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ASSOCIATION BETWEEN ERGONOMICS RISK FACTORS AND WORK- RELATED MUSCULOSKELETAL DISORDERS AMONG FOOD AND BEVERAGES INDUSTRY WORKERS

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BY

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ABSTRACT

ASSOCIATION BETWEEN ERGONOMICS RISK FACTORS AND WORK-RELATED MUSCULOSKELETAL DISORDERS AMONG FOOD AND BEVERAGES INDUSTRY WORKERS

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Introduction: The trend of confirmed case for occupational poisoning and disease increases every year, and it is reported that Work-related Musculoskeletal Disorders (WMSDs) has become the second highest occupational disease with 338 of confirmed cases after the occupational noise related hearing disorders (DOSH,2021). Additionally, with the increasing of demand in the food and beverages services, this consequently could contribute to the development of WMSDs among the food and beverages workers. Therefore, it is important to determine the prevalence of WMSDs and the related ergonomics risk factors that could significantly contribute to the development of WMSDs among the food and beverages workers. This study would be beneficial to the employee as well as to the employers to determine the prevalence of WMSDs among the workers and to determine the ergonomics risk factors workers that could lead to occurrences of WMSDs. The finding from this study can be used to carry out and priorities the appropriate and practical intervention for ergonomics in the workplace in preventing WMSDs among the workers. **Objectives:** The aim of this study is to determine the prevalence of WMSDs among the food and beverages workers. Besides, this study also conducted to determine if there any significant association between the ergonomics risk factors and the development of WMSDs among food and beverages industry workers. **Methodology:** This study is a cross-sectional study that use purposive sampling to recruit the food and beverages workers. 151 workers involved in this study and the respondents are required to answer the adapted and modified self-administered questionnaire to answer the objectives and hypothesis of this study. **Results:** The prevalence of WMSDs symptoms experienced by the workers was 86.1%. The highest body parts with WMSDs symptoms were neck (84.1%), lower back (79.5%), and followed with right lower legs, both right and left foot (78.8%) respectively. The ergonomics risk factors that were statistically significant with the prevalence of WMSDs were awkward posture, lifting and lowering, carrying load, noise ($p<0.05$), and both vibration, repetitive motion ($p<0.001$). **Conclusion:** There was a significant association between ergonomics risk factors with the prevalence of reported WMSDs among workers in the F&B industry. The company is recommended to improve the ergonomics practice and awareness in preventing and reducing WMSDs among the workers

Keywords: ergonomics risk factors, musculoskeletal disorders, food and beverages workers, Cornell Musculoskeletal and Hand Discomfort Questionnaire

ABSTRAK

HUBUNGAN DI ANTARA FAKTOR RISIKO ERGONOMIK DAN GANGGUAN MUSKULOSKELETAL DISEBABKAN PEKERJAAN DALAM KALANGAN PEKERJA INDUSTRI MAKANAN DAN MINUMAN

NURUL SYAZWANI BINTI MOHD RAFAEN

Pengenalan: Trend kes yang disahkan untuk keracunan dan penyakit pekerjaan meningkat setiap tahun, dan Gangguan Muskuloskeletal Berkaitan Pekerjaan telah direkodkan sebagai penyakit pekerjaan yang kedua tertinggi dengan jumlah 338 kes selepas gangguan pendengaran berkaitan bunyi pekerjaan (DOSH,2021). Tambahan pula, dengan peningkatan permintaan dalam industri makanan dan minuman, hal ini menyumbang kepada terjadinya Gangguan Muskuloskeletal Berkaitan Pekerjaan dalam kalangan pekerja makanan dan minuman. Justeru, ianya amat penting untuk mengenalpasti kelaziman Gangguan Muskuloskeletal Berkaitan Pekerjaan dan faktor risiko ergonomik yang menyumbang kepada terjadinya gangguan musculoskeletal dalam kalangan pekerja industri makanan dan minuman. Dapatan dari kajian ini boleh digunakan untuk menjalanlankan dan mengutamakan intervensi yang praktikal dan bersesuaian di tempat kerja bagi mencegah Gangguan Muskuloskeletal Berkaitan Pekerjaan dalam kalangan pekerja. **Objektif:** Tujuan kajian ini dijalankan adalah untuk menentukan kelaziman Gangguan Muskuloskeletal Berkaitan Pekerjaan dan faktor risiko ergonomik yang menyumbang kepada terjadinya Gangguan Muskuloskeletal Berkaitan Pekerjaan dalam kalangan pekerja industri makanan dan minuman. Selain itu, kajian ini juga dijalankan untuk menentukan sama ada terdapat hubungkait yang signifikasi antara Gangguan Muskuloskeletal Berkaitan Pekerjaan dan faktor risiko ergonomik antara pekerja di industri makanan dan minuman. **Metodologi:** Kajian ini adalah kajian keratan rentas yang menggunakan persampelan bertujuan untuk mendapatkan pekerja industri makanan dan minuman. 151 orang telah terlibat dalam kajian ini dan responden dikehendaki untuk menjawab boring soal selidik yang telah diubahsuai untuk menjawab objektif dan hipothesis kajian ini. **Keputusan:** Kelaziman bagi Gangguan Muskuloskeletal Berkaitan Pekerjaan yang dihadapi oleh pekerja ialah 86.1%. Anggota badan yang merekodkan Gangguan Muskuloskeletal Berkaitan Pekerjaan paling tinggi ialah leher (84.1%), pinggang (79.5%), diikuti betis kanan, dan kedua-dua tapak kaki kiri dan kanan (78.8%). Faktor risiko ergonomik yang signifikan dengan kelaziman berkaitan Gangguan Muskuloskeletal Berkaitan Pekerjaan adalah posisi janggal, mengangkat dan menurunkan, membawa beban, dan bising ($p<0.05$) manakala getaran dan pergerakan berulang dengan ($p<0.001$). **Kesimpulan:** Terdapat hubungan signifikan di antara faktor risiko ergonomik dan kelaziman Gangguan Muskuloskeletal Berkaitan Pekerjaan yang dilaporkan dalam kalangan pekerja di industri makanan dan minuman.

Kata kunci: faktor risiko ergonomik, gangguan muskuloskeletal, pekerja makanan dan minuman, Soal selidik ketidakselesaan muskuloskeletal dan tangan Cornell

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LIST OF ABBREVATIONS

ACGIH	American Conference Governmental Industrial Hygienist
BMI	Body Mass Index
CDC	Centers for Disease Control
CMDQ	Cornell Musculoskeletal Discomfort Questionnaire
CTS	Carpal Tunnel Syndrome
DOSH	Department of Occupational Safety and Health
DOSM	Department of Statistics Malaysia
ERA	Ergonomics Risk Assessment
F&B	Food and Beverages
MSDs	Musculoskeletal Disorders
OSHA	Occupational Safety and Health
SOCSO	Social Security Organization
SPSS	Statistical Package for the Social Sciences
WMSDs	Work-related Musculoskeletal Disorders

CHAPTER 1

INTRODUCTION

This chapter will discuss on the research background, problem statements, study justification, research question, research objectives, research hypothesis, definition of variables, and conceptual framework.

1.1 Research Background

Malaysia Food and Beverages Industry (F&B) is one of the main contributors to the country's economy. It is a fast-growing industry with a wide variety of processed food and beverages. According to Department of Statistic Malaysia (DOSM, 2021), it is reported that food and beverage services industry's gross output value increased to RM82.8 billion in 2017 from RM66.4 billion in 2015, with an annual growth rate of 11.7%. Additionally, the value of intermediate input also increased with annual growth rate of 11.2%, where RM9.1 billion to reach a record high of RM47.5 billion in 2017. This was also due to the robust growth in the gross output, which recorded a growth rate of 11.2 per cent. The economic progress needs evolution customer demands, and technology and information are the contributing factors to the food and beverages sector. The major category of food and beverages services include the plate service, cart service, plated service, buffet service and family style services (Setupmyhotel, 2021).

