



UNIVERSITI PUTRA MALAYSIA

***RELATIONSHIP BETWEEN MUSCULOSKELETAL DISEASE AND
WORKING FROM HOME AMONG TEACHERS DURING MCO :
LITERATURE REVIEW***

MUHAMMAD HAZIQ BIN YUSANIZAN

**lp
FPSK4 2021 6**

**RELATIONSHIP BETWEEN MUSCULOSKELETAL DISEASE AND
WORKING FROM HOME AMONG TEACHERS DURING MCO :
LITERATURE REVIEW**



**A PROJECT PAPER SUBMITTED AS PARTIAL REQUIREMENT FOR
THE DEGREE OF BACHELOR SCIENCE (ENVIRONMENTAL AND
OCCUPATIONAL HEALTH**

**DEPARTMENT OF ENVIRONMENTAL AND OCCUPATIONAL FACULTY
OF MEDICINES AND HEALTH SCIENCES, UNIVERSITI PUTRA
MALAYSIA SERDANG, SELANGOR 2021**

ACKNOWLEDGEMENT

With the name of Allah, Most Gracious and Most Merciful. Here, I would like to praise to Allah because for His permission, this thesis could be completed. Without His permission, I would not have the will and bless to run this research and to produce this complete thesis. Many thank goes to my supervisor, Assoc Prof Dr Emilia Zainal Abidin and Prof Dr Noor Hassim Bin Ismail for support and guidance in the overall coordination in this study. All constructive comments, suggestions and guidance are highly appreciated. I also would like to thank my fellow friend. Not forgetting my family for their support that given to me throughout my study until the completion of this project especially my parent, Encik Yusanzan Shafie and Puan Mahdalina Kassim. In addition, I would like to thank my project mates, for being there with me during data collection, analysis of data and also supporting each other throughout this project. Last but not least, to all who had directly and indirectly given their hands and words helping me during this project, your kindness means a lot to me. Thank you very much.

MUHAMMAD HAZIQ BIN YUSANIZAN
Universiti Putra Malaysia
Julai 2021

ABSTRACT

RELATIONSHIP BETWEEN MUSCULOSKELETAL DISEASE AND WORKING FROM HOME AMONG TEACHERS DURING MCO: LITERATURE REVIEW

Musculoskeletal disorder (MSD) is commonly suffered by most teachers. Many studies had been done internationally to investigate its prevalence amongst teachers during MCO. However, there are still not much study done in Malaysia. The objective of this study is to investigate the prevalence and risk factors for MSD in teachers and to evaluate its association to individual and occupational characteristics. A systematic mapping study was done on 50 research paper from 2019 to 2021. The relevant literature for this project were identified using the keywords as the following: school teachers, prolonged standing, musculoskeletal disorders, work-related musculoskeletal disorders, prevalence, risk factors of MSDs, work at home, Movement Control Order. Three scientific search engines were used namely Google Scholar, Mendeley and Scopus. 20 were excluded based on the inclusion and exclusion criteria. The remaining 38 articles were screened based on their titles, abstracts, and keywords. This screening process yielded 8 articles which met the eligibility criteria. A questionnaire was distributed to get their demographic and occupational information. The prevalence of MSD was assessed using the Standardized Nordic Questionnaire (SNQ) and other tools that related to MSD. The neck (70.89 %) had the highest prevalence of discomfort, followed by the shoulders (58.23 percent) and the low back area (58.23%) (49.37%). Prolonged standing and sitting, long work hours, and not taking breaks during class were all recognised as risk factors. Preventive and management methods, such as taking breaks between sessions, maintaining correct working posture, and avoiding repetitive movement, should be taught to teachers.

Keywords: school teachers, prolonged standing, musculoskeletal disorders, work-related musculoskeletal disorders, prevalence, risk factors of MSDs, work at home, Movement Control Order

ABSTRAK

HUBUNGAN ANTARA PENYAKIT MUSKULOSKELETAL DAN BEKERJA DARI RUMAH DI ATAS GURU SEMASA MCO: TINJAUAN LITERATUR

Gangguan muskuloskeletal (MSD) biasanya dialami oleh kebanyakan guru. Banyak kajian telah dilakukan di peringkat antarabangsa untuk menyelidiki kelazimannya di kalangan guru semasa MCO. Walau bagaimanapun, masih belum banyak kajian dilakukan di Malaysia. Objektif kajian ini adalah untuk mengkaji kelaziman dan faktor risiko MSD pada guru dan menilai perkaitannya dengan ciri-ciri individu dan pekerjaan. Kajian pemetaan sistematik dilakukan pada 50 kertas penyelidikan dari tahun 2019 hingga 2021. Literatur yang relevan untuk projek ini dikenal pasti menggunakan kata kunci sebagai berikut: guru sekolah, kedudukan berpanjangan, gangguan muskuloskeletal, gangguan muskuloskeletal yang berkaitan dengan pekerjaan, kelaziman, faktor risiko MSD, bekerja di rumah, Perintah Kawalan Pergerakan. Tiga mesin carian saintifik digunakan iaitu Google Scholar, Mendeley dan Scopus. 20 dikecualikan berdasarkan kriteria kemasukan dan pengecualian. Selebihnya 38 artikel disaring berdasarkan tajuk, abstrak, dan kata kunci mereka. Proses penyaringan ini menghasilkan 8 artikel yang memenuhi kriteria kelayakan. Soal selidik diedarkan untuk mendapatkan maklumat demografi dan pekerjaan mereka. Kelaziman MSD dinilai menggunakan Standardized Nordic Questionnaire (SNQ) dan alat lain yang berkaitan dengan MSD. Leher (70.89%) mempunyai prevalensi ketidakselesaan tertinggi, diikuti oleh bahu (58.23%) dan kawasan punggung bawah (58.23%) (49.37%). Berdiri dan duduk yang berpanjangan, waktu kerja yang panjang, dan tidak berehat semasa kelas semuanya diakui sebagai faktor risiko. Kaedah pencegahan dan pengurusan, seperti berehat antara sesi, menjaga postur kerja yang betul, dan mengelakkan pergerakan berulang, harus diajarkan kepada guru.

Kata kunci: guru sekolah, kedudukan berpanjangan, gangguan muskuloskeletal, gangguan muskuloskeletal yang berkaitan dengan pekerjaan, kelaziman, faktor risiko MSD, kerja di rumah, Perintah Kawalan Pergerakan

TABLE OF CONTENTS

	Page
DECLARATION	i
ACKNOWLEDGEMENT	ii
ABSTRACT	iii
ABSTRAK	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF ABBREVIATIONS	xi
CHAPTER 1	
1.0 INTRODUCTION	1
1.1 Study Background	1
1.2 Problem Statement	3
1.3 Study Justification	7
1.4 Conceptual Framework	8
1.5 Research Objectives	10
1.6 Conceptual Definition	10
1.6.1 Operational Definition	11
CHAPTER 2	
2.0 LITERATURE REVIEW	13
2.1 COVID-19	13
2.2 Musculoskeletal Disease	13
2.3 Movement Control Order (MCO)	14
2.4 Working from Home	15
2.5 Problem Faced by Teachers During MCO	17
2.6 Prevalence of MSD	19
2.7 Factors Contribute to MSD Problems	21
CHAPTER 3	
3.0 METHODOLOGY	23
3.1 Definition of Research Questions	23
3.2 Data Sources and Search Strategy	24
3.3 Study Selection and Screening phase	25
3.4 Define Eligibility Criteria	25
3.5 Data Extraction	25
CHAPTER 4	
4.0 RESULTS	27
4.1 Yield of literature search	27
4.2 Results of the literature search	30

4.3	The methodology and tools used in the literature found	35
4.4	Prevalence of Musculoskeletal Disorders	36
4.5	Risk factors for Musculoskeletal Disorders	40
CHAPTER 5		
5.0	DISCUSSION	47
5.1	Prevalence of MSD	47
5.2	Neck	47
5.3	Shoulders	48
5.4	Lower back	49
5.5	Comparison between genders and age	49
5.6	Prevention and management of pain	50
CHAPTER 6		
6.0	CONCLUSION, STUDY LIMITATION AND FUTURE RECOMMENDATIONS	51
6.1	Conclusion	51
6.2	Study Limitation	52
6.3	Recommendations	53
	REFERENCES	55

LIST OF TABLES

Tables	Page
3.1 Number of Study by Year	26
4.1 Summarised the background of eight studies published covering on the relationship between musculoskeletal disease and working at home among teachers	32
4.2 Studies on Relationship Between Musculoskeletal Disease and risk factors related to Working At Home Among Teachers During MCO	42



LIST OF FIGURES

Figures	Page
1.4 Conceptual framework	9
3.1 The systematic mapping study process where there are 5 process steps and outcomes.	23
4.1 Flowchart for Relationship Between Musculoskeletal Disease and Working At Home Among Teachers During MCO	29





UPM

ABBREVIATIONS

MOE	Ministry of Education
MOH	Ministry of Health
MOHE	Ministry of Higher Education
MSD	Musculoskeletal disease
SNQ	Standardized Nordic Questionnaire



CHAPTER 1

INTRODUCTION

1.1 Study Background

The teaching profession is one of the occupations that suffer from muscle strain disease (MSD). During MCO, teachers tend to work from home which lead to different hazard in new environment but the content is a whole lot difference and hazardous to health.

The first Movement Control Order was issue by Malaysia government started on Wednesday March 18, 2020 – Thursday, December 31, 2020. One of the first COVID-19 deaths was recorded on March 17, 2020, linked to a mass Islamic missionary (*tabligh*) gathering in Kuala Lumpur (“Malaysia Records First Two Covid-19 Deaths,” 2020). The government imposed a partial lockdown known as a movement control order (MCO) on March 18 with the Prime Minister stating its purpose was “to break the chain of infection of the virus” (Yassin., 2020a), just 1 week after the WHO declared COVID-19 a pandemic. The MCO effectively flattened the COVID-19 infection curve (Aziz, 2020) but imposed drastic restrictions on the population, including social distancing; closing offices, schools, universities and nonessential businesses; prohibiting public gatherings, religious congregations, interstate and international travel; and confining people through a “Just Stay at Home” order. The fourth extension of the MCO eased restrictions under the conditional MCO until June 9, 2020, taking into account the restoration of selected economic activities. As of May 18, 2020, Malaysia had 6,941 confirmed cases of COVID-19, with 113 deaths and 5,615 recovered cases, and out of 47 new cases, 21 were imported (Ministry of Health Malaysia, 2020).

Due to COVID-19 and lockdown, teachers were compelled to deliver education through e-learning. In times of emergencies, such as the one we are facing right now, where educational institutions are called to respond swiftly, there must be a distinction between promptness and thoughtfulness in actions. Issues on acceptance and readiness have been a common theme among the resistance. Previously, the use of online activities delivered through learning

management systems has been an option among the teaching staff, with a majority, along with the students, opting for face-to-face physical classes. At best, online activities and flipped classrooms have been considered as enrichment activities adjunct to conventional educational strategies. With the current situation, we are placed in a situation where we need to migrate digitally and conduct classes virtually online. Most of the teacher do not have facilities like what is in school. They are prone to danger and accidents due to negligence of ergonomic factor.

The term ergonomics was first used by Wojciech Jastrzebowski (Polish scientist) in 1857. Ergonomics come from two words, an ergon which means work or effort and nomos which means rules. According to International Ergonomics Association (IEA) (2003), ergonomics (or human factors) is the scientific discipline concerned with the understanding of the interactions among human and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.

Third Objects of OSHA (1994) is to promote an occupational environment for persons at work which is adapted to their physiological and physiological needs.

Musculoskeletal disorders or MSDs are injuries and disorders that affect the movement of the human body or the musculoskeletal system (ie muscle, tendon, ligaments, nerves, discs, blood vessels and others). Other names for MSDs are “recurrent motion injuries”, “recurrent stress injuries”, “excessive injuries” and more where it refers to the single cause for musculoskeletal system damage - repetition and pressure. When employees are exposed to risk factors for MSDs, they begin to fatigue. When fatigue overcomes their body’s recovery system, they experience musculoskeletal imbalance. From time to time, when fatigue continues to worsen and musculoskeletal imbalances persist, musculoskeletal disorders will increase. Due to employment characteristics, most occupational groups are susceptible to work-related

musculoskeletal discomfort or pain. School instructors are the group that stands out among these. (Vaghela et al., 2018).

1.2 Problem Statement

Problem Statement

Teachers are one of the most common professional careers in Malaysia, and they can be classified as a mass profession. Malaysia has 423,566 school teachers, making it the largest sector in terms of total public service personnel (Alias et al., n.d.). The government's goal for the teaching profession is to improve the quality and standard of education, as evidenced by policy development and implementation based on the Education Development Master Plan (2006-2010) and the Malaysian Education Blueprint 2013-2025. Both policies are focused on the teaching profession and are concerned about the critical role that teachers play in building good human capital for Malaysia's economic development (Malaysia Educational Statistics. *Education Data Sector, Education Planning and Research Division.*, 2011).

In terms of education, the learning process is also being disrupted as a result of the closure of schools, colleges, and universities, which deprive students of their social lives and learning opportunities. The majority of instructional activities, such as classroom instruction and assessment, are shifting to the internet (Burgess & Sievertsen, 2020). Teachers are the ones who are most affected by this pandemic, as they are overburdened with online teaching during the COVID-19 epidemic.

