examine other risk factors associated with MSD. Furthermore, a qualitative and/or mixed-method study should be undertaken with the aim of not only investigating the risk factors associated with MSD but also understanding the strategies used in minimizing MSD at the workplace among firefighters. Nevertheless, this preliminary study in Kota Kinabalu, Sabah could assist the relevant authorities in highlighting the risk factors associated with MSD that need to be taken into consideration when developing any intervention to minimize health and psychological-related issues at the workplace.

Limitations

This study was conducted during the Movement Control Order (MCO) of the COVID-19 pandemic; therefore, the researcher could not travel to collect a bigger sample size to reduce the sampling error. Moreover, the researchers used a self-report questionnaire which may contain negative views and bias during the answering process which will affect the result of the study.

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