According to Flanders Investment & Trade, Malaysia (2020), fine dining restaurants, international chains, and cafes have risen rapidly in recent years, and it is approximated that more than 31% of Malaysians spend their expendable cash on dining out. This indicates that there is increasing of demand in the food and beverages services and consequently has contributes to the increase of workload to the food and beverages workers to fulfil the customer needs from this sector. Nevertheless, the increases of workload among the food and beverages workers due to the consumer demands has contributes to the rising of occupational disease among workers in Malaysia. It is reported that from 2005 to 2019, where 454 cases are reported in 2005 and 8253 in 2019 respectively (DOSH,2021). They added that the five major confirmed cases of occupational poisoning and disease experienced by workers were occupational noise related hearing disorders (5699), occupational musculoskeletal disorders (338), occupational skin disorders (109), occupational poisoning (76) and followed by occupational lung disorders (61).

Occupational musculoskeletal disorders or also known as Work-related musculoskeletal disorders (WMSDs) is an occupational disease and poisoning that poses health problems such as musculoskeletal discomfort and pain. These conditions would become more severe if the workers exposed to occupational factor such as poor working environment and work performance. According to Canadian Centre for Occupational Health and Safety (2014), occupational factors that can contribute to WMSDs are work postures and movements, work pace and repetitive task, vibration, force of movements, temperature and increases of workload. They also mentioned that workplace condition such and the workstation layout, working speed and the weight of object that the workers dealing with also lead to WMSDs. All these factors will

affect to chronic and cumulative injuries to the soft tissues, tendons, ligaments, nerves, joint and blood vessel in the human body.

As the customer demand for food and beverages is high nowadays, thus the workers are likely exposed to multiple hazards in their workplace and this situation will put them to the risk of getting disability and death upon exposure to the hazards. WMSDs also one of the occupational diseases and poisoning among workers who work in the food and beverages services. WMSDs are caused by factors such as such as awkward posture, prolonged standing or sitting, forceful and sustained exertions, repetitive motion, static and sustained posture, vibration, contact stress and environmental risk factors (DOSH, 2017). In food and beverages services, the workers require to perform various work task during their working period, thus it will increase the risk of getting WMSDs. A study conducted in Taiwan food industry found that from the ergonomic risk assessment conducted among the workers and chef working there, they found that repeated flexion and extension postures led to the increase of risk to WMSDs (Tan & Balaraman, 2020).

Thus, it is important to access the prevalence of WMSDs experienced by the food and beverages workers and to look at the ergonomics risk factors that is associated with WMSDs occurrences among the food and beverages workers as this will be helpful in preventing the occurrences of WMSDs among the food and beverages workers with the appropriate ergonomics preventions at the workplace.

1.2 Problem Statements

Food and beverages workers are hired to perform various job task to meet all the demand from customer. Their job task ranging from the process of food preparation, cooking, serving the customer and cleaning the premises. All these job task requires workers to work quickly and efficiently especially during the peak dining time. In Malaysia, the number of food and beverages premises has increase day by day and this shows that many Malaysians are eating outside. Previous studies found that 64% of Malaysians dine out at least once a day, while only 34% of Malaysians enjoy eating at house and about 12.5% of Malaysians at least purchased one meal outside from their house (Tan, 2014). Similarly, a finding from study conducted by Khazanah Research Institute where they established a trend of dining out among the Malaysians and the trend has doubled for the past three decades (Post,2015). The increasing number of people eating outside at the food and beverages premises will directly contribute to increase of workload to the food and beverages workers.

In addition, food and beverages workers will highly be exposed to various hazard throughout their working time that will lead to injuries, accidents, and disabilities. Previous study conducted in Taiwan restaurant reported that 84% from total of 905 workers from the restaurant experience WMSDs and the study reported that the workers experience disorders for different body parts such as the shoulder, neck, lower back, and waist (Chyuan et al., 2004). In Malaysia, WMSDs are one of the major occupational diseases and poisoning that is reported in Malaysia. Study conducted in Statistics from Social Security Organization (SOCSO) Annual Report 2017 showed that number of workers compensated due to musculoskeletal disease

increase every year from 2005 until the year of 2016 and slightly reduced by 100 in 2017 (900 cases).

Furthermore, with the advance technology, nowadays the food and beverages also has offered the online order services. Almost of the food and beverages premises has utilise the digitalization and all the online delivery applications such as Foodpanda, Grabfood, Dahmakan apart from serving their customer through dining in or take-aways services. With the current situation of COVID 19 pandemic in Malaysia, the government also has prohibited the food and beverages premises from running their business as usual before the pandemic, where the customer does not allow to dine in like before the pandemic occur. Thus, more demand from the customer will lead to the increase of workload for the food and beverages workers to fulfil the customer needs. Consequently, the workers will be exposed to the risk of getting WMSDs as they need to perform many different work activities that may produce ergonomics hazards.

1.3 Study Justification

This study provides the data on the current prevalence of WMSDs among food and beverages workers among at the selected food and beverages industry. The finding from this study would give benefits to both of employers and to the employee as this study could aid them to reduce the ergonomics risk factors which associated to WMSDs among the workers. Many studies have reported that WMSDs are one of the major occupational disease and disorders that affected the workers due to the ergonomics risk factors in the workplace.

However, there is limited research have been done in Malaysia in assessing the association between the ergonomics risk factors that associated to WMSDs especially among the food and beverages workers. Most of the study concern on the manufacturing workers, construction workers, agriculture mining and quarrying sector. Thus, it is crucial to conduct this study as it will help to identify the ergonomic risk factors among the food and beverages workers along with the increasing number of food and beverages premises from day to day.

Additionally, the data from this study will help in assessing the most affected part of body which experiences any discomfort or disorders due to the awkward posture risk factor. This will help the workers to seek for early diagnosis to prevent them from developing more severe health condition due to the risk factor. Furthermore, at the end of this study, it also provides the significant ergonomics risk factors during performing job task that could lead to the occurrences of WMSDs. The finding will really benefit the food and beverages workers and also the employers as they will get the information on the level of ergonomics risks factors arise from completing the job task, and this will help the workers and employers to be more aware on the impact of ergonomics risk factors that will lead to occurrence of WMSDs. Thus, it could aid the premises in preventing WMSDs among their staff through implementation of appropriate and practical ergonomics preventative measures such as giving the training on ergonomic at F&B premises.

1.4 Research Question

Is there any significant association between ergonomics risk factors and work-related musculoskeletal disorders (WMSDs) among workers in the food and beverages industry?

1.5 Research Objectives

1.5.1 General Objective

The general objective of this study is to determine the association between ergonomics risk factors and work-related musculoskeletal disorders (WMSDs) among food and beverages industry workers.

1.5.2 Specific Objectives

The specific objectives are stated as below:

i) To determine socio-demographic characteristics of workers in the food and beverages industry.

ii) To determine the prevalence of WMSDs among the food and beverages industry workers.

iii) To determine the ergonomics risk factors among the food and beverages industry workers.

iv) To determine the association between ergonomics risk factors with the prevalence of WMSDs among the food and beverages industry workers.

1.6 Research Hypothesis

Research hypothesis of the study is:

There is a significance association between ergonomics risk factors with work-related musculoskeletal disorders (WMSDs) among the food and beverages workers.

1.7 Definition of Terms

This section will discuss on the conceptual and operational definitions of several study variables applied in this study. As for the conceptual definitions, it is obtained from experts from this research field while the operational definitions are applied according to relevant concepts to be used in the context of this study.