According to a study conducted by Chabbott et al. (2020), major concerns about the use of technology in online teaching include teachers' lack of technological infrastructure and security issues. In order to assist their delivery, teachers must first evaluate their needs, resources, and digital infrastructure. This puts more pressure on teachers to deliver excellent online instruction in order to keep students interested in attending their classes. Teachers, particularly in rural and distant places, are surprised by the quick implementation of online learning during MCO. Malaysia, as is well known, has a substantial rural population in comparison to the urban

population, with a total of 23.39 percent of the people living in rural areas (R. Hirschmann, 2021).

Teaching during COVID-19 presents a greater challenge to instructors and is likely to cause them stress, particularly when dealing with technologies and online methods that they are unfamiliar with (Al-Fudail & Mellar, 2008).

The use of online teaching during MCO has a significant impact on a large number of teachers. The lack of internet connectivity, which is currently at a low level in rural regions, is the main difficulty in conducting online learning. The internet distribution gap between urban and rural areas persists at an astounding 70:30 ratio, according to Luqman Arif Abdul Karim (2020). The report also stated that according to official data from the National Statistics Department in 2019, there was no progress in internet access in rural and urban areas between 2014 and 2016. The inclusion of online learning as one of the MCO learning modes will have a significant impact on the academic achievement gap between urban and rural pupils. If not supplemented by other alternate learning methods, this policy is a kind of educational discrimination, especially for kids who live in the interior. As a result, teachers are under pressure to come up with a solution that is fair to all kids.

Using data from the Labour Force Survey Musculoskeletal diseases (MSDs) are on the rise around the world, and teaching is one of the professions that has been linked to an increase in MSDs (Mohseni-Bandpei, Ehsani, Behtash, & Ghanipour, 2014). According to previous studies, the most commonly reported MSD areas for instructors were the neck and shoulder, lower back, and upper limbs (Erick & Smith, 2011; Darwish & Al-Zuhair, 2013; Erick & Smith, 2014; Rottermund, Knapik, Saulicz, Myśliwiec, Saulicz, Rygiel, & Linek, 2015).

MSDs are becoming more prevalent in developing countries as a result of growing industrialization and urbanisation (Louw et al., 2007). MSDs are a global health issue that affects workers not only in poorer nations, but also in developed countries such as the European Union, where they are a prevalent occupational ailment (Schneider, E., & Irastorza, X., 2010). MSDs were seen as the most important work-related health hazard by 54 percent of those who

reported them in Europe, and they accounted for up to 38 percent of all occupational illnesses. MSDs are a leading cause of work absenteeism (Sickness, O. E. C. D., 2009). In study Da Costa et al., (2010) physical factors such as unpleasant postures or the lifting of large items, according to research, are the most common causes of MSDs.

In comparison to other professions, school teachers have a relatively high risk of musculoskeletal problems; from 40 and 95% (Erick, P., & Smith, D., 2011). Missed workdays, financial losses owing to medical bills, and poor work ethics owing to discomfort while at work are all consequences of MSDs. The annual expenses of MSDS are estimated to be between 13 and 54 billion dollars (Mesaria, S., & Jaiswal, N., n.d.).

Teachers' work duties frequently require extensive use of a 'head down' position, such as regular reading, assignment marking, and chalkboard writing (Erick & Smith., 2011). Musculoskeletal complaints, especially of the lower back, neck and shoulders, are also common among teachers due to prolonged desk work, prolonged standing in class and repetitive overhead writing on the board, prolonged sitting resulting from frequent reading, preparation of lessons and marking of assignments, and working on a computer

In study (Juhanson, K., & Merisalu, E., 2017) ,Upper or lower limb discomfort is the main focus of health and safety concerns. The neck, shoulders, and arms make up the upper limbs. Back, hips, knees, ankles, and feet are all parts of the lower limbs. Muscles, bones, and joints can all be affected by musculoskeletal problems. Tendinitis, carpal tunnel syndrome, osteoarthritis, rheumatoid arthritis, fibromyalgia, and bone fractures are the most common diagnosis. Discomfort in any body region could lead further to musculoskeletal disorder. This is the reason why is very important to focus on discomfort even if this is not causing a lot of afflictions yet.

Furthermore, proof that the risk or protective factor exists prior to the onset of the condition is a strong indicator that the factor may play a role in aetiology. There may also be a dose effect, which means that the stronger the risk factor, the more diseases are likely to occur (Mrazek & Haggerty, 1994). MSD was found to be prevalent among teachers in a range of 39% to 95% (Erick, P. N., & Smith, D. R., 2011). Teachers in rural schools face more challenges than those in urban schools, including social and geographic isolation, poor working conditions, low pay,

limited opportunities for professional development, insufficient resources, careless buildings, cultural differences, and a lack of community involvement (Adedeji et al., 2011; Villarroel Rosende, G., & Sánchez Segura, X., 2002). Physical variables such as extended standing, sitting, and poor posture have been linked to an increased prevalence of MSD, according to certain research (Mohan et al., 2015).

School teachers appear to be an occupational group with a high prevalence of MSDs, with prevalence estimates ranging from 40% to 95% (Chong et al., 2010; Korkmaz et al., 2011).

MSD decreases the productivity at work due to sick leave, absenteeism, and early retirement (Cardoso et al., 2009). Men and women have diverse patterns of musculoskeletal illnesses, which is likely due to their segregation in different industries and occupations. Education is a profession, and in most nations, the proportion of female teachers is increasing (Cardoso et al., 2009; Nurul et al., 2010). Female gender is connected with a higher prevalence of musculoskeletal pain problem. As a result, teachers' mental and physical health is jeopardised as a result of their profession (Chong et al., 2010).

Muscles, joints, tendons, ligaments, and nerves can all be affected by MSDs. The majority of job-related MSDs develop over time and are caused by either the work itself or the working environment of the employees (Buckle, P., & Devereux, J., 1999). MSDs are quite frequent and become more so as people get older. Work is crucial in both men and women's lives; nevertheless, when done incorrectly, it can constitute a health threat (Gasparini & Barreto., 2005).

According to the Occupational Safety and Health Act of 1994, employers must foster an occupational environment that is tailored to employees' physiological and psychological needs. The third goal is to promote a suitable working environment that meets the demands of employees. Its goal is to tailor the process and workstation to the employees' physiological and psychological demands. The work environment should be suitable to human physiology, for example, working in a heated environment would necessitate a proper rest-work schedule; a trolley to aid in the lifting of big weights that are beyond an individual's capacity. Employees' psychological needs should also be met, such as not being overworked or underworked; an

acceptable degree of stressor that maximises production without resulting in a stressed employee.

Employees must also follow the Act's rules and cooperate with employers in order to guarantee a safe and healthy workplace. This is consistent with the Act's principle, which states that those who produce the risks (employers) and those who work with the risks share responsibility for workplace safety and health (employees).

1.3 Study Justification

One of the major parts of continuous health management is a study on various psychological concerns of working from home among teachers during COVID-19 MCO. This research will help researchers better understand the prevalence and factors that contribute to musculoskeletal disease difficulties in teachers during the COVID-19 pandemic. The findings of this study will be crucial in the attempt to establish information for musculoskeletal illness management among instructors. This study's findings will also help teachers in the afflicted area better comprehend and cope with the effects of musculoskeletal disease.

The findings of this study can be presented to the MOE and MOHE as information about the prevalence, factors, and problems that instructors face during MCO. If MOE and MOHE decide to address the issues, they must establish a policy for dealing with musculoskeletal disease among teachers. This study will also serve as a point for MOE to consider in assisting teachers in upholding their rights to receive mental health counselling and rehabilitation from an approved counsellor in the education sector. If the most contributing element of mental health problems is already known and the best technique of

preventing it according to the suitability of respective teachers can be obtained, the efficacy of the counselling and rehabilitation session will be successful.

When comparing before and after MCO, not all of the learning outcomes that MOE has achieved for students are the same. For example, when students are only taught the core theory during online based learning, the learning outcome of the hands-on skills part may not be reached. However, if the MOE continues to aim for the same results as before the MCO, this may not be feasible. The teachers will state the obstacles and problems that may be a barrier to achieving various elements in the learning outcomes based on the questionnaire in this study. MOE will be more flexible in determining the requirements that are appropriate for the current scenario as a result of this.

1.4 Conceptual Framework

The whole research purpose is to determine the musculoskeletal disease among teachers during MCO. This research specifically focused on both primary and secondary school and purposely to study among the population of teachers. The data obtained may not represent the whole population of teachers in other part of Malaysia.

During the COVID-19 pandemic, the majority of teachers used online learning as a teaching strategy. For online teaching, the teachers will be working from home the majority of the time. Working from home poses numerous biological, chemical, physical, ergonomic, and emotional risks. Physical dangers, such as musculoskeletal disorders, are one of the risks mentioned in this study. In recent years, one of the global public health concerns linked with working from home during the COVID-19 epidemic has been musculoskeletal disease. It's difficult to pinpoint the most significant risk factors for musculoskeletal disease because there are so many. Teachers who handle teaching methods such as online learning, on the other hand,

encounter a lot of problems that might lead to musculoskeletal disease in order to successfully conduct their teaching method.

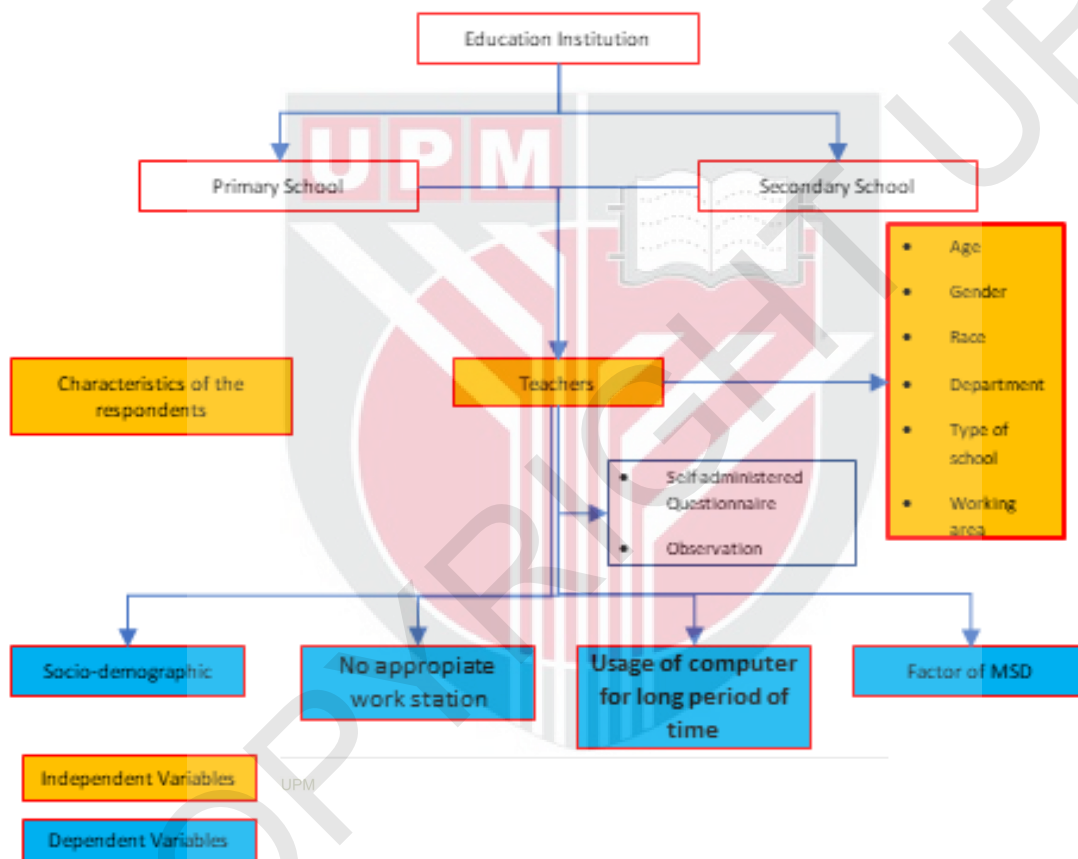


Figure 1.4 : Conceptual framework

1.5 Research Objectives

General Objective:

To conduct a literature review on the distribution of musculoskeletal disease(msd) among teachers working from home during the covid 19 pandemic and to identify the major risk factors associated with msd.

Specific Objectives:

- 1) To identify the factors on musculoskeletal disease among teachers.
- 2) To identify the distribution of musculoskeletal disease prevalence among teachers

1.7 Conceptual Definition

i. Teachers

- A person who helps students to acquire knowledge, competence or virtue. Informally the role of teacher may be taken on by anyone. (Teachers, n.d.).

ii. School

- An educational institution designed to provide learning spaces and learning environments for the teaching of students under the direction of teachers. Most countries have systems of formal education, which is sometimes compulsory. (School, n.d.).

iii. Online learning

- An education that takes place over the Internet. It is often referred to as “e- learning” among other terms. However, online learning is just one type of “distance learning”

the umbrella term for any learning that takes place across distance and not in a traditional classroom. (Online learning, n.d.).

iv. Movement Control Order

- Commonly referred to as the MCO or PKP, is a cordon sanitaire implemented as a preventive measure by the federal government of Malaysia in response to the COVID-19 pandemic in the country on 18 March 2020. (MCO, n.d.).

v. Musculoskelatal Disease

- Consist of signs and symptoms that will vary, depending on the severity of the injury, and may include pain or tenderness, redness or bruising, limited motion, muscle spasms, swelling and muscle weakness (MSD,n.d).

1.7.1 Operational Definition

i. Teachers

- Teachers were selected as respondents. The relationship between musculoskeletal disease and working at home among them during MCO were determined by the score obtain using standardized questionnaire.

ii. School

Primary and secondary school were chosen as the ground for this research. All academic activity was conducted in the school. Various department representing each to their own field to place teachers from various background.

i. Online learning

- Learning method that teacher that affected during Covid -19 and using online learning approach such as google meet, zoom meeting, webex etc.

iv. Movement Control Order

- Commonly referred to area which ground for this research. Closure of all kindergartens, government and private schools including daily schools, boarding schools, international schools, tahfiz centres and another primary, secondary and pre-university institutions were implement.

vi. Musculoskeletal Disease

- Any symptoms that lead to MSD occur when conducting online learning at home during MCO.

CHAPTER 2

LITERATURE REVIEW

2.1 COVID-19

The current SARSCoV-2 (coronavirus illness 2019; formerly 2019-nCoV) outbreak, which began in Hubei Province of the People's Republic of China, has spread to a number of other nations. Based on rising case notification rates in Chinese and worldwide locales, the WHO Emergency Committee declared a global health emergency on January 30, 2020. The case detection rate fluctuates on a daily basis and can be watched in near real time on the Johns Hopkins University website (Lana et al., 2020) and other forums.

China continues to face a huge burden of disease and mortality as of the middle of February 2020, although the incidence in other Asian countries, Europe, and North America has remained low thus far. Coronaviruses are enclosed, single-stranded big RNA viruses that infect humans and a variety of animals. Coronaviruses were first described in 1966 by Tyrrell and Bynoe, who cultivated the viruses from patients with common colds (Tyrrell & Bynoe., 1966).

The threat of COVID-19 became more evident in Malaysia when, on January 23, 2020, Singapore reported its first imported COVID-19 case from Wuhan, China, which was also the republic's first positive case. Eight close contacts were found in Johor, Malaysia, as a result of the first instance (Abdullah, 2020b). Malaysia reported their first COVID-19-positive case on January 25, 2020, less than 48 hours after the first case was reported in Singapore. (Abdullah, 2020c) This was an imported instance from Wuhan, China. Starting with the initial case, a total of eight positive cases were reported within six days. These cases were all brought in from China (Abdullah, 2020d).

The MOH Malaysia reported a total of 4,346 COVID-19 cases as of April 10, 2020, including 70 deaths and 1,830 recovered cases (MOH, 2020). Furthermore, the WHO predicted that the number of COVID-19 cases in Malaysia will rise exponentially, peaking in mid-April, prompting the government to prolong the MCO for another 14 days, until April 28, 2020 (Elengoe, 2020).

2.2 Musculoskeletal Disease

Musculoskeletal diseases (MSDs) are discomfort or injuries that affect the muscles, joints, tendons, ligaments, and nerves of the body. MSDs are mostly work-related and manifest themselves progressively over time. Working conditions and environment, as well as the nature of the work itself, can trigger these diseases (Mesaria S & Jaiswal N, 2015).

MSDs are one of the most common health issues among workers. MSDs have a severe influence on working people's quality of life, resulting in significant financial hardship to compensate for lost wages and costs (Hashim et al., 2010).

Workers quitting tasks, failing to attend work, and taking sick leave are all factors that contribute to decreased productivity at work. They may also have to pay a lot of money for medicine and treatment. According to the National Occupational Research Agenda (NORA) of the United States of America (USA), MSD is one of the major health issues because it is the leading cause of work-related illnesses in the country. According to recent estimates, the expenses of MSDs in the United States alone range from \$13 billion to \$54 billion each year (Mesaria S & Jaiswal N, 2015; Yue et al., 2012). Although the extent to which MSDs affect a country's economy varies, it is agreed that MSDs have a significant impact on a country's economy when considering lost productivity in the workforce, physical disability, and medical or non-medical expenses incurred either directly or indirectly (Constantino Coledam, Jnior, Ribeiro, & de Oliveira, 2018).

Working ergonomics is an important aspect that influences the prevalence of MSDs in the workforce. In the current situation, ergonomics has become a major concern in the workplace, as ergonomics have a significant impact on a worker's decision to retire (Schwerha et al., 2011). To adapt to the ever-changing population, industrially progressive countries are aggressively campaigning for longer working hours and a rise in the average age of workers. As a result, workers must suffer longer periods of exposure to the risks of poorly set employment. As a result, the incidence of MSDs has been rising in recent years in industrialised countries.

MSDs are the leading cause of physical disability in people under the age of 45, and the third most common cause of physical disability in people over 45. (McGeary, Mayer, Gatchel, Anagnostis, & Proctor, 2003). As a result, it is critical to properly coordinate work and create a workplace environment that can avoid the emergence of these disorders, allowing more workers to complete their work obligations until they reach retirement age (Silva, Barros, Cunha, Carnide, & Santos, 2016).

2.3 Movement Control Order (MCO)

The Malaysian government has been wary of Covid-19 since January 2020, when it issued a travel warning on the 25th of January after three Chinese citizens tested positive for the virus (Immigration Department of Malaysia 2020). Following it, a series of measures were implemented. The measures began with entry restrictions on certain foreign nationals, as well as self-quarantine of Malaysian and non-Malaysian citizens returning from Covid-19 hotspots, and ended with the passage and implementation of the Movement Control Order (MCO) (Immigration Department of Malaysia 2020; Ministry of Health 2020; Prime Minister's Office of Malaysia 2020a).

On March 18, 2020, a Movement Control Order (MCO) was implemented to help the Ministry of Health keep the spread and deaths under control. The MCO was about restricting

people's movement into and out of an area. The order was issued under the Prevention and Containment of Infectious Diseases Act 1988 and the Police Act 1967, according to the Director-General of the Ministry of Health, and would aid in the control of the virus's spread (Bernama, 2020b). This approach was essential since the situation in China had demonstrated that the pandemic could be contained by isolating sick persons and exercising social distance (WHO, 2020a).

On March 18, 2020, a Movement Control Order (MCO) was implemented to help the Ministry of Health keep the spread and deaths under control. The MCO was about restricting people's movement into and out of an area. The order was issued under the Prevention and Containment of Infectious Diseases Act 1988 and the Police Act 1967, according to the Director-General of the Ministry of Health, and would aid in the control of the virus's spread (Bernama, 2020b). This approach was essential since the situation in China had demonstrated that the pandemic could be contained by isolating sick persons and exercising social distance (WHO, 2020a).

Prior to its adoption, the MCO sparked significant mobility, with Malaysian citizens returning home. Such movements, together with other movements during the start of the MCO prior to stronger enforcement, typified by localised gathering at markets and vacation sites, enhanced the likelihood of Covid-19 transmission, which was connected to a 14-day spike in daily Covid-19 cases, peaking on March 26. (Salim et al. 2020). Following that, the MCO experienced more strict enforcement, with roadblocks being set up across the country and military troops being sent to help with MCO enforcement (Bernama 2020c). From April 1, all companies' operating hours were limited to 8 a.m. to 8 p.m., and all citizens were restricted to a 10-kilometer travel radius, with each household's travel for essential purchases limited to just one person at a time (Bernama 2020c). Inhabitants in regions identified as Covid-19 hotspots were subjected to tighter MCO, which included prohibiting permanent and temporary residents from leaving their houses and prohibiting non-residents from entering. The government donated food to those who were affected, and medical bases were established in those locations (Prime Minister's Office of Malaysia 2020d).

2.4 Working from Home

Work From Home (WFH) is now a dream for many people, particularly the current millennial generation, who do not have to get up in the morning, shower, and get ready to go to the office by avoiding the time-consuming traffic jams. Enough to put on improvised clothing and then open the laptop from home and go to work. The current state of the world The Covid-19 virus pandemic has been declared by the World Health Organization (WHO). Implementing Job From Home work systems, schools, and online lectures are just a few examples. This is a purposeful move by the government to halt the spread of the corona virus, which is becoming increasingly widespread. This approach has several benefits and drawbacks, particularly for workers. Some fields of work cannot be done from home, particularly because the company's

preparation with this WFH system is not always complete. For optimal outcomes, the recommendations for enterprises and businesses can employ a variety of programmes to assist Work From Home activities (Purwanto et al., 2020).

The move of many employees to work from home arrangements across occupations as a result of the Covid-19 pandemic has been one of the most visible shifts. Those from particular occupational groupings who had minimal experience working from home (e.g., teachers in primary school) were switched to such arrangements, while individuals from all occupations who opted not to work from home were suddenly required to do so. At the same time, other people in specific occupations saw a less dramatic change. Certain occupational groups (e.g., translators) have extensive experience with work from home arrangements, while individuals from all occupational groups have extensive experience working from home (Kramer, A., & Kramer, K. Z., 2020).

The Covid-19 epidemic is a major (unplanned) experiment for researchers and practitioners. Researchers may be able to answer two critical issues as a result of the widespread transition to working from home. First, are there any occupational groupings that previously rejected a broad-based working from home occupational structure and are now as productive as they were when they worked on-site? To put it another way, are there any occupational groups that were previously underutilised (in terms of productivity when working from home) but are now well-suited to working from home? Traditionalism, a lack of trust, the gender and age makeup of the occupational group, as well as a lack of interest and motivation, at the occupational level, to invest in the infrastructure required to work from home, may all contribute to occupational opposition to working from home (Kramer, A., & Kramer, K. Z., 2020). Will certain professional groups, however, find that working from home is better than they thought once it becomes a necessity?

The interaction between the worker and the sort of occupation is a second crucial subject. Is it true that some people are better suited to working from home in certain occupations? What influences the distribution of production within an occupational group given a specific occupational group? The answers to these questions can have a significant impact on how various occupational groups structure their work arrangements. It's possible that the nature of the job dictates the level of productivity that workers can achieve from home in some cases. When working from home, individual preferences, personality, and habits will have little impact on productivity occupational characteristics will overcome individual features and preferences. In other professions, the opposite may be true. When completing extremely identical work, individuals within a particular occupation will exhibit a large variance in productivity. Individual preferences, personalities, and behaviours, in other words, will have a substantial impact on workers' productivity within a given occupation individual qualities and preferences will trump occupational characteristics (Kramer, A., & Kramer, K. Z., 2020).

The interaction of professional and personal factors has significant research and application consequences. Moving to work from home arrangements may necessitate the selection of workers who are better suited to work from home, training of such workers on

more efficient remote work methods, and increased monitoring of the quality and productivity of those assigned to work from home when individual characteristics trump occupational characteristics. When occupational variables trump individual qualities, however, allowing individuals to work from home may be based on the average level of productivity at home versus at work, and will not necessitate much selection, training, or monitoring (Kramer, A., & Kramer, K. Z., 2020).

2.5 Problem Faced by Teachers During MCO

Teachers were supposed to be able to use online learning tools right away during the abrupt shift to online education (Zhang et al., 2020). Teachers, on the other hand, indicated a lack of knowledge and abilities in converting offline (hardcopy) materials to online (softcopy) materials and sharing them on online platforms. Due to a lack of experience in online teaching, teachers lacked online teaching skills. As a result, they had difficulty producing teaching materials that could accommodate students of various levels, devising appropriate approaches for all students, and planning synchronous classes. Izhar et al. (2021) stated that online teaching necessitates extensive preparation, stating that "teacher knowledge of using online resources is insufficient." She also stated that she spent a significant amount of time preparing for her lessons, stating that "need to take a long time in preparing the materials". Her experience was comparable to that of Izhar et al. (2021), who stated that online teaching was difficult because teachers had little experience using online platforms to educate before the school shutdown.

Effective lesson delivery depends on the capacity to integrate technology, material, and pedagogy based on knowledge and abilities. As a result, these abilities and knowledge are critical for teachers in today's world. Technology Pedagogy Knowledge (TPK) is a teacher's understanding of specific techniques that complement the teaching of the subject matter, according to Koehler, Mishra, and Cain (2013). Technology Content Knowledge (TCK) is the understanding of specific techniques that complement the teaching of the subject matter. "I need to design my teaching and learning with simpler and easy to follow," Izhar et al. (2021) noted in this regard. Teachers, on the other hand, faced difficulties when they were unable to provide learning platforms with appropriate lesson designs and plans. "I am lacking in skills to provide learning resources such as using video with the lesson plan for the teaching and learning process on the online platforms," said one teacher (Izhar et al., 2021). Switching from T&L sessions in real classrooms to online T&L was difficult, especially for new teachers. Despite the fact that the majority of people own internet-connected devices such as smartphones, it is impossible to presume that individuals are technologically literate, let alone capable of teaching with technology. According to data released by the Malaysian Department of Statistics (2020), 97.1 percent of internet users in Malaysia consider social interactions to be their primary internet activity, 84.7 percent download images, videos, music, and games online, and 83.5 percent use the internet to find information about goods and services (Department of Statistics Malaysia, 2020). In conclusion, this study shows that the internet is rarely used for academic purposes.

The most commonly stated difficulty that impedes the smooth flow of online T&L sessions appears to be access to technology. Limited internet access owing to an unreliable internet connection, slow internet, and insufficient data for individuals who use mobile data are just a few of the issues that have arisen as a result of this theme. Because online teaching and learning necessitates regular synchronised and asynchronous communication (Akbulut, ahin, & Esen, 2020; Awang et al., 2018), it is critical to investigate this issue. Lessons will be less effective if your internet connection is unreliable. Unreliable devices or gadgets, on the other hand, are another barrier to online T&L, even if the internet connection is stable (Sadeghi, 2019). To ensure the continuance of education utilising online learning platforms, quality technical infrastructure should be prioritised, as recommended by UNESCO and the OECD (UNESCO, 2020; Reimers & Schleicher, 2020). However, since the implementation of VLE-Frog as a learning management system, this issue has not been adequately rectified (Ramli & Saleh, 2019; Awang et al., 2018).