1.7.1 Work-related Musculoskeletal Disorders (WMSDs)

Conceptual: Work-related musculoskeletal disorders (WMSDs) are disorders that affect the body's musculoskeletal system due to occupational factor such as the work environment and the work performance (Centers for Disease Control and Prevention, 2020).

Operational: Work-related musculoskeletal disorders symptoms are assessed by using Cornell Musculoskeletal and Hand Discomfort Questionnaire (CMHDQ) which previously developed and used in published research of musculoskeletal discomfort among office workers (Hedge et al., 1999). In this study, his questionnaire is used to assess the prevalence of WMSDs symptoms reported by the food and beverages workers.

1.7.2 Awkward Posture

Conceptual: Awkward working posture refers to positions of the body while performing work activities such as bent, extended, or flexed positions rather than in a neutral or straight position. These working conditions will increase the muscle force needed to complete a task (Department of Occupational Safety and Health [DOSH], 2017).

1.7.3 Forceful and Sustained Exertions

Conceptual: Forceful exertion is the excessive use of force in performing work activites such as transporting or supporting the load which includes lifting, lowering, pushing, pulling, carrying and moving load by using hands or body force application (Department of Occupational Safety and Health [DOSH], 2017).

Operational: The assessment of the forceful and sustained exertions is measured by the questions being asked in the self-administered questionnaire which related to forceful and sustained exertions risk factors in the workplace.

1.7.4 Repetitive Motion

Conceptual: Repetitive motion is the frequent, too quickly of the repeated movements involving the similar groups of joints and muscles over a long duration and the task will be considered as highly repetitive when the cycle for the task is 30 seconds or less (Department of Occupational Safety and Health [DOSH], 2017).

Operational: The assessment of the repetitive motion is measured by the questions being asked in the self-administered questionnaire which related to repetitive motion risk factors in the workplace.

1.7.5 Static and Sustained Posture

Conceptual: Static and sustained posture refers to condition with a restricted, minimal or no movement which cause the body to stay in a particular position over a prolonged period which it will lead to injuries, fatigue and pain (Department of Occupational Safety and Health [DOSH], 2017).

Operational: The assessment of the static and sustained posture is measured by the questions being asked in the self-administered questionnaire which related to static and sustained posture risk factors in the workplace.

1.7.6 Vibration

Conceptual: Vibration is divided into two types which are the whole-body vibration (WBV) and hand-arm vibration (HAV). WBV is the mechanical transmission of kinetic energy through the seat or feet of the employees during driving mobile machines or other work vehicles over the rough and uneven floor surfaces. For HAV, it refers to the exposure of the kinetic energy from a vibrating and percussive hand-held power tools to the hands and arm (Department of Occupational Safety and Health [DOSH], 2017).

Operational: The assessment of the vibration is measured by the questions being asked in the self-administered questionnaire which related to vibration risk factors in the workplace.

1.7.7 Environmental Risk Factors

Conceptual: Environmental risk factors refers to stressful factors presence in the environment which could affect the comfort, activity and health such as the thermal

environments, illumination, noise and extreme atmospheric pressure in the environments (Department of Occupational Safety and Health [DOSH], 2017).

Operational: The assessment of the environmental risk factors is measured by the questions being asked in the self-administered questionnaire which related to environmental risk factors in the workplace.

1.8 Conceptual Framework

The conceptual framework of this study is shown in the Figure 1.1 below. The research is focused on the population from the food and beverages industry. The independent variables are the ergonomics risk factors which covers the awkward posture, prolonged standing or sitting, forceful and sustained exertions, repetitive motion, static and sustained posture, vibration and environmental risk factors (DOSH, 2017). All these ergonomics risk factors could contribute to the prevalence of work-related musculoskeletal disorders (MSDs) experiences by the food and beverages workers. Additionally, the development of WMSDs could also be influenced by several other individual risk factors such as age, gender, Body Mass Index, educational level, marital status and working experience of a workers.

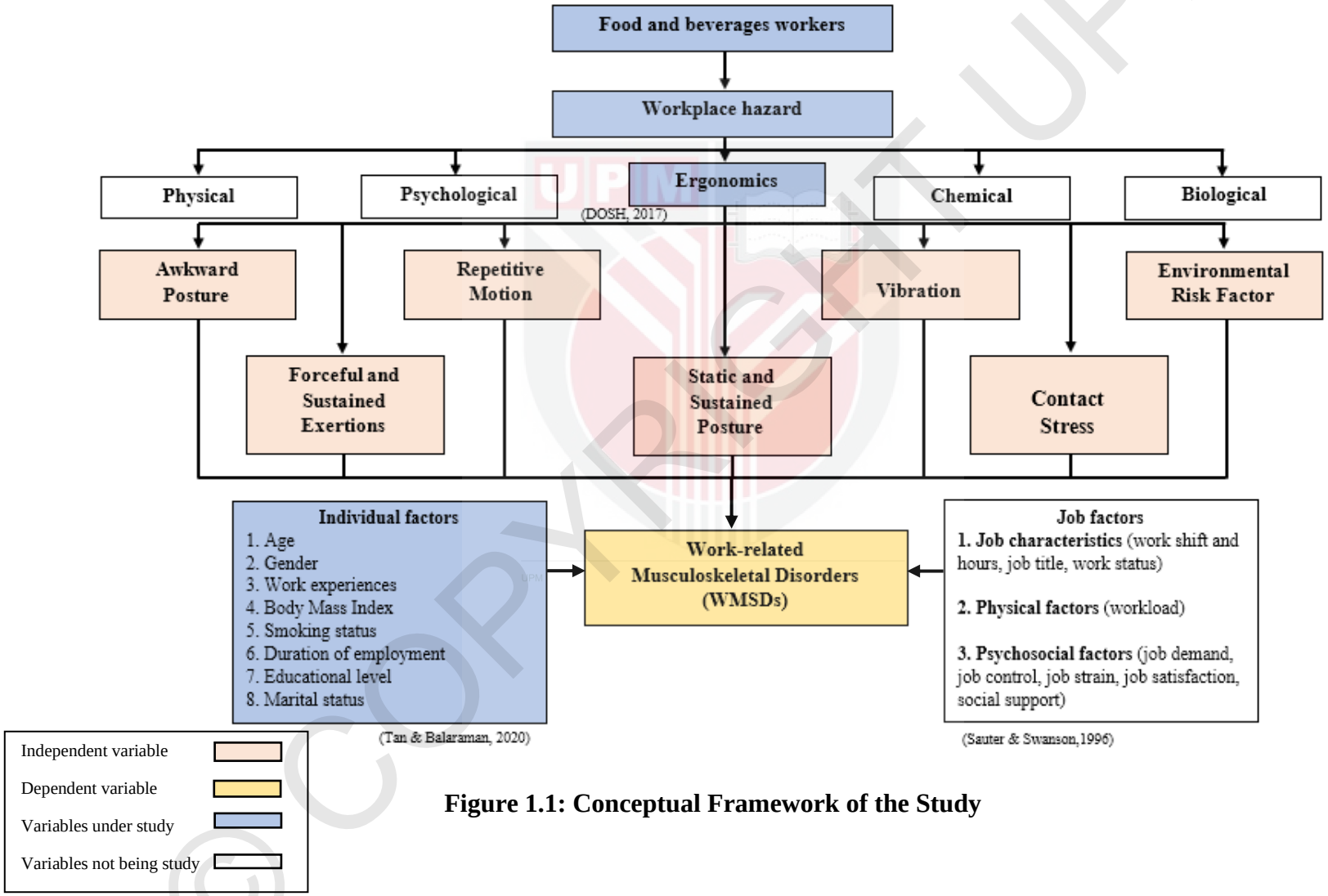

Figure 1.1: Conceptual Framework of the Study

CHAPTER 2

LITERATURE REVIEW

This chapter will discuss on the research background, problem statements, study justification, research question, research objectives, research hypothesis, conceptual definition, and conceptual framework.