The most common obstacle identified by Zhang et al. (2020) and Akbulut et al. (2020) in their separate studies was access to technology. Large quantities of users cause online learning systems to get overwhelmed and crash, according to Zhang et al. (2020). Furthermore, areas with difficult topographical features, such as mountains and rural areas, often have limited or no access to technology. Izhar et al (2021) stated in this study that she faced “....slow or sometimes no internet access” while preparing for online classes. The fact that not everyone has access to the internet or computers, as stated by Akbulut et al. (2020), renders online education unfair. For example, Izhar et al. (2021) explored the suitability of using an asynchronous way of teaching: ‘I need to think about the right approach and platform to utilise so that it doesn't stress my pupils and they can easily access the information’. For example, I do not believe video conferencing is appropriate for Malaysian school pupils because not all families can afford to supply their children with a mobile phone. As a result, some parents are forced to lend their phones to their children. So I'll have to set aside some time to conduct some preliminary research on which platform is most suited for that particular course’.

“Delivering content knowledge is the hardest part,” according to Izhar et al (2021). Students have a bad habit of not reading before class. Even when I tell them to read, they refuse. It is not a good idea to give a lecture on team meetings. In general, I don't believe I know how to plan an excellent synchronise lesson”. Aside from that, the school's administration has expressed its support by making the lesson plan easier for instructors. ‘Management requested us to make daily lesson plans based on school timetables where only notes are required and flexible time is available,’ according to Izhar et al (2021). Difficulties in designing online T&L were described as “difficulties in planning and designing interesting activities that attract students' interest,” implying that online teaching necessitates a specialised skill set in terms of how to teach, how and when to use synchronous, asynchronous, or both teaching strategies, preparing and designing a lesson, gathering feedback, and reflecting lessons taught (Martin, Budhrani, Kumar, & Ritzhaupt, 2019a; Abdous, 2011).

Despite the fact that the Ministry of Education has made numerous online learning platforms available, such as Digital Textbook, EduwebTv, and CikgooTube, a lack of adequate materials has been identified as one of the challenges, as the majority of the materials are in hardcopy and located in schools. “Some of the documents are in hardcopy,” Izhar et al (2021) complained. And I couldn't reach them because they were at school while I was at home,” says the narrator. Teachers also confront the issue of locating materials that are compliant with school curricula and adequate for students' understanding levels. For instance, ‘finding appropriate learning materials for every level of pupils is quite a struggle as most are at school,’ (Izhar et al., 2021), and ‘limited teaching resources because much of it is worldwide syllabus,’ (Izhar et al., 2021). (Izhar et al., 2021).

2. 6 Prevalence of MSD

According to a recently released Scottish study by Maguire & O'Connell (2007), the most common grounds for ill-health retirement among teachers were 37 percent mental diseases and 18 percent musculoskeletal ailments.

In terms of musculoskeletal diseases, the prevalence of confirmed musculoskeletal symptoms and disease in the upper back, shoulders, neck, upper limbs, wrists, hands, lower back, lower limbs, feet, ankles, and knees was more than 30%. The physical anatomical areas with the highest disability rate include the upper back, shoulders, lower back, and knees (Constantino Coledam et al., 2018).

According to Paixo Cardoso Isadora de Queiroz Batista Ribeiro II et al. (2009), the frequency of discomfort was determined to be 41.1 percent in the lower limb area, 23.7 percent in the upper limb area, and 41.1 percent in the lower back part in a study including 496 instructors. Gender, age, degree of education, years of teaching experience, marital status, total number of offspring, and MSD manifestation were all found to be positively related (Paixo Cardoso Isadora de Queiroz Batista Ribeiro II et al., 2009).

Teachers were found to have a wide range of pervasiveness rates of lower back pain (LBP) throughout the working groups, ranging from the United States of America (61%) to China (59.2%), Brazil (53.3%), and Japan (53.3%). (17.7 percent). Several studies have found that teachers are at a higher risk of developing back discomfort than the general population (Atlas et al., 2007; Chong & Chan, 2010; Grant, Habes, & Tepper, 1995). Another study based on the Modified Oswestry Low Back Pain Disability questionnaire discovered that teachers had back pain with a minimum disability (14.5%), moderate disability (49.4%), serious disability (6%), crippling disability (6%), and being confined to bed (5 percent) (Atlas and colleagues, 2007). Lack of back support, extended standing and sitting, static body posture, and the prevalence of lower back discomfort were all found to have statistically significant positive

associations (Yue et al., 2012). Due to the numerous procedures used, the ambiguous working definition of lower back pain, the imprecise occurrence periods, the array of research samples, and the various research sample quantity, differences in the pervasiveness rate of lower back pain among teachers may also exist (Mohseni Bandpei et al., 2014).

According to Mohseni Bandpei et al., (2014), LBP occurrence rates were 21.8 percent, 26.3 percent last month, 29.6 percent last six months, 31.1 percent yearly, and 36.5 percent lifetime. In comparison to elementary school teachers (11.9 percent, 18.9 percent), high school teachers were found to have a greater point and lifetime prevalence (31.66 percent, 54.23 percent), and they are more prone to acquire LBP ($P < .05$). Long periods of sitting (27.4 percent) standing for long periods of time (25.2 percent) Working with computers for lengthy periods of time (24.3%) and grading test papers (15.5%) were shown to be the two most important factors contributing to LBP in teachers. Female instructors appear to be more affected than male teachers, according to research, however the difference was not statistically significant ($P = .26$). In comparison to younger instructors, older teachers appeared to be more likely to suffer from LBP ($P = 0.00$). Furthermore, BMI has a favourable correlation with the occurrence of LBP ($P = 0.01$). Teachers who were obese or overweight had a higher chance of developing LBP than teachers who had a normal BMI ($P = 0.05$). Work satisfaction shows a favourable correlation with the occurrence of LBP ($P = 0.05$). Teachers who are dissatisfied with their jobs are more likely to develop LBP than teachers who are satisfied with their jobs ($P = 0.001$). Furthermore, the number of years and duration of employment could be a factor in the occurrence of LBP in teachers. Teachers with more than 20 years of experience were shown to have a higher chance of developing LBP ($P = 0.001$). Long periods of time spent in unfavourable teaching environments can result in the development of LBP. Short interval breaks and active engagement in physical activities are the most efficient management and prevention of LBP among teachers, according to studies (Mohseni Bandpei et al., 2014).

Neck pain is one of the most common types of MSDs among teachers when compared to other working groups, according to numerous studies (Cetisli Korkmaz et al., 2011; Chiu & Lam, 2007; Chong & Chan, 2010; Darwish & Al-Zuhair, 2013; Yue et al., 2012). Neck pain was observed to affect 60% of teachers in Hong Kong (Chiu & Lam, 2007), 57 percent in China (Chiu et al., 2006), 44 percent in Sweden (Fjellman-Wiklund & Sundelin, 1998), and 43 percent in Turkey (Fjellman-Wiklund & Sundelin, 1998). (Cetisli Korkmaz et al., 2011; Ehsani et al., 2018). Female instructors are also more likely than their male counterparts to suffer from neck pain (Cetisli Korkmaz et al., 2011).

2.7 Factors Contribute to MSD Problems

Long periods of standing and sitting are recognised as risk factors for developing MSDs in various working situations and conditions of school teachers (e.g., teaching a class, evaluating students' work, assessing examination papers, and doing computer-related tasks) (Paixo Cardoso Isadora de Queiroz Batista Ribeiro II et al., 2009).

Teachers are responsible for a variety of tasks that can result in physical health issues. Although a teacher's primary responsibility is to teach their pupils, their workloads also include arranging courses and exercises, evaluating students' work, and participating in a variety of activities such as competitions, crafts, and games. Teachers must also participate in a variety of school committees. Most instructors will suffer physical and mental health problems as a result of these rigorous activities (Mesaria S & Jaiswal N, 2015).

The majority of schools use non-adjustable chairs, tables, and equipment that do not fit children and teachers of varied sizes, resulting in poor body posture and negative physical health problems with long-term effects on musculoskeletal health and development (Mesaria S & Jaiswal N, 2015).

Instructional is frequently done in bad conditions, requiring teachers to actively use their physical, mental, and emotional abilities to achieve teaching objectives. These job conditions are demanding and necessitate an overabundance of effort on their psychological functions (Paixão Cardoso Isadora de Queiroz Batista Ribeiro II et al., 2009). A significant number of teachers are also dealing with psychosocial issues as a result of their unfavourable working environment on a daily basis (Cezar-Vaz, Bonow, Almeida, Rocha, & Borges, 2015).

As established in the previous studies, an unfavourable working environment can play a role in the development of MSDs. As a result of long hours of exposure to these hazardous working settings, health concerns may arise. Overexertion of physical energy, such as standing in an upright posture for up to 95% of the teaching hours, head-down posture when writing reports or checking students' work, and regular lifting of large loads are all examples of unfavourable working conditions for teachers. Teachers also have to deal with another physically demanding job that requires them to elevate their hand above shoulder level for lengthy periods of time, which has been linked to upper body, shoulder, and neck pain. All of the criteria listed have a biomechanical basis for being potential risk factors for musculoskeletal pain (Chiu & Lam, 2007; Miranda et al., 2002; Paixão Cardoso Isadora de Queiroz Batista Ribeiro II et al., 2009). Repetitive strain injuries (RSIs), a type of MSD that affects the upper

limb, lower back, shoulder, and neck area, can be caused by repetitive duties and prolonged static posture in a teacher's job (Yue et al., 2012).

Significant connections were discovered between teaching level, BMI, and the presence of lifelong disease, all of which contribute to the occurrence of MSDs in instructors (Ehsani et al., 2018). The current study found that age, gender, overall health, length of employment, lack of physical activity, and job satisfaction were all significant and important factors in the development of neck discomfort among teachers. Furthermore, the findings suggested that certain working conditions, such as long periods of time spent working with computers or grading examination papers that need head down positions, are associated with a higher risk of developing neck pain in teachers (Ehsani et al., 2018).

CHAPTER 3

METHODOLOGY

The systematic mapping study developed by Petersen et al. (2008) was chosen as a model for this study's research technique. The goal of a systematic mapping study is to provide an overview of a certain area, determine whether there is research evidence, and measure the quantity of evidence available that matches our goal of MSD studies. Kitchenham and Charters (2007) guidelines for systematic review were also employed to find relevant studies papers. The research sources, as well as the inclusive and exclusive criteria used to choose studies for review, will be reviewed, followed by a discussion of the papers that were chosen. The process of systematic mapping study is shown in figure 3.1.

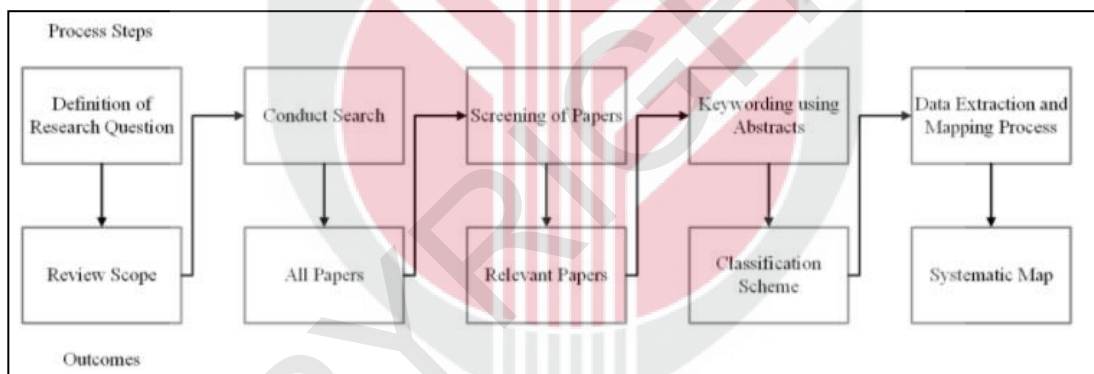


Figure 3.1: The systematic mapping study process where there are 5 process steps and outcomes (Petersen et al., 2008)

3.1 Definition of Research Questions

The aim of the study is aims to confirm the link between musculoskeletal disease and working from home among teachers, as described in the literature as a result of the COVID-19 outbreak. Hence, 4 research questions are listed.

- i) What are the work postures and movements that need to be done at home?
- ii) How repetitiveness and pace of work affect the productivity?
- iii) Is there any association between working at home and present of MSD?

3.2 Data Sources and Search Strategy

The second phase of mapping study is to search for all related research papers on the subject which is the musculoskeletal disease. A search protocol specifies the technique to be used to perform a detailed systematic search of literature. A predefined protocol is required to reduce the potential of research bias.

A search protocol were developed that we used to collect all the papers related to our research subject in scientific databases. After pilot searches we selected the terms used in the search string, where we tested possible keywords. We chose several keywords as most of the papers could not met all of this study objective. Each of the keywords represents specified information that is required for this study review. The following were search terms or keywords used scientific bases:

- musculoskeletal disorders among teacher OR lower back pain * OR risk factor of musculoskeletal disorders OR prevalence musculoskeletal disorders (articles referring to musculoskeletal disorders)
- work at home among teacher OR work at home during MCO *OR work at home during covid-19 (articles related to situation working among teacher)
- work-related musculoskeletal OR activities that effect musculoskeletal (articles related to action-related musculoskeletal)
- Impact of Prolonged standing posture to MSD *OR Impact of frequency of computer use to teacher (articles related and explaining about unsuitable posture)

After the search protocol were created and proved, we selected the scientific databases for the searches. The review focuses on high-quality peer-reviewed papers that have appeared in related conferences, seminars, symposia, books, and journals. Three scientific search engines were used namely Google Scholar, Mendeley and Scopus. The search was limited to research articles published between the years 2019 and 2021. There were a few exceptions to utilising papers from previous years, particularly when it came to definitions and associated words, which several research cited.

3.3 Study Selection and Screening phase

A process inspired by (Denyer, D., & Tranfield, D., 2009) was used to screen the admissible papers. At the first stage, the papers were screened based on the titles and exclude studies that were not relevant to the research topic. For example, articles related musculoskeletal disease but does not involved any other chronic disease and only occur during Movement Control Order. These papers were obviously out of this mapping study's reach, which was good reason to ruled them out. However, in some situations, establishing the article's relevance based on the paper's names proved problematic. In this instance, we move on to the next level of the process, when the document will be read further.

3.4 Define Eligibility Criteria

For the next phase, the abstracts of each paper that passed the preceding phase were revised. Papers with these criteria were ruled out from the review; (1) papers without full text availability, (2) papers where the main language was not English, (3) paper from 2018 and below and (4) have chronic disease. For the inclusion criteria, we only choose studies that include fulltime teachers as their subject. Of all the MSD paper, research from 2019 to 2021 were preferably selected. This review also included studies that using the Nordic Musculoskeletal Questionnaire (NMQ), Cornell questionnaire, self-administered questionnaire as well as any other tool for musculoskeletal disease.

3.5 Data Extraction

For this study review all the primary papers that have been selected were classified based on the research questions which related to the objective of this study. For every research objective, 10 studies were chosen to be review. Some of the selected papers did not fully meet the inclusive criteria where it only addressed to some of the objectives. For example, some of the paper include musculoskeletal disease but not occur during Movement Control Order. In addition, there is limited number of papers related to musculoskeletal disease that carried out any test or discussing about relation working at home among teacher which is also one of this research objectives.

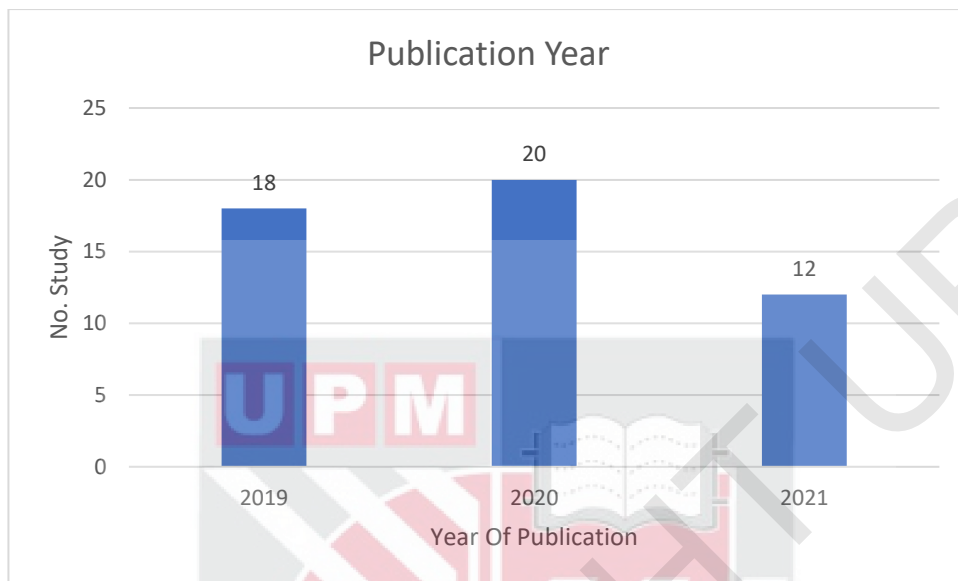


Table 3.1: Number of Study by Year

CHAPTER 4

RESULTS

4.1 Yield of literature search

A total of 50 potential articles were found in this initial search. The relevant literature for this project were identified using the keywords as the following: school teachers, prolonged standing, musculoskeletal disorders, work-related musculoskeletal disorders, prevalence, risk factors of MSDs, work at home, Movement Control Order. Literature found was documented after a complete literature search of three electronic databases using google scholar, Mendeley and Scopus. Studies that were not conducted in Malaysia, did not have full texts accessible, were done in languages other than English, and were irrelevant were all filtered out of this review using the database's filtering tool. Other publications that did not appear in the search engine databases were found in the reference lists of each study from the remaining records. One reviewer screened the list of literature that met the criteria based on the title, abstract, keywords, and statement in the eligibility criteria. Irrelevant studies, duplicate publications, and review papers were all eliminated.

Out of 50 potential articles, 20 were excluded based on the inclusion and exclusion criteria. The remaining 38 articles were screened based on their titles, abstracts, and keywords. This screening process yielded 8 articles which met the eligibility criteria. The relevant data of each study including the authors, year of the study, study population, sample size, methodology or

instrument used, prevalence, and risk factors were recorded. Figure 1 represents the process flow of the literature search which took place in this project.



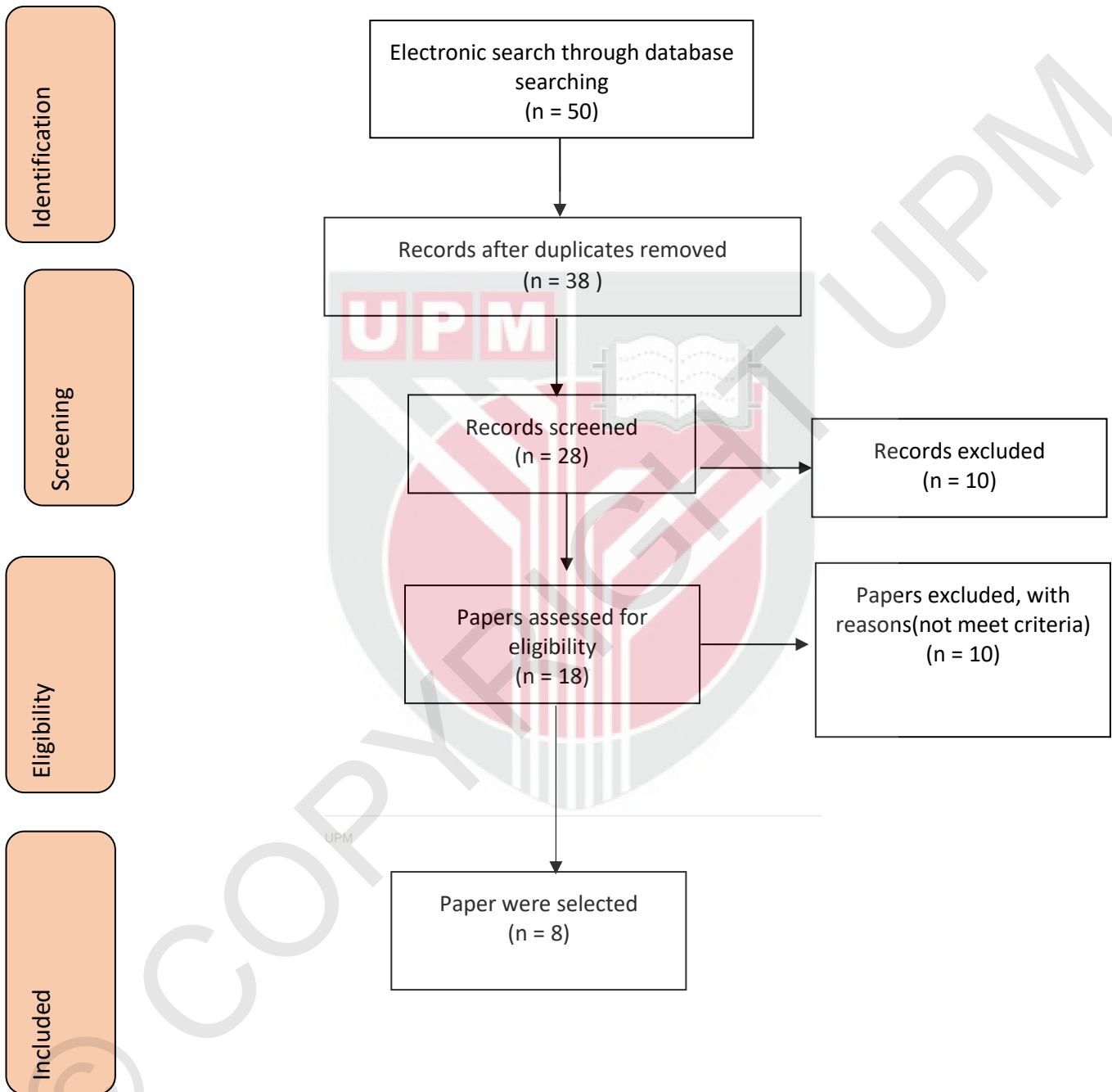


Fig 4.1 Flowchart for Relationship Between Musculoskeletal Disease and Working At Home Among Teachers During MCO

4.2 Results of the literature search

The total 8 articles found from the literature search were then evaluated to elaborate on its findings. The literatures covered in this study were published between 2019 and 2021. One study was conducted in Philippine (Asia continent) (Amit et al., 2020), one in Spain (Europe continent) (Leirós-Rodríguez et al., 2020), three studies in Malaysia (Asia continent) (Ng et al., 2019; Ming et al., 2020; Alias et al., 2020), one study in India (Asia continent) (Karingada et al., 2021), one study in Iran (Asia continent) (Karimian et al., 2020) and Brazil (America continent) (Kraemer et al., 2020). Six of the studies were cross-sectional, while the one were quantitative descriptive exploratory while one was a semi-experimental study.

The study Amit et al., (2020) was conducted on 200 public school teachers in the secondary level from Calbayog City division, Samar Province, Philippines. Two studies namely the study by Ng et al., (2019) and Alias et al., (2020) conducted in Kuala Lumpur and Terengganu, Malaysia. For Ng et al., (2019), during a 6-month period, the researchers measured how common MSD was among teachers at 15 primary schools in Kuala Lumpur. For Alias et al., (2020) the goal of this study was to find out how common MSDs are among female teachers in Terengganu primary schools, as well as the risk factors that come with them.

In the study by Ming et al., (2020), the researchers determined the frequency of MSDs as reported among teachers, as well as gender differences and the interaction of associated predictors. Another goal of the study was to look at the role of these predictors, which had not been properly

investigated before, particularly in Malaysia. This study was conducted using a cross-sectional survey and data was collected from primary school teachers in Kota Kinabalu.

The study Kraemer et al., (2020), researcher focus on assess musculoskeletal discomfort and ergonomic risk factors in the workplace of teachers at the Instituto Federal Catarinense's So Bento do Sul Campus. In this study, a quantitative descriptive exploratory study was done.

For Karingada et al., (2021), the goal of this study is to look into MSD connected to online learning. The current study was a cross-sectional study involving Indian students enrolled in undergraduate courses at a prestigious university in India. A cross-sectional study was planned to show the prevalence of the MSD-online learning link. MSD symptoms in the head, eye, neck, and right elbow change significantly between students wearing spectacles and those who do not wear spectacles for medical reasons following online studying.

The study Karimian et al. (2020), was to determine the relationship between upper-extremity musculoskeletal disorders and upper cross syndrome (UCS) in teachers, as well as the benefits of NASM exercises and ergonomic intervention on their musculoskeletal problems. Among 269 instructors, the Nordic Questionnaire was used to assess the prevalence of musculoskeletal problems, and the New York Test was utilised to assess the prevalence of UCS. Among those who were tested, 23 people were chosen as the study's sample, and they were then separated into two groups: one for the experimental group and one for the control group. The current study is a semi-experimental study. The current study has a quasi-experimental design. This study's statistical population covers all primary school teachers who work in Fasa City's schools.

In Alias et al. (2020), the goal of this study was to find out how common MSDs are among female teachers in Terengganu primary schools, as well as the risk factors that come with them. In recent

years, musculoskeletal disorders (MSDs) have become a well-known occupational health issue for employees, with a particularly high frequency among school teachers. Few research in Malaysia focus on MSDs and associated factors among school teachers, but there is no data for MSDs among school teachers in Terengganu. The goal of this cross-sectional study was to determine the prevalence of musculoskeletal diseases (MSDs) and related risk factors among female primary school teachers in Terengganu.

The summary of the background of the selected studies is as presented in Table 1. The table is organised according to variables such as authors, country, study design and population of study.

Table 4.1 summarised the background of eight studies published covering on the relationship between musculoskeletal disease and working at home among teachers.

Reference	Location	Title	Sample	Methodology	Study Design
Ng, Y. M., Voo, P., & Maakip, I. (2019).	Kuala Lumpur, Malaysia	Psychosocial factors, depression, and musculoskeletal disorders among teacher	Primary school teachers in 15 primary schools in Kuala Lumpur, with a cluster size of 60 teachers from 15 primary schools; 367 primary school teachers participated in the study.	The Cornell Musculoskeletal Disorder Questionnaire (CMSD) was used to assess the level of musculoskeletal discomfort.	A cross-sectional study.
Amit, L. M., & T MALABARBAS, G. (2020).	Samar Province, Philippines	Prevalence and Risk-Factors of Musculoskeletal Disorders Among	200 public school teachers in the secondary level from	The English version of the musculoskeletal symptom questionnaire	A cross-sectional study.