2.1 Overview of Musculoskeletal Disorders (MSDs)

Musculoskeletal disorders (MSDs) have been reported and recognized as one of the diseases that is associated with occupational activity. MSDs are injuries or disorders that involves part of the body such as the muscles, nerves, tendons, joints, cartilage, and spinal discs and it also being the leading cause of disability. In addition, MSDs also occurs in the other part of the body parts such as cartilage, upper and lower limbs, neck and lower back due to physical factors including vibration, awkward posture, and force recurrence (Bernard et al., 1997). MSDs has become one of the serious threats to people worldwide especially to the workers as this condition could limit the normal movement, cause early work retirement, and reduce the ability to socially participate. A study conducted by the Global Burden of Disease (2017), they found that MSDs were the major contributor to the global disability which about 16% of all year people lived with disability. In addition, from the Bureau of Labor Statistics, 29% to 35% of all injuries and illnesses involving days away from work is accounted due to MSDs in the United States (US), and MSDs remain the highest category of injury and illness in that country.

In the context of MSDs in the workplace, International Ergonomic Association (2018) reported that low back pain and upper limbs disorders were the most well-known MSDs. There are several risk factors which associated with MSDs. The risk factor of MSDs can be categorized into two different categories which are work-related risk factor and individual- related risk factors (Middlesworth, 2015). They also added that the work-related risk factor associated with MSDs are involving with force, repetition, and posture while the individual-related risk factors associated with MSDs such poor work practices, poor fitness, and poor health habits. Without a proper ergonomic practice, every people would have the tendency in developing MSDs. These disorders will have a negative effect to human life as it would cause a constant pain when doing daily activity and it also could result to a permanent disability.

Additionally, the risk of developing MSDs will increase with age, occupation, lifestyle, activity level and family history. There are many treatments available in treating MSDs, but the effectiveness of the treatment is still being studied. People who suffer from MSDs can seek the specialist and surgical case to get primary treatment exercise therapy and psychosocial therapy. However, according to Babatunde et al. (2017), they found that only short-term benefits is observed from MSDs treatment. This shows that apart from treatment, preventing MSDs occurrences need to be prioritize first to cope with MSDs problem.

2.2 Work-related Musculoskeletal Disorders (WMSDs)

According to the Centers for Disease Control and Prevention (2020), work-related musculoskeletal disorders are the condition in which the work performance and the work environment that significantly contribute to the condition; and/or the disorders worsen, or prolonged resulting from the work conditions. Usual lifting of overload object, frequent exposure to whole body vibration, awkward posture and performing repetitive forceful tasks are the examples of work conditions that is associated with WMSDs. In addition, work-related musculoskeletal disorders (WMSDs) are a group of painful disorders that includes muscles, tendons, and nerves such as carpal tunnel syndrome, tendonitis, thoracic outlet syndrome, and tension neck syndrome (Canadian Center for Occupational Health and Safety (CCOHS), 2019).

Lower back, neck, upper and lower extremities are the most affected part due to work condition. The severity of these disorders may vary between occasional aches or pain to exactly diagnosed specific diseases. According to the Bureau of Labor Statistics (BLS) in 2013, it is reported that approximately 33% of all worker injury and illness are accounted with the WMSDs. This show that WMSDs in workplace is important to focus on, as it would reduce the productivity, cause absenteeism, increase health care cost and compensation costs. Additionally, the work condition such as poor design of workplace and workstation would cause WMSDs development among the workers. The longer exposure time to poor workplace design and workstation, this will directly contribute to worsening the condition of WMSDs developed among the workers. Workers spend a long duration of time weekly in doing and completing their job. A study conducted in Korea found that WMSDs were significantly associated with the long working hours in the country (Park et al., 2021). In a food and beverages

services, most of the work task involves the use of arms and hands. This manual handling will cause the development of WMSDs that mostly affect the upper body skeletal systems of the workers such as hands, wrists, elbows, neck and shoulders. In addition, improper work practice and prolonged exposure to work condition and workplace design also associated with the occurrence of back pain among the workers.

Furthermore, there are several injuries which are related to WMSDs such as muscle injury, nerve injury and tendon injury. For muscle injury, the long duration of muscle contraction will lead to reduce the blood flow in the blood vessel. This condition is dangerous as the by-product produced such as lactic acid during muscle contraction cannot be removed by the blood in a high rate, thus resulting to the accumulation of lactic acid in the muscles. As the consequences, this condition will lead to muscles irritation and pain experiences to the affected people. The accumulation of these substances will irritate muscles and causes pain. Next, nerve injury is related with work activity such as the repetitive movement and awkward posture will cause swollen of tissue located near to the nerves, squeeze, or compress nerves. Lastly, awkward posture and repetitive work activity are highly related with the tendon injury as these activities will lead to malfunction of lubrication system of the body part. Less lubricating fluid will be produced which lead to inflammation and swelling at the tendon area such as the hand, wrist, elbow, shoulder and forearm.

However, WMSDs can be treated by implementation of several approaches such as work restriction, treatment with heat or cold in reducing the pain, exercise and stretching in improving the circulation and reducing muscle tension and lastly through medication and surgery. Apart from that, a good ergonomic practice especially

involving the workers who are highly exposed to ergonomic hazards also help in preventing this disease. Thus, the company management, employers and employees need to work together and involve with the intervention of WMSDs in the workplace. Employers need to play the role in promoting the awareness on having a good ergonomic practice, designing the work environment properly such as having job rotation between workers, workplace design and layout, job enlargement in reducing the WMSDs cases. The employees also need to have a good ergonomic practice in doing the work task as the preventative strategies.

2.3 Work-related Musculoskeletal Disorders (WMSDs) in Food and Beverages (F&B) Industry

Work-related Musculoskeletal Disorders (WMSDs) has become a common occupational disorder that would affect the quality of life and several studies also reported that the prevalence of WMSDs is high in F&B sector. Study conducted in catering industry South India found that the prevalence of work-related musculoskeletal disorders (MSDs) for the past 12 months is 67.5% among male kitchen workers (Subramaniam & Murugesan, 2015). Meanwhile, study conducted in both male and female restaurant workers has found that female workers report a higher WMSDs complaint compared to male (Shiue et al., 2008). In addition, the researchers also found that from the total of 52,261 Chinese restaurant cooks in Taiwan, nearly 25% of them suffer from WMSDs.

However, in Malaysia, the research on WMSDs has been conducted in major economic sector such as manufacturing industry, construction work and mining activities. There is limited research conducted in assessing the prevalence of WMSDs

among F&B workers. It is crucial to conduct the study among the F&B workers as the data from other country shows that F&B workers also having a high risk in developing WMSDs. Research conducted to investigate the ergonomics risk factors and the relationship with WMSDs among the catering workers reported that the prevalence of musculoskeletal complaints in different body parts reported that symptoms were major in upper back (65%), knees (58.3%), wrist (46.7%), lower back (43.3%) and followed by other body parts (Salleh et al., 2017). Besides, another study conducted among the body regions that reported a high percentage of WMSDs were the shoulder, wrist, lower back, and feet among the restaurant chefs (Tan & Balaraman, 2020).