		Provincial High School Teachers in the Philippines	Calbayog City division, Samar Province, Philippines.	developed by the Korea Occupational Safety and Health Agency (KOSHA) was used as the diagnostic tool.	
Leirós-Rodríguez, R., Rodríguez-Nogueira, Ó., Pinto-Carral, A., Álvarez-Álvarez, M., Galán-Martín, M. Á., Montero-Cuadrado, F., & Benítez-Andrades, J. A. (2020).	Spain	Musculoskeletal Pain and Non-Classroom Teaching in Times of the COVID-19 Pandemic: Analysis of the Impact on Students from Two Spanish Universities	31,293 students: 18,650 students from the Universidad de Valladolid and 12,643 students from de Universidad de León.	The main instruments used for measuring were the Standardized Kuorinka Modified Nordic Questionnaire and the Perceived stress scale (the questionnaire regarding the practice of physical activity).	A cross-sectional study.
Ming, N. Y., Kiong, P. V. S., & Maakip, I. (2020).	Kota Kinabalu, Sabah	Predictors of Musculoskeletal Disorders Among Teachers: An Exploratory Investigation in Malaysia	60 teachers from 10 primary schools in Kota Kinabalu.	To measure the incidence of MSDs, participants were asked if they had experienced discomfort toward the end of their workday in the past six months, with a yes or no response (Oakman et al., 2014).	A cross-sectional study.
Karingada, K. T., & Sony, M. (2021).	India	Demonstration of the relationship	261 students participated in	Self-reported MSD scales were used	A cross-sectional study.

		between MSD and online learning during the COVID-19 pandemic	this online survey. An online web-based questionnaire randomly sent to 700 students out of 1120 students. The data was collected between 15th July and 10th August 2020.	because it enables easy collection of data. Self-reported MSD scales are used even in clinical studies, thus, depicting the accuracy (Spielholz et al., 2001; Stoveret al., 2007)	
Kraemer, K., Moreira, M. F., & Guimarães, B. (2020).	São Bento do Sul Campus of the Instituto Federal Catarinense, Brazil	Musculoskeletal pain and ergonomic risks in teachers of a federal institution	The sample consisted of 25 teachers, 18 of whom (72%) were male while 7 (28%) were female.	The 12-month prevalence of musculoskeletal pain was assessed using the Nordic Musculoskeletal Questionnaire (NMQ), originally developed by Kuorinka et al.	A quantitative descriptive exploratory study.
Karimian, R., Rahnama, N., Ghasemi, G., & Lenjannejadian, S. (2020).	Fasa, Iran	Association between Upper-extremity Musculoskeletal Disorders and Upper Cross Syndrome among Teachers, and the Effects of NASM Corrective Exercises along with Ergonomic Intervention on their Upper-extremity	269 teachers. Among those tested, 23 participants were identified as the sample of the study, and then they were divided into an experimental group.	The Nordic Questionnaire was used for determining the prevalence of musculoskeletal disorders and the New York Test was used for determining the prevalence of UCS among 269 teachers.	A semi-experimental study.

		Musculoskeletal Disorders			
Alias, A. N., Karuppiah, K., How, V., & Perumal, V. (2020).	Terengganu, Malaysia	Prevalence of musculoskeletal disorders (MSDS) among primary school female teachers in Terengganu, Malaysia	A total of 212 female school teachers in 6 primary school in the district of Dungun, Terengganu participated in this study.	Standardized Nordic Musculoskeletal Questionnaire (NMQ) were used to assess general musculoskeletal system health problems at different positions in the body over the last 12 months and seven days.	A cross-sectional study.

4.3 The methodology and tools used in the literature found

The study Ng et al., (2019) was a cross-sectional study to understand the relationship between psychosocial factors, depression, and musculoskeletal disorders among teachers. The level of musculoskeletal discomfort was measured using the Cornell Musculoskeletal Disorder Questionnaire (CMSD). The CMSD is a 54-item questionnaire that includes a body map diagram and questions concerning the frequency of musculoskeletal soreness, pain, or discomfort in 18 different body locations throughout the past week.

The study by Kraemer et al., (2020) was a quantitative descriptive exploratory study to investigate the Musculoskeletal pain and ergonomic risks in teachers of a federal institution in Brazil during the period of the COVID-19 pandemic. The Nordic Musculoskeletal Questionnaire

(NMQ), first created by (Kuorinka et al.) and later translated and validated for use in Brazil, was used to determine the 12-month prevalence of musculoskeletal pain. The National Memory Questionnaire (NMQ) is a self-administered questionnaire that includes a body map divided into nine anatomical regions.

The study by Amit et al., (2020) in Philippine was a cross-sectional which survey took place in Calbayog City, Samar Province, Philippines, from October to December 2015. The diagnostic instrument was the English version of the Korea Occupational Safety and Health Agency's (KOSHA) musculoskeletal symptom questionnaire. The National Institute for Occupational Safety and Health provided the inspiration for this MSDs diagnostic questionnaire (NIOSH).

The study by Alias et al. (2020) found that musculoskeletal disorders and symptoms of discomfort/pain in school instructors as a significant health issue. The goal of this cross-sectional study was to determine the prevalence of musculoskeletal diseases (MSDs) and related risk factors among female primary school teachers in Terengganu. A self-administered questionnaire, standardized Nordic Musculoskeletal Questionnaire (NMQ) and assessed general musculoskeletal system health problems at different positions in the body over the last 12 months and seven days were used in the study.

4.4. Prevalence of Musculoskeletal Disorders

For Ng et al., (2019) a six-month point prevalence of MSD was 80.1 percent (95 percent CI: 75.8–84.2 percent), with 80.5 percent of female teachers and 77.5 percent of male teachers experiencing pain in the previous six months. The most experience MSD amongst participants was on their wrist (93.2%), followed by thigh (91.8%), upper arm (91.3%) and lower leg (90.5%).

The wrist was the location where participants had the greatest MSD (93.2%), followed by the thigh (91.8%), upper arm (91.3%), and lower leg (91.3%). (90.5 percent).

In the study by Amit et al., (2020) it was found that the overall prevalence of musculoskeletal discomfort was reported to be 74.5 percent, with the highest prevalence in the legs (56.5 percent) and lower back (56 percent). There were significant differences in MSD prevalence across age groups ($P= 0.032$) and salary categories ($P= 0.045$). Teachers in secondary public schools in the Philippines had a high rate of musculoskeletal ailments, implying that school administrators, curriculum and policy makers, and other stakeholders should improve their working conditions.

For Leirós-Rodríguez et al., (2020), it was found that the prevalence of musculoskeletal pain increased for the entire sample and in both sexes in the rachis (cervical dorsal and lumbar regions), despite the fact that they were reduced in the total calculation. The prevalence of dorsal pain increased significantly in both the entire sample and the subgroup of women ($p = 0.01$, in both cases). The number of participants experiencing pain in other parts of the body, on the other hand, reduced during the lockdown compared to the previous year, with the exception of women with discomfort in both shoulders, which increased ($p = 0.03$). In the sample of men and women, there was a reduction in the prevalence of musculoskeletal discomfort ($p 0.001$), an increase (12.5 percent) in the frequency of physical activity from moderate to frequent, and a preference for strength training (15.1 percent), notably among women.

In Ming et al., (2020), MSDs were shown to be prevalent in 61.7 percent of female and male teachers (95 percent CI: 57.4 percent – 65.9%), with both female and male instructors expressing discomfort in the previous six months, which was similar to other Malaysian studies. Participants reported the greatest MSD discomfort in their neck/shoulder (56.5%),

followed by hips, bottom, legs and feet (lower limb) (48.9%), middle to lower back (48.4%), arms (40.7%), and finally hands/fingers (40.7%). (36.5 %). Primary school teachers' MSDs were based on the level of discomfort by body area. The most severe discomfort described by teachers was in the neck/shoulder region (14.6 percent), but many (14.6 percent) said they experienced a moderate level of MSDs in the neck/shoulder region (37.8 %). Teachers reported mild MSDs in their hips, bottoms, legs, and feet (lower extremity).

For Karingada et al., (2021) it was found that since the beginning of online studying, approximately 80% of students have reported some MSD symptoms in the head, neck, and eyes. MSD symptoms were reported by 58 percent in the right shoulder and 56 percent in the right-hand fingers. MSD symptoms were milder on the left shoulder, arm, and fingers than on the right. Furthermore, due to online education, more than 40% of students developed MSD symptoms in practically all body areas evaluated. Previous research has found that the prevalence of MSD differs between males and females. Since beginning online studying, approximately 80% of students have reported some MSD symptoms in the head, neck, and eyes. MSD symptoms were reported by 58 percent in the right shoulder and 56 percent in the right-hand fingers.

In study by Kraemer et al., (2020) it was found that shoulder pain is more common among computer users. The findings also revealed that 75 to 100 percent of instructors with shoulder pain worked 10 to 15 hours per week and spent 60 to 100% of their time outside the classroom on a computer. According to the NMQ, 100 percent of instructors have experienced discomfort in the previous 12 months. The low back (60%), neck (56%), shoulders (48%), upper back

(40%), wrists/hands (32%), hips/thighs (28%), knees (24%), ankles/feet (20%), and elbows were the most commonly affected locations (8%).

In Karimian et al. (2020) it was found that the prevalence rate of musculoskeletal problems was 53% for the neck, 41% for the shoulders, 39% for the back, and 43% for UCS. The test revealed a statistically significant link between upper-extremity musculoskeletal problems and the UCS ($p < 0.05$). Furthermore, after providing the therapies, the participants' intragroup and intergroup results demonstrated a substantial decrease in musculoskeletal problems of the neck, shoulders, and back ($p < 0.05$). Furthermore, a high majority of these diseases were related to the nature of the participants' jobs, with 60% of instructors reporting that working in such an atmosphere was the greatest risk factor for inducing upper-extremity musculoskeletal illnesses.

In the study by Alias et al. (2020) the findings demonstrate that MSDs are prevalent in 40.1 percent of the population in all areas of the body. Feet were the most affected portion of the body, accounting for 32.5 percent during the last year and 36.8 percent in the last seven days. Hands (9.9% and 12.7%), elbow (10.4 percent and 13.2%), arm (11.3 percent and 11.8 percent), and thigh (11.3 percent and 11.8 percent) were the least afflicted body parts in the last 12 months and 7 days (18.4 percent and 20.3 %). the incidence of related risk factors in various bodily areas A chi-squared test was used to visualise the connection between risk variables and the prevalence of musculoskeletal illnesses in different areas of the body. The frequency of lower back, hands, knee, thigh, calf, and foot among teachers was significant, according to the findings.

4.5 Risk factors for Musculoskeletal Disorders

In terms of socio-demographic risk factors, in the study by Ng et al., (2019) it was found that obese teachers with a high BMI had a higher prevalence of upper limb problems than non-obese educators. In terms of occupational factors, longer teaching experience was linked to a lower prevalence of musculoskeletal illnesses (duration of employment). Educators who were exposed to ergonomic risk factors such as extended standing, extended sitting, computer use, stair climbing, and dealing with loads had a greater prevalence of musculoskeletal illnesses.

In the study Kraemer et al., (2020), the main ergonomic risk factors identified in this study were, sharp edges on work desks, use of a laptop touchpad instead of a mouse and inadequate screen height (upper edge of the monitor below eye level).

In Amit et al., (2020) awkward work postures, repetitive and inappropriate postures were linked to MSDs. MSDs were also linked to advancing age.

In Leirós-Rodríguez et al., (2020), constant labour with electronic gadgets were found to be linked with increased pain at the shoulders.

In Ming et al., (2020), physical effort and repeated processes (sitting or standing), head down positions, frequent carrying of heavy weights, and many hours working with the hands raised are all physical variables that contribute to the development of MSDs in teachers.

In Karingada et al., (2021) it was found that online time poses a significant threat to emotional and physical health since it leads to a shift away from vigorous leisure pastimes and recreational sports and toward a sedentary lifestyle. The number of hours a student spent online learning each day was linked to MSD symptoms in the head, eye, neck, left shoulder, left-hand fingers, right

shoulder, right upper arm, right elbow, right wrist, and right fingers in this study. There is also a positive association with an increased laptop or smartphone usage and neck pain.

In Kraemer et al., (2020) it was stated that prolonged standing and sitting, sharp edges on work surfaces, using a laptop touchpad instead of a mouse, and insufficient screen height (upper edge of the display below eye level) were the key ergonomic risk factors discovered in this study. Furthermore, 80% of teachers with low back pain worked 10 to 20 hours each week and spent 60 to 100 percent of their time on a computer. Participants in this study worked 40 hours per week and might spend up to 30 hours per week on their computers as a result.

For Karimian et al. (2020) it was found that these illnesses were linked to the nature of their profession, with 60% of teachers citing working in such an atmosphere as the primary risk factor for developing upper-extremity musculoskeletal illnesses. Furthermore, a high majority of these diseases were related to the nature of the participants' jobs, with 60% of instructors reporting that working in such a work setting was the greatest risk factor for generating upper-extremity musculoskeletal illnesses. Forward-head posture and kyphosis were identified when sitting behind a desk and checking students' homework, as well as forward shoulders when writing on the board and checking exam sheets, based on the researcher's observations in the participants' working environments, and holding such postures for prolonged periods can lead to upper cross syndrome. Teachers will easily become afflicted with musculoskeletal disorders due to the improper postures they have in these situations, such as prolonged sitting, static posture, improper back posture, raising shoulders in relation to the body, relying on arms and hands while standing, and performing repetitive and fast movements in the classroom.

In study Alias et al. (2020) it was found that long-term exposure to unfavourable working conditions and posture when teaching becomes a health risk factor. According to the findings of this study, instructors aged 40 to 49 years old and over 50 years old are 1.06 and 3.24 times more likely to suffer from MSDs affecting their lower backs, respectively. Additionally, instructors between the ages of 30 and 39, as well as those between the ages of 40 and 49, are 1.57 and 2.21 times more likely to have MSDs affecting their knee. Table 2 summarised the findings of studies on risk factors of musculoskeletal disease and working at home among teachers.