Work-related musculoskeletal disorders (WMSDs) due to awkward posture during performing job task. The job task of F&B workers require movement that sometimes will put them in an awkward position. When the body posture in not in the neutral position, thus this will increase the risk of getting WMSDs. Various awkward posture such as twisting the body to reach sideways, reaching hand above the shoulder, reaching below the knee level, reaching across deep counters and holding objects will happen among the F&B workers during preparation of cooking ingredient, cooking, plating, washing and cleaning that will lead to fatigue, discomfort and increase the risk of injury to the body (*Ergonomic Tips for the Hospitality Industry*, n.d.). According to study conducted in Turkey factory reported that the prevalence of WMSDs of lower back, neck, shoulders, and upper back is high due to awkward posture (Pinar et al., 2013). Similar finding from Anita et al. (2014), where they found that the awkward posture among automotive assembly line workers is statistically significant with the reported MSDs among the workers. Thus, the understanding on ergonomics risk factor

in preventing WMSDs are important to address the intervention and preventative measure at the workplace as F&B workers are at a high risk in developing WMSDs.

2.4 Work-related Musculoskeletal Disorders (WMSDs) Risk Factors

2.4.1 Awkward Posture

Awkward posture is one of the common risks which contributes to WMSDs. This condition will put an excessive force on joints of the related body part, and the affected joints will experience tendons and muscles overload. The dimensions of the segments of the employee's body in combination with the spatial structure of the workstation determine the working posture of the employee. The best situation is when the workstation dimensions can be adjusted in order to facilitate an optimal working posture (*OSHWiki*, 2020). Work activities which require the workers for twisting, bending, over-reaching, working with hand above the head, elbows above the shoulders, and bending the neck or back more than 30 degrees are the example of awkward position which significantly deviated from the neutral position of the human body.

In the food and beverages industry, the workers who responsible in preparation of the meals and drinks that their company produce also being exposed to awkward posture throughout their working day. Study conducted among the food production staff found that the workers were exposed to awkward posture during a long working hour and the workers reported WMSDs discomfort in the lower back, wrist, and calf muscle (Memkiya & Dalal, 2017). Awkward posture risk could reduce the efficiency of muscles operation and it will lead to more force required in completing the task.

2.4.2 Forceful and Sustained Exertions

Forceful and sustained exertions in completing work task may poses and increases the risk of body injuries. In a certain work task, the workers need to exert a high force a lot of physical effort to complete a certain motion in completing their work. Factors that determine the amount of force needed to apply in performing the work task include the type of grip, the weight of load, body posture and the duration to complete the task (*Environmental, Health and Safety Services | Virginia Tech*, 2011). This situation will significantly put the workers in a work demand that exposed to the ergonomics risk.

In food and beverages industry, work task such as pushing, pulling, or lifting a heavy load will require the workers to exert a huge amount of force in doing the task.This condition will place an excessive force on the joint and overload the muscles and tendons which lead to fatigue. When a greater force needed to apply in a work activity, the muscles, joint and tendons will become strained and fatigue more quickly. Besides, this ergonomics risk also could lead to inflammation, nerves and blood vessel constriction in the body region which the excessive force applied which could lead to the development of Carpal Tunnel Syndrome (CTS). Another injury that could arise from doing a work task that requires forceful and sustained exertions is the injuries of the body's back.

2.4.3 Repetitive Motion

Repetitive motion is the work task which requires the workers to perform the same motions repeatedly for a long period, either the workers perform one task repeatedly or the workers perform multiple tasks but the motions for each task are very

identical and involving the use of same tissues and muscles. Repetitive task is one type of high-risk task which requires the movement of same groups of muscle and joint to move too fast and frequent over a long period (CCOHS, 2020). This ergonomics risk could lead to the development of WMSDs if the workers do not perform a good working procedure for a long period. According to Hedge et al., (2014), repetitive task also caused by other factors which include awkward working posture, repetitiveness, lack of recovery period, environmental and organizational factors.

To relate with the food and beverages industry, the workers also perform certain repetitive task such in food preparation such as cutting a great amount of raw product, packing the cooked meals and many more in order to complete the customer request. If they receive several meals ordered by the customer, this will put the workers to exposed to the repetitive motion risk which could lead to WMSDs such as the Carpal Tunnel Syndromes (CTS). According to a study conducted among organization which perform repetitive task in France, the workers who work from different company reported a high frequency of CTS (n=1079) from 1547 total of workers especially for those who totally perform repetitive task with only one working condition throughout their working period.

Next, another study conducted in a textiles and clothing manufacturing company also reported a high incidence of musculoskeletal symptoms and related physical problems due to standardized workstations that involves high task repetition (Sealetsa & Thatcher, 2011). Besides, ErgoPlus (n.d) claimed that in nature there are various works task that is repeated, and the task is regularly controlled by work process and the target of production. They also added that if the job is completed by the

workers in the duration of 30 seconds or less, thus it is considered as a high repetitive task. Thus, it is proven that repetitive motion is an ergonomics risk factor which is highly associated with the development of WMSDs.

2.4.4 Static and Sustained Work Posture

Static and sustained posture refers to a work task which restricted the movement of workers' body as the workers need to remain in the same position for a long period. Restriction of body movement will cause the body to have a fixed posture in that working position which could lead the workers to experience fatigue, pain and also injuries that could lead to the development of WMSDs. The example of static and sustained posture commonly requires the workers to sit or stand for a long working period.

In food and beverages industry, the workers especially those who working in the kitchen area need to stand for a long period to cook the meals as commonly, the kitchen design requires them to stand in preparing, cooking, and packaging the foods and beverages. Study conducted among the restaurant chef in Johor and Melaka found that the chef reported several WMSDs symptoms such as high prevalence of discomfort especially at the feet, lower back and shoulders due to prolonged standing during a long working hour (Tan, 2021). Another study conducted in Malaysia also reported that from the Quick Exposure check in analysing the working posture adopted by the catering workers, majority of the workers also reported the discomfort of the body part mainly at the back, shoulder, and arm.

2.4.5 Vibration

The other ergonomics risk factor is vibration where it can be divided into two types include the whole-body vibration (WBV) and the hand-arm vibration (HAV). Exposure to vibration risk factors is mainly due to the used of vibrating and power hand tools. When the workers performed a work task that utilize the hand and power tools, this not only put them to injury, but the workers also exposed to vibration risk as most of the power tools can transfer the kinetic energy mechanically to the workers body part that involves in handling the tools.

In food and beverages industry, there a still many companies which do not has an advanced food and beverages production technology and some of the food and beverages preparation task is not suitable to use automatic machines and others. Thus, the workers still need perform the work task manually with the help of specified hand and power tools. For instance, the used of blender and mixed in food preparation, the workers need to handle the tools by using their hand. These kitchen tools also transmitting the kinetic energy mechanically to the workers hand and the workers would expose to vibration. Prolonged exposure to vibration during the working period could lead to a painful condition that affects the nerves, blood vessels, muscles and joint of the hands and arms area. Furthermore, vibration risk also could led the workers to experiences numbness and tingling at the fingers area, reducing the hand grip strength and if worser, this risk also would affects the blood circulation at the fingers area (International Labour Organization [ILO], n.d.).

2.4.6 Environmental Risk Factors

Environmental risk factors also another contributing risk which influenced the ergonomics aspects in performing work. This is because the condition of surrounding environment would significantly influence the comfort, work activity and human health. In assessing the cause of WMSDs among the food and beverages industry workers, the environmental factor that needed to be assessed are the lighting at the workstation, temperature, ventilation, noise exposure as all these factors would affect the way of the workers completing their task and the comfort during performing the task. These environmental risk factors should be assessed by the competent person and the industry should follow the requirement stated according to related and applicable regulation, Industrial Code of Practice and guidelines provided by the legislative body.

To relate with the food and beverages industry, environmental factors is important in order to prevent WMSDs among the workers due to poor working environment. A bad workplace environment could leads to the difficulties for the workers such as fatigue and injuries. For example, the food and beverages workers who involves in cooking several meals every working day, if the kitchen area is too hot, this will cause discomfort and loss of focus in doing the task and the workers would also feel fatigue during the working day.

2.4.7 Cornell Musculoskeletal and Hand Discomfort Questionnaire

Cornell Musculoskeletal and Hand Discomfort Questionnaire is a set of questionnaires that can be used to identify the MSD symptoms that experienced by the workers at any of their body and hand parts which might affected by the ergonomics risk factors exposed by the workers. This questionnaire was adopted from Hedge et al.

(1999) in English version which is now considered as one of the most important questionnaires for assessing musculoskeletal discomfort internationally. A lot of studies related to WMSDs used the questionnaire in order to relate the WMSDs with the exposure to ergonomics risk factors among the workers. This questionnaire is a very useful tools in the study of ergonomics as the questionnaire could give the data on the prevalence of WMSDs among the studied population, providing the frequency and severity of discomfort and lastly, this questionnaire also could be used to determine the of musculoskeletal discomfort which interferes with the ability to work (Shariat et al. 2016). This questionnaire was available in assessing both male and female body pain and discomfort from the figure of the body map.

CHAPTER 3

METHODOLOGY

This chapter will discuss on the research background, problem statements, study justification, research question, research

3.1 Study Design

This study is a quantitative research study, where cross-sectional study design, a type of observational study used to determine the association between ergonomics risk factors and work-related musculoskeletal disorders (WMSDs) among food and beverages industry workers.

3.2 Study Location

This study is conducted at a food and beverages industry named Mas Awana Services Sdn. Bhd. which the main branch located in Sepang and Petaling Jaya. The reason behind this selection is because MAS Awana Services Sdn Bhd is one of the foods and beverages-based company that is closely related to the context of this research.

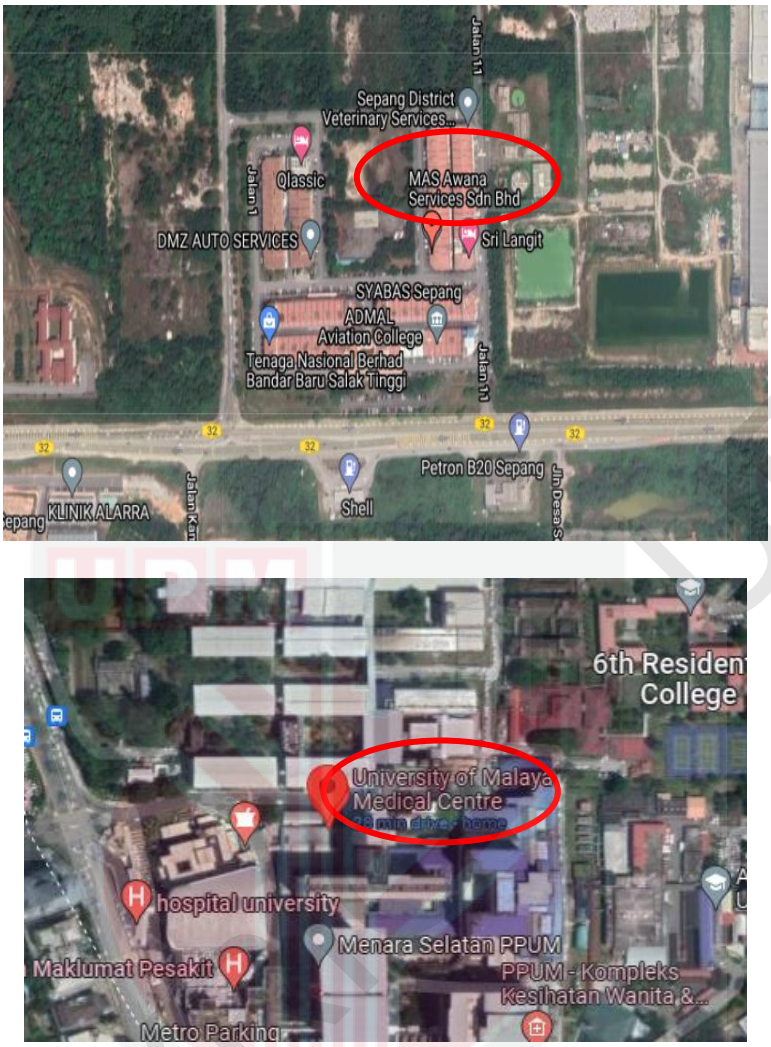

Figure 3.1: Satellite image of MAS Awana Sdn Bhd

3.3 Study Duration

This study is conducted from October 2021 until December 2022.

3.4 Details of Work Task Performed by the Workers

In the selected F&B company which is the Mas Awana Sdn. Bhd., there were seven work departments which the workers from all the departments were selected based on the inclusion and exclusion criteria. The work departments include the logistic, wet and dry store, hot kitchen, cold kitchen, pastry, packaging and serving department.

a) Hot kitchen department

Workers in this department perform various task ranging from preparation of food material activity such as cutting the raw food material such as vegetable, fruits chicken, meat and others. Additionally, some of the workers also were responsible in cooking the dishes requested by the customers. Normally, the number of dishes being prepared was in a big amount. For example, at a one time, the workers will cook the chicken curry up to 50kg. Most of the time, the workers were required to stand throughout their working duration in completing their work task. The readily prepared meal will be then sent to the packaging department.

Figure 3.2: Workers preparing the dishes in the hot kitchen department

b) Cold kitchen department

In this work department, the example of foods that being prepared by the workers was the cold appetizers, salads, dressings, cut fruits and others. The number of foods being prepared in this department was also depending on the client's request. The workers will perform their work task at the preparation table in a standing position.

Figure 3.3: Workers preparing sandwich at the preparation table

c) Pastry department

In pastry department, the workers were responsible to prepare various desserts, cookies, cakes and bread for their customer. The tasks performed by the workers ranging from preparing of dough, shaping of dough, baking, decorating cakes and others. The workers perform the task manually which involves an extensive use of the upper body parts especially the arm and fingers

Figure 3.4: Dough preparation activity

d) Packaging department

The workers in packaging departments worked for 8 hours and they will perform packaging task of the food that has been prepared into the smaller individual food container. Each of the workers were assigned to pack different types of food depending on the order from the customer. The workers were required to stand to complete the work task.

3.5: Packaging cooked food activity

e) Logistic department

Workers in the logistic department were assigned to transport the readily packed food to the customer's location including the cafes, hospitals, airport lounge and others. The workers were required to carry and lift the foods which has been placed inside the basket and arranged inside the lorry. Besides, the workers were also required to send the raw food material to the central kitchen.

Figure 3.6: Workers transferring the food inside the lorry

f) Store department

In store department, the workers were required to checked and received all the raw food materials from the suppliers and transfer the goods from the receiving area to the store. The workers also will be in charged on keeping the inventory of the goods. Weekly, the company will receive the food material from the supplier for three times per week.

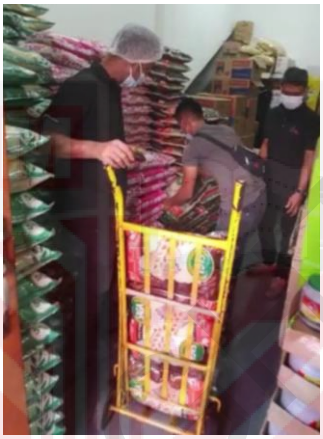

Figure 3.7: Workers transferring the food materials into the store area

g) Serving department

The workers were required to serve the ready to eat food to the customer. For example, as this company also providing the F&B services at the hospital, the workers were required to deliver the food to the patients. They used the food trolley to send the food to the patients.

Figure 3.8: Workers placed the food into the trolley to send to the patients

3.5 Sampling

3.5.1 Study Population

The target population in this study was the workers who involves in food and beverages related works from the selected F&B industry, which is the food and beverages workers in MAS Awana Services Sdn Bhd.