Table 4.2: Studies on Relationship Between Musculoskeletal Disease and risk factors related to Working At Home Among Teachers During MCO

Reference	Prevalence	Risk Factors			
		Socio-demographic	Occupational	Psychosocial	Others
Ng et al., (2019).	The prevalence of MSD in school teachers ranges from 12 to 84%. Prevalence of MSD was 80.1% (95% CI: 75.8–84.2%) with 80.5% of female and 77.5% of male teachers reporting discomfort in the preceding 6 months.	Gender(80.5% of female and 77.5% of male), ethnic, age	-	low social support at work, low satisfaction among workers.	Depression n (r = - 0.25, p < .01)

<p>Amit et al., (2020).</p>	<p>Prevalence of MSDs in the present study was 74.5% among secondary public school teachers. Prevalence of musculoskeletal pain was 74.5%, with legs (56.5%) and lower back (56%) having the highest prevalence.</p>	<p>age (P= 0.032), sex, years in service, workload/demands, body mass index(BMI) (underweight 30 kg/m²), salary (P= 0.045)</p>	<p>Work postures were related to MSDs in the teaching profession, and that awkward, repetitive and improper postures.</p>	<p>low back pain (P = 0.046), leg/foot (56.5%)</p>	<p>Obese (17.5%)</p>
<p>Leirós-Rodríguez et al., (2020).</p>	<p>A reduction in the prevalence of musculoskeletal pain (p < 0.001) was identified in the sample of men and women, an increase (12.5%) in the frequency of carrying out physical activity from moderate to frequent, and the preference for strength training (15.1%), especially among women, was identified.</p>	<p>Gender(OR=1.852), age(OR=1.141)</p>	<p>They tend to adopt incorrect postures when using electronic gadgets, which can cause pain and musculoskeletal changes, particularly in the upper limbs and spine.</p>	<p>-</p>	<p>type of teaching (from classroom to online), exercise</p>
<p>Ming et al., (2020).</p>	<p>The prevalence of MSDs was</p>	<p>genders (t = 1.04, p > .05)</p>	<p>The physical factors that</p>	<p>low back pain (25.2%), upper</p>	<p>biomechanical bases, chronic</p>

	61.7% (95% CI: 57.4% – 65.9%) with females and male teachers reporting discomfort in the prior six months which was similar to previous studies undertaken in Malaysia.		contribute to the development of MSDs among teachers are physical exertion and remaining in the same (sitting or standing) repetitive procedures, head down positions, frequent lifting of heavy loads, and many hours working with the hands raised. High job demand	limb pain, low social support, low job satisfaction, low work-family conflict, high work-life balance (P=0.303), prolonged standing (23.4%), , sitting at a computer (6.3%)	pain, anxiety/depression, somatization disorder, burnout
Karingada et al., (2021).	Previous studies have reported that the prevalence of MSD is different for females compared to males. Around 80% of students have reported some MSD symptoms in the head, neck and eyes since they started online learning. In total, 58% have reported MSD symptom in the right shoulder and 56% in	Age, gender	Online time presents a major risk on our emotional and physical health as it results in a trend away from active leisure pursuits and recreational sports and leading us towards a sedentary lifestyle.	pain in the neck, the shoulder, the upper limb, the hands and fingers, social support	level of frustration

	right-hand fingers.				
Kraemer et al., (2020).	Computer users have a higher prevalence of shoulder pain. Our results also showed that 75 to 100% of teachers who reported shoulder pain taught 10 to 15 hours a week and used a computer for 60 to 100% of work hours spent outside the classroom.	Gender(72% male and 28% female), age, body mass index (BMI)	mechanical compression, excessive force, repetitive movements, long hours and inadequate posture. Repetitive movements, frequent computer use, prolonged standing and sitting, significant physical effort and repetitive activities.	low back pain (60%)	smoking, obesity, organizational features
Karimian et al. (2020).	The prevalence rate of musculoskeletal disorders for neck was 53%, for shoulders was 41%, for back was 39%, and the prevalence rate of UCS was 43%.	-	These disorders were related to the nature of their career, in a way that 60% of the teachers reported working in such a work environment as the main risk factor for inducing upper-extremity musculoskeletal disorders.	joint dysfunction, particularly in the atlantooccipital joint, the neck pain, back joint pain (p=0.004), and the glenohumeral (shoulder) joint(p=0.002)	Quality of life
Alias et al. (2020).	The findings show that the MSDs prevalence of 40.1% for any parts of the body. The most	Age (p < 0.01), body mass index (BMI) (p < 0.01), sports activity, shoe type (p= 0.02)	Prolonged exposure due to unfavourable working condition and posture during teaching	Teaching hours (p= 0.04), lower back and knee (p=0.03), thigh and calf (p < 0.01)	Quality of life

	<p>affected part of the body was feet, with 32.5% for the past 12-months and 36.8% for the past 7 days.</p>		<p>becomes a risk factor for health. problems (Ebied, 2015). Standing hours during school, Income</p>		
--	---	--	---	--	--



© COPY RIGHT UPM

CHAPTER 5

DISCUSSION

Currently, there are limited literature which covers the relationship between musculoskeletal disease and working from home among teachers during MCO. WHO has declared this disease a global pandemic for the first time since West African Ebola was declared a pandemic in 2014. Since COVID-19 is a new disease, the literature related musculoskeletal disease and working at home among teachers during MCO is limited.

5.1 Prevalence of MSD

Musculoskeletal disorders and indications of discomfort/pain have been identified as a significant health issue for school instructors in recent studies. The purpose of this study was to generate baseline data on the prevalence of musculoskeletal problems among female instructors in elementary schools throughout a 12-month period. MSD was found to be present in 40.1 percent of people in any area of the body. This study's prevalence rate was comparable to other studies with observed prevalence rates ranging from 40% to 95%. (Erick and Smith, 2011). According to a Chinese poll, MSD is very common among primary and secondary school teachers (95 percent) (Chong and Chan, 2010). Previously, music teachers in Sweden had a high prevalence of 82 percent and 80 percent MSDs, respectively (Fjellman-Wiklund and Sundelin, 1998; Fjellman-Wiklund et al., 2003). The prevalence was lower than that reported by instructors in Brazil (55 percent) and Ethiopia (Cardoso et al., 2009) (53.8 percent) (Beyen and colleagues, 2013). Ng et al. (2017) found a high prevalence of MSDs in Malaysia, with a 6-month prevalence of 80.1 percent among primary school teachers.

The neck (56.5 percent), shoulders (48 percent), and low back (48 percent) are the three body areas with the highest complaints of pain or discomfort, according to the data gathered (60 percent). It was also discovered that around half of the teachers had had issues with one or more parts of their bodies, limiting their ability to do daily tasks.

5.2 Neck

Among the instructors, the neck has the highest percentage of victims. This finding is in line with previous research (Cetisli Korkmaz et al., 2011; Darwish & Al-Zuhair, 2013; Fjellman-Wiklund & Sundelin, 1998), which found that teachers have a high prevalence of neck pain. This outcome is also greater than that of a Hong Kong study, which showed a 60 percent success rate (Chiu & Lam, 2007).

Long periods of standing, sitting, and also uncomfortable postures have been linked to the occurrence of neck pain (Cetisli Korkmaz et al., 2011; Yue et al., 2012). Neck pain might

be caused by a persistent head down posture while using the computer or marking documents (Ehsani et al., 2018).

Long working hours ($P = 0.04$) have a significant difference in the prevalence of neck pain, according to the results in Table 2. This could be related to the amount of time spent at a desk doing clerical work, as the number of hours spent lecturing in class did not differ significantly ($P = 0.156$). Furthermore, as seen in Table 2, clerical labour caused a lot of stress for the majority of the teachers. The stress caused by clerical job had a major impact on the outcome. This was in accordance with a study that established a link between stress and the likelihood of developing MSD (Coledam et al, 2018).

The results of standing and sitting, on the other hand, contradict previous literature because they did not indicate a substantial difference. It's possible that this is due to the tiny sample size.

5.3 Shoulders

The number of people who suffer from shoulder pain is 48 percent. This is backed by a previous study, which found that over 45 percent of teachers had this issue (Chong & Chan, 2010; Constantino Coledam et al., 2018; Yue et al., 2012; Zamri et al., 2017)

The development of shoulder soreness can be linked to the teachers' incorrect posture when working at the table. Table 2 revealed that individuals who sat for a long period of time had a significantly higher prevalence than those who sat for less than 5 hours per day. Aside from that, frequent elevation of the arms when writing on a laptop or PC can increase the pain.

There was also a significant difference in the calf ($p=0.04$) and feet ($p=0.02$) after prolonged standing. This is related to the teachers' poor working posture and frequent bending movements. The P value for all other factors was more than 0.05.

5.4 Lower back

During the previous 12 months, 60% of the teachers experienced lower back pain. It's similar to previous research that found a significant prevalence of low back pain among teachers, ranging from 21.8 percent to 53 percent (Atlas et al., 2007; Hashim et al., 2010; Mohseni Bandpei et al., 2014).

Inadequate back support, stagnant posture, and long periods of sitting cause LBP to develop. According to Amit et al. (2020), stress during marking papers has a significant link with LBP frequency ($P = 0.046$). This finding is consistent with previous research that has found a strong link between stress and MSD. (Constantino Coledam et al., 2018; Erick & Smith, 2013; Cardoso et al., 2009; Erick & Smith, 2013; Cardoso et al., 2009)

There was also a link between the frequency of LBP and the number of work interruptions taken during class ($p.01$). A teacher who takes more than a 5-minute break is less likely to get LBP.

5.5 Comparison between genders and age

Many studies have found that females have a higher prevalence of MSD than males (Cetisli Korkmaz et al., 2011; Mohseni Bandpei et al., 2014; Ng et al., 2019). According to one study, this is attributable to their reduced pain tolerance (Chiu & Lam, 2007). Aside from that, it's been suggested that females experience more job stress than males (Abdulmonem et al., 2014).

However, when the prevalence of each of the three body parts is compared by gender, the results of this study show no significant difference. The p-values in all three locations were greater than 0.05. This could be due to the male sample being substantially smaller than the female sample.

According to Amit et al., (2020), the age group under 40 had a significantly higher prevalence of neck pain than the age group over 40 ($P = 0.032$). This could be due to increasing time spent in front of computers and the use of electronic devices.

According to the findings of this study, instructors aged 40 to 49 years old and over 50 years old are 1.06 and 3.24 times more likely to suffer from MSDs affecting their lower backs, respectively (Alias et al., 2020). Additionally, instructors between the ages of 30 and 39, as well as those between the ages of 40 and 49, are 1.57 and 2.21 times more likely to have MSDs affecting their knee. Teachers between the ages of 30 and 49 had a significant link with knee pain, while instructors between the ages of 40 and 59 had a positive considerable correlation with calf MSD ($p= 0.02$) when compared to teachers wearing flat shoes. This substantial number corresponds to a study in Saudi Arabia that found a strong positive link between

teachers wearing high-heeled shoes and musculoskeletal pain issues ($p < 0.01$). This is due to the entire body's gait and posture being disrupted, producing considerable muscular and ligament tension.

Pronation of the subtalar joint, which occurs most commonly at heel impact, aids in shock absorption. If this pro activity is restricted, the joints closest to the foot must bear a greater amount of trauma. Misalignment of the spine and lower limbs caused by wearing heels may predispose teenagers to musculoskeletal diseases, with low back discomfort being one of the most common complaints in high-heeled users. However, greater spinal error muscle activity and abdominal distension during heel use may be linked to user-reported pain and discomfort. When the height of the sole promotes an inclination that is characterised by an elevation of the heel region of support over the forefoot, a high-heeled shoe causes injury to the musculoskeletal system (Santos et al., 2008).

5.6 Prevention and management of pain

Tables 1 and 2 show that over half of the teachers do nothing when they experience discomfort in any part of their body. If left addressed, these aches and pains might worsen, affecting the instructors' quality of life. The 'others,' on the other hand, had the second highest percentage, opting for traditional methods such as rubbing and applying ointment. Only a small fraction of teachers sought competent medical help to address their condition.

Teachers' musculoskeletal health can be improved by encouraging them to take brief, regular breaks and doing easy stretching exercises. Aside from that, they must understand optimal working posture, including how to stand, sit, bend, and lift things. When writing on the whiteboard, teachers are also urged not to raise their arms too high. Furthermore, they are not permitted to perform lengthy motions such as standing or sitting. They should also refrain from doing repetitive activities on a regular basis.

Because the health status of teachers has been identified, schools should implement a preventive and management programme. It is critical for teachers to be aware of the dangers of MSDs associated with their profession. It is possible to have an officer or a teacher trained in ergonomics stationed in schools to ensure that these programmes and awareness are executed smoothly. The school's administration can also take steps to reduce teachers' workloads and implement stress-reduction programmes.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Neck (56.5 percent), shoulder (48 percent), and low back (48 percent) discomfort were all common in this study. High stress, prolonged sitting and standing, and lengthy work hours are all risk factors for various MSDs. The prevalence of MSD did not differ significantly between males and females. Meanwhile, people under the age of 40 were more likely to experience neck pain. The occurrence of MSD is reduced by taking a 5-minute rest.

There are numerous preventive steps that can be implemented to delay the start of MSD. They can improve their working postures by reducing repeated movement and static postures, as well as doing easy exercises in between jobs.