3.5.2 Sampling Frame

The sampling frame is the food and beverages workers that work in the food and beverages industry and were selected based on the exclusion and inclusion criteria of the study.

3.5.3 Sampling Unit

In this study, the sampling unit is the food and beverages workers who are working in the selected F&B industry which is Mas Awana Services Sdn Bhd. The workers were selected when they meet the inclusive criteria as stated below.

Inclusive criteria:

1. Workers who working as food and beverages staff.
2. Workers with ages between 18 to 60 years old.

Exclusive criteria:

1. Workers with any history of musculoskeletal injuries for the past 12 months that is caused by non-occupational factors.
2. Workers who have been diagnosed with WMSDs.

3.5.4 Sampling Method

Purposive sampling was applied in recruiting the respondents that meet the study criteria of this study. Only the F&B workers that meet the study criteria were included in this study.

3.5.5 Sample Size Calculation

The study is conducted to determine the association between ergonomics risk factors and work-related musculoskeletal disorders (WMSDs) among food and beverages workers in selected F&B industry.

The sample size calculation is calculated using the formula:

$$n = \frac{Z^2{}_{1-\propto/2}\, P(1-P)}{d^2}$$

Where,

n = sample size

Z= level of confidence at 95% (1.96)

P= prevalence of WMSDs on workers due to ergonomic risk factors

According to study conducted by (Abaraogu et al., 2015), P=0.904%

d=precision (in proportion of one; if 5%, d= 0.05)

Calculation of sample size is as below:

$$n = \frac{(1.96^2)(0.904)(1-0.904)}{(0.05^2)}$$

$$n = \frac{(3.8416)(0.904)(0.096)}{(0.05^2)}$$

$$n = 133.36$$

$$n = 134$$

The calculated sample size was **N= 134**. However, this study needs to consider 20% of non-response rate, missing data, and respondents' refusal in participating, thus the sample size for this study is calculated as below:

$$n = 134 + [134 \times \frac{20}{100}]$$

$$n = 161$$

The **total sample size** for this study was **161 respondents.**

3.6 Study Instrumentation

3.6.1 Self-Administered Questionnaire

Self-administered questionnaire is prepared in Malay language to make the respondents easier to understand and answer the questions. This questionnaire consisted of three parts: **Part A (Socio-demographic and work-related information)**, **Part B (Cornell Musculoskeletal and Hand Discomfort Questionnaire)** and **Part C (involved questions regarding work-related ergonomic factors)**. The questionnaire was distributed to the respondents and the workers were briefed regarding the content of the questionnaire and lastly, they were asked to fill in

consent form to participate in the study before answering all the questions. The questionnaire is shown in Appendix.

Part A: Personal information and work-related information

This part is an open and close-ended questions where the respondents are required to fill in the information such as the age, gender, race, height and weight, marital status, education level, working experience, working hours, employment type and smoking status. The purpose of this questionnaire was to determine the individual risk factors and work-related information that could associated with the development of MSDs among the workers.

Part B: Cornell Musculoskeletal and Hand Discomfort Questionnaire

To obtain the information on musculoskeletal disorders reported by the workers, Cornell Musculoskeletal and Hand Discomfort Questionnaire is used to assess the musculoskeletal discomfort that interferes the workers' ability to do work along with assessing the frequency and severity of it (Shariat et al., 2016). Malay version of questionnaire were adopted by Hedge et al. (1999) and Shariat et al. (2016) respectively. This questionnaire contains maps for body part of body for both male and female. In addition, this questionnaire also comprises the question to assess the frequency, severity and interference score of the workers are feeling discomfort on the body part and at the right and left hand while handling their work task. 12 differences of body musculoskeletal system that will be asked in the questionnaire starting from neck, shoulder, upper back, upper arm, lower back, forearm, wrist, hip/buttocks, thigh, knee, lower leg and foot and also for the discomfort assessment for right and left hand

or the workers. (Appendix 2.2, Cornell Musculoskeletal and Hand Discomfort Questionnaire).

Part C: Ergonomic Risk Factors

This part will involve questions related to work-related ergonomics risk factors that may be associated with the development of WMSDs among the F&B workers. The questions will be an open and close ended questions on different type of ergonomics risk factor such as awkward posture, stationary position, forceful motion, repetition, contact stress, vibration and environmental factors that may influenced the development of WMSDs among the workers. This part will be able to show the association between the ergonomics risk factors and the WMSDs experienced by workers participated in this study.

3.7 Data Collection

Data collection of this study on food and beverages workers who are working in a food and beverages industry where the main branch located in Sepang and Petaling Jaya. This study was conducted once this study has been approved by JKEUPM. Next, this study also as obtained the permission from MAS Awana Services Sdn Bhd, and the data collection was conducted upon getting approval from the company. Then, the F&B workers were selected by purposive sampling where only the food and beverages staff that met the inclusion criteria were involved in this study. Next, a brief explanation regarding this study such as the objectives of the study, the confidentiality of data was declared through the consent form that has been given to the selected respondents. The selected respondents were asked to fill in the all the questions in the

self-administered questionnaire. Figure 3.2 below show the data collection flow chart in this study.

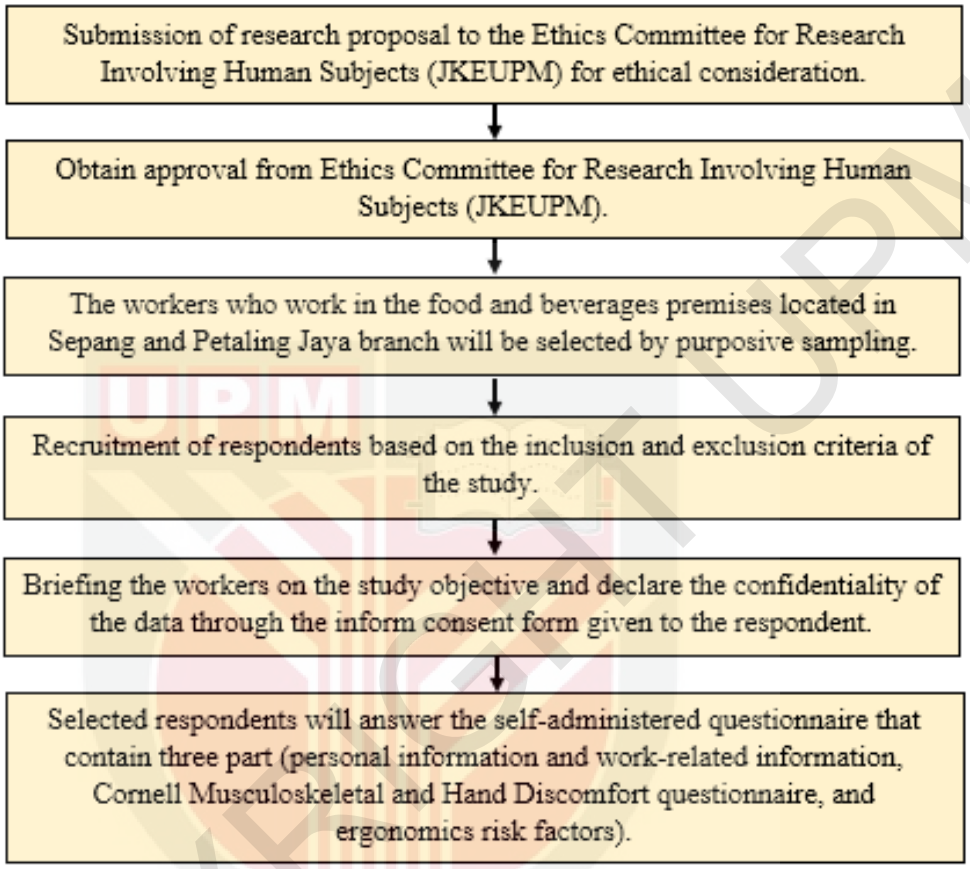

Figure 3.2: Research Flow Chart

3.8 Quality Control

The questionnaire had undergo content validity by consultation with the expert to ensure the questions being asked in the questionnaire were valid. Besides, Pilot study is conducted among 16 F&B workers which is 10% from the sample size of this study. These 16 subjects are selected based on the homogeneous criteria to the actual study respondents. It is important in order to know either the subjects understand with the questions being asked in the questionnaire or not. Then, the questionnaire will be corrected upon completion of the pilot study by taking into consider on the workers' comment. Cronbach's alpha value of 0.762 was obtained by running SPSS to measure the internal consistency of the questionnaire. The final version of the self-administered questionnaire will be used as the study instrumentation of this research.

3.9 Statistical Analysis

The data that that is collected is then analysed by using the statistical computer software (Statistical Package Service and Solution-SPSS Version 25. The type of statistical analysis is depending on the specific objectives of this study as shown below:

Specific objectives	Statistical analysis
1. To determine socio-demographic characteristics of the food and beverages workers.	Descriptive Analysis
2. To determine the prevalence of WMSDs among the food and beverages workers.	Descriptive Analysis
3. To determine the ergonomics risk factors among the food and beverages workers.	Descriptive Analysis
4. To determine the association between ergonomics risk factors with WMSDs among food and beverages workers.	Chi-Square Binary Logistic Regression

Table 3.1 Statistical tests that will be used for each objective

3.10 Ethical Consideration

This study required the ethical approval from the University Ethic Committee Involving Human Subject (JKEUPM). The reference number for JKEUPM approval was JKEUPM-2021-356, and the details information related to ethical approval is attached together in the Appendix. Upon approval, the data collection was started, and all the respondents were given an informed consent forms and only those who are willing to get involves in study were selected as the respondent. The respondents were briefly explained about this study before they answer the questionnaire. There was enough time allocated for the respondent to make decision whether to participate in this study or not. All the confidential of the data were strictly controlled and maintained as only the researchers could retrieve it.

CHAPTER 4

RESULT

4.1 Socio-demographic Characteristics and work-related information of workers in food and beverages industry

The first objective of the study is to determine the socio-demographic characteristics of workers in the food and beverages industry. The information on socio-demographic characteristics includes the age, gender, race, Body Mass Index (BMI), marital status, educational level, and smoking status while for work-related information includes the employment type, break time and working experience. All these information was obtained to determine the individual risk factors and work-related risk factors that could contribute to the development of Work-related Musculoskeletal Disorders (WMSDs) among workers in the food and beverages industry.

Table 4.1 below shows the socio-demographic and work-related information of the worker. From this study, it shows that majority of the respondents were aged between 18 to 25 years old (44.0%) and 26 to 35 years old (37.7%). Besides, more than half of the respondents (88.0%) were male workers in the studied food and beverages industry. From 151 respondents, 140 (92.7%) of them were Malay followed by Indian, 2 (1.3%) and another 9 respondents (6.0%) from others ethnicity such as Bengalis and Javanese. For Body Mass Index (BMI), 55.6% of them were between range of 18.5 to 24.9 which been categorized under normal weight. Most of the workers were still single (76.2%) and more than half of them learned until secondary

educational level (58.3%). Furthermore, 140 (92.7%) of the workers had been work in the food and beverages industry for more than one year and 141 (93.4%) of them were a full-time worker. To add, almost all the workers (96.0%) were having break time during their working period. Lastly, for the lifestyle information, less than half of the workers were a smoker (30.5%).

Table 4.1: Socio-demographic characteristics and work-related information of workers in food and beverages industry

Variables	Location of Study		
	Overall (N=151)	**Sepang (N=85)**	**Petaling Jaya (N=66)**
	n (%)	**n (%)**	**n (%)**
(1) Socio-demographics			
Age (Years)			
18-25 years old	67 (44.4%)	33 (38.8%)	34 (51.5%)
26-35 years old	57 (37.7%)	32 (37.6%)	25 (37.9%)
36-45 years old	15 (9.9%)	12 (14.1%)	3 (4.5%)
≥ 46 years old	12 (7.9%)	8 (9.4%)	4 (6.1%)
Gender			
Male	88 (58.3%)	45 (52.9%)	43 (65.2%)
Female	63 (41.7%)	40 (47.1%)	23 (34.8%)
Race			
Malay	140 (92.7%)	77 (90.6%)	63 (95.5%)
Chinese	0 (0.0%)	0 (0.0%)	0 (0.0%)
Indian	2 (1.3%)	1 (1.2%)	1 (1.5%)
Others	9 (6.0%)	7 (8.2%)	2 (3.0%)

Table 4.1: (Continue)

Variables	Location		
	Overall (N=151)	Sepang (N=85)	Petaling Jaya (N=66)
	n (%)	n (%)	n (%)
Body Mass Index (BMI)			
< 18.5 (Underweight)	9 (6.0%)	5 (5.9%)	4 (6.1%)
18.5–24.9 (Normal weight)	84 (55.6%)	39 (45.9%)	45 (68.2%)
25.0–29.9 (Overweight)	67 (44.4%)	27 (31.8%)	8 (12.1%)
> 30 (Obesity)	23 (15.2%)	14 (16.5%)	9 (13.6%)
Marital status			
Single	115 (76.2%)	62 (72.9%)	53 (80.3%)
Married	34 (22.5%)	22 (25.9%)	12 (18.2%)
Divorced	2 (1.3%)	1 (1.2%)	1 (1.5%)
Educational level			
No formal education	2 (1.3%)	2 (2.4%)	0 (0.0%)
Primary education	0 (0.0%)	0 (0.0%)	0 (0.0%)
Secondary education	88 (58.3%)	48 (56.5%)	40 (60.6%)
Tertiary education	61 (40.4%)	35 (41.2%)	26 (39.4%)
Smoking Status			
Yes	46 (30.5%)	24 (28.2%)	22 (33.3%)
No	105 (69.5%)	61 (71.8%)	44 (66.7%)
(2) Work-related information			
Working Experience			
Less than one year	11 (7.3%)	6 (7.1%)	5 (7.6%)
More than one year	140 (92.7%)	79 (92.9%)	61 (92.4%)

Table 4.1: (Continue)

Variables	Location		
	Overall (N=151)	**Sepang (N=85)**	**Petaling Jaya (N=66)**
	n (%)	**n (%)**	**n (%)**
Employment Type			
Part time	10 (6.6%)	8 (9.4%)	2 (3.0%)
Full time	141 (93.4%)	77 (90.6%)	64 (97.0%)
Break Time			
Yes	145 (96.0%)	80 (94.1%)	65 (98.5%)
No	6 (4.0%)	5(5.9%)	1 (1.5%)

4.2 Prevalence of Work-related Musculoskeletal Disorders (WMSDs) among workers in food and beverages industry, (N=151)

The second objective of this study is to determine the prevalence of Work-related Musculoskeletal Disorders (WMSDs) among workers in the food and beverages industry. The prevalence of WMSDs were recorded for the symptoms they experienced during the last working week. Table 4.2, 4.3 and 4.4 tabulate the result of prevalence WMSDs reported by the workers for the past week. From Table 4.2, the overall prevalence of WMSDs reported by the workers shows a very high prevalence where 86.1% of the respondents reported at least one symptom for any one body part. To add, workers in Sepang, (N=85) reported (90.6%) while in Petaling Jaya, (N=66) reported (80.3%) of WMSDs slightly