The findings demonstrated a high prevalence of MSDs among operating room employees, notably in the lower back, upper back, neck, shoulders, ankles, and feet. Because the home is more sensitive than school and is known as the family's heart, special attention should be paid to the environment, because any disorder or challenge not only harms the teacher, but also has negative consequences for the family.

6.2 Study Limitation

This systematic review has a few flaws that can be noted. To begin, the process of examining research articles will invariably identify several types of research in terms of design, methodologic quality, and specific interventions used. Conclusions drawn from any investigations, regardless of quality, can lead to estimations that deviate from the truth. Furthermore, the research goal of identifying the prevalence of MSD and its association with ergonomic risk factors of working from home among teachers during the Covid 19 pandemic cannot be completed because no study connected to it, particularly during the MCO and Covid-19 pandemics, can be discovered. However, there have been studies on musculoskeletal condition that have a comparable category for research that can be used to this study.

The use of multiple questionnaires for MSD investigation was one of the most significant limitations of the current study. As a result, not all organs were analysed in all investigations, and only the low back was thoroughly examined. As a result, it is advised that future research employ a standard questionnaire, such as the Nordic Musculoskeletal Questionnaire, to collect comprehensive data on MSDs and assess the effects of these illnesses on all bodily organs.

6.3 Recommendation

Future studies could benefit from a few tweaks. To begin with, the sample size can be expanded. More comprehensive results can be obtained with a considerably bigger sample size. Second, the time since the pain began and how long it has lasted might be inquired about in order to determine the degree of the pain. Finally, the survey can be conducted in a variety of schools. For instance, a school in a metropolis or a rural area.

Future research should look at the physical and psychosocial factors that influence musculoskeletal problems, according to the findings of this study. Future research could compare the prevalence of musculoskeletal problems among teachers to that of other educational workers like students and lecturers.

There are a few aspects of this article review that may be improved. To begin, undertake a review of other MSD tests, such as meta-analysis, as they are as relevant. Following that, a review of musculoskeletal disease among teachers during Covid-19 will be conducted, as further studies may be released in the future. The research on Covid-19 and MCO is still in its early stages, and much work need to be done. There is currently no research on musculoskeletal disease among teachers during MCO. As a result, when further studies on the issue become available in the future, a systematic review of those studies can be done.

In conclusion, despite the scarcity of research among Malaysian educators, the studies included in this review found a significant frequency of musculoskeletal illnesses, voice abnormalities, and stress. Other risk factors include personal lifestyle (smoking and alcohol consumption), occupational risk factors (teaching experience, ergonomic issues, workload, and salary), and psychosocial risk factors, in addition to the commonly reported socio-demographic risk factors (sex, age, education level, BMI, ethnicity, and religious practise). There could be more factors that contribute to sickness and stress among educators that have yet to be discovered. Future research is needed to better understand this population's health condition and risk factors, as well as policy planning to provide the most appropriate and effective preventive actions.

REFERENCES

- Abdel-Salam, D. M., Almuhausen, A. S., Alsubiti, R. A., Aldhuwayhi, N. F., Almotairi, F. S., Alzayed, S. M., & Bakri, F. F. (2019). Musculoskeletal pain and its correlates among secondary school female teachers in Aljouf region, Saudi Arabia. *Journal of Public Health*, 1-8.
- Albeeli, A., Tamrin, S. B. M., Guan, N. Y., & Karuppiah, K. (2017). Potential of participatory ergonomic intervention approaches to reduce work-related musculoskeletal disorders among office workers. A review. *Malaysian Journal of Human Factors and Ergonomics*, 2(2), 1-14.
- Alias, A. N., Karuppiah, K., How, V., & Perumal, V. (2020). Prevalence of musculoskeletal disorders (MSDS) among primary school female teachers in Terengganu, Malaysia. *International Journal of Industrial Ergonomics*, 77, 102957.
- Alias, A. N., Karuppiah, K., How, V., & Perumal, V. Does Prolonged Standing at Work Among Teachers Associated With Musculoskeletal Disorders (MSDs)?
- Amit, L. M., & T MALABARBAS, G. (2020). Prevalence and Risk-Factors of Musculoskeletal Disorders Among Provincial High School Teachers in the Philippines. *Journal of UOEH*, 42(2), 151-160.
- Andreadakis, Z., Kumar, A., Román, R. G., Tollefsen, S., Saville, M., & Mayhew, S. (2020). The COVID-19 vaccine development landscape. *Nature reviews. Drug discovery*, 19(5), 305-306.
- Azlan, C. A., Wong, J. H. D., Tan, L. K., Huri, M. S. N. A., Ung, N. M., Pallath, V., ... & Ng, K. H. (2020). Teaching and learning of postgraduate medical physics using Internet-based e-learning during the COVID-19 pandemic—A case study from Malaysia. *Physica Medica*, 80, 10-16.
- Bhattarai, P., Bashistha, M., & Acharya, I. P. (2019). Study on Occupational Health Status of Secondary Level Teachers Teaching in Government School of Kathmandu District. *Journal of Training and Development*, 4, 74-82.

Coledam, D. H. C., Júnior, R. P., Ribeiro, E. A. G., & de Oliveira, A. R. (2019). Factors associated with musculoskeletal disorders and disability in elementary teachers: A cross-sectional study. *Journal of bodywork and movement therapies*, 23(3), 658-665.

Damayanti, S., Zorem, M., & Pankaj, B. (2017). Occurrence of work related musculoskeletal disorders among school teachers in Eastern and Northeastern part of India. *International Journal of Musculoskeletal Pain Prevention*, 2(1), 187-192.

Fauci, A. S., Lane, H. C., & Redfield, R. R. (2020). Covid-19—navigating the uncharted.

Izhar, N. A., Al-dheleai, Y. M., & Na, K. S. (2021). Teaching in the Time of Covid-19: The Challenges Faced By Teachers in Initiating Online Class Sessions.

Jiang, N., Yan-Li, S., Pamanee, K., & Sriyanto, J. (2021). Depression, Anxiety, and Stress During the COVID-19 Pandemic: Comparison Among Higher Education Students in Four Countries in the Asia-Pacific Region. *Journal of Population and Social Studies [JPSS]*, 29, 370-383.

Juhanson, K., & Merisalu, E. (2017). Ergonomic Intervention Programs in Different Economics Sectors: A Review Article. *Agronomy Research*, 15(1), 170-186.

Karimian, R., Rahnama, N., Ghasemi, G., & Lenjannejadian, S. Association between Upper-extremity Musculoskeletal Disorders and Upper Cross Syndrome among Teachers, and the Effects of NASM Corrective Exercises along with Ergonomic Intervention on their Upper-extremity Musculoskeletal Disorders.

Karingada, K. T., & Sony, M. (2021). Demonstration of the relationship between MSD and online learning during the COVID-19 pandemic. *Journal of Applied Research in Higher Education*.

Kayabinar, E., Kayabinar, B., Önal, B., Zengin, H. Y., & Köse, N. (2021). The musculoskeletal problems and psychosocial status of teachers giving online education during the COVID-19 pandemic and preventive telerehabilitation for musculoskeletal problems. *Work*, (Preprint), 1-11.

Kraemer, K., Moreira, M. F., & Guimarães, B. (2020). Musculoskeletal pain and ergonomic risks in teachers of a federal institution. *Revista Brasileira de Medicina do Trabalho*, 18(3), 343.

Kramer, A., & Kramer, K. Z. (2020). The potential impact of the Covid-19 pandemic on occupational status, work from home, and occupational mobility.

Kraft, M. A., Simon, N. S., & Lyon, M. A. (2020). Sustaining a sense of success: the importance of teacher working conditions during the COVID-19 pandemic.

Leirós-Rodríguez, R., Rodríguez-Nogueira, Ó., Pinto-Carral, A., Álvarez-Álvarez, M., Galán-Martín, M. Á., Montero-Cuadrado, F., & Benítez-Andrades, J. A. (2020). Musculoskeletal Pain and Non-Classroom Teaching in Times of the COVID-19 Pandemic: Analysis of the Impact on Students from Two Spanish Universities. *Journal of Clinical Medicine*, 9(12), 4053.

Malik, N. A., & Björkqvist, K. (2018). Occupational stress and mental and musculoskeletal health among university teachers. *Eurasian Journal of Medical Investigation*, 2(3), 139-147.

McDowell, C. P., Herring, M. P., Lansing, J., Brower, C., & Meyer, J. D. (2020). Working from home and job loss due to the COVID-19 pandemic are associated with greater time in sedentary behaviors. *Frontiers in public health*, 8, 750.

Ming, N. Y., Kiong, P. V. S., & Maakip, I. (2020). Predictors of Musculoskeletal Disorders Among Teachers: An Exploratory Investigation in Malaysia. *Asian Social Science*, 16(7).

MM, K. (2017). Work related musculoskeletal disorders among preparatory school teachers in Egypt. *Egyptian Journal of Occupational Medicine*, 41(1), 115-126.

Ndonye, N. A., Matara, N. J., & Muriithi, I. A. (2019). *Predictors of work-related musculoskeletal disorders among primary school teachers in Machakos County, Kenya* (Doctoral dissertation, KENYATTA UNIVERSITY).

Ng, Y. M., Voo, P., & Maakip, I. (2019). Psychosocial factors, depression, and musculoskeletal disorders among teachers. *BMC public health*, 19(1), 1-10.

Ojukwu, C. P., Anekwu, E. M., & Onanike, O. F. (2017). Risk factors of work-related musculoskeletal disorders among school teachers in Enugu, Nigeria. *International Journal of Medicine and Biomedical Research*, 6(3), 142-150.

Pieper, C., Schröer, S., & Eilerts, A. L. (2019). Evidence of workplace interventions—A systematic review of systematic reviews. *International journal of environmental research and public health*, 16(19), 3553.

Purwanto, A., Asbari, M., Fahlevi, M., Mufid, A., Agistiawati, E., Cahyono, Y., & Suryani, P. (2020). Impact of work from home (WFH) on Indonesian teachers performance during the Covid-19 pandemic: An exploratory study. *International Journal of Advanced Science and Technology*, 29(5), 6235-6244.

Rahimipour Najafabadi, E., Rajabi, R., Alizade, M. H., & Mirabedi, A. (2019). Comparing the Musculoskeletal Disorders of the Neck Between the Teachers of Physical Education and Other Majors in High Schools of Tehran City, Ira. *journal of exercise science and medicine*, 11(1), 43-50.

Rocha, R. E. R. D., Prado, K., Silva, F. N. D., Boscari, M., Amer, S. A. K., & Almeida, D. C. D. (2017). Musculoskeletal symptoms and stress do not alter the quality of life of basic education teachers. *Fisioterapia e Pesquisa*, 24, 259-266.

Santos, H. E. C. D., Marziale, M. H. P., & Felli, V. E. A. (2018). Presenteeism and musculoskeletal symptoms among nursing professionals1. *Revista latino-americana de enfermagem*, 26.

Shah, A. U. M., Safri, S. N. A., Thevadas, R., Noordin, N. K., Abd Rahman, A., Sekawi, Z., ... & Sultan, M. T. H. (2020). COVID-19 outbreak in Malaysia: Actions taken by the Malaysian government. *International Journal of Infectious Diseases*, 97, 108-116.

Solis-Soto, M. T., Schön, A., Solis-Soto, A., Parra, M., & Radon, K. (2017). Prevalence of musculoskeletal disorders among school teachers from urban and rural areas in Chuquisaca, Bolivia: a cross-sectional study. *BMC musculoskeletal disorders*, 18(1), 1-7.

Susihono, W., & Adiatmika, I. P. G. (2021). The effects of ergonomic intervention on the musculoskeletal complaints and fatigue experienced by workers in the traditional metal casting industry. *Heliyon*, 7(2), e06171.

Tai, K. L., Ng, Y. G., & Lim, P. Y. (2019). Systematic review on the prevalence of illness and stress and their associated risk factors among educators in Malaysia. *PloS one*, 14(5), e0217430.

Tang, K. H. D. (2020). Movement control as an effective measure against Covid-19 spread in Malaysia: an overview. *Journal of Public Health*, 1-4.

Tavakkol, R., Kavi, E., Hassanipour, S., Rabiei, H., & Malakoutikhah, M. (2020). The global prevalence of musculoskeletal disorders among operating room personnel: a systematic review and meta-analysis. *Clinical Epidemiology and Global Health*.

Tengku Farhanah, T. J. (2019). *Prevalence and risk factors of musculoskeletal disorder (MSD) among school teachers in Klang Valley/Tengku Farhanah Tengku Johari* (Doctoral dissertation, University of Malaya).

Vaghela, N. P., & Parekh, S. K. (2018). Prevalence of the musculoskeletal disorder among school teachers. *National Journal of Physiology, Pharmacy and Pharmacology*, 8(2), 197-201.

Velavan, T. P., & Meyer, C. G. (2020). The COVID-19 epidemic. *Tropical medicine & international health*, 25(3), 278.

Yang, L., Liu, S., Liu, J., Zhang, Z., Wan, X., Huang, B., ... & Zhang, Y. (2020). COVID-19: immunopathogenesis and Immunotherapeutics. *Signal transduction and targeted therapy*, 5(1), 1-8.

Yee, K. S., Tat, T. K., Philip, J., Fulanthiram, G., & Rai, S. B. Knowledge, Perception and Practice of Malaysian Residents on Covid-19 during the Period of the Conditional Movement Control Order.

Zamri, E. N., Moy, F. M., & Hoe, V. C. W. (2017). Association of psychological distress and work psychosocial factors with self-reported musculoskeletal pain among secondary school teachers in Malaysia. *PloS one*, 12(2), e0172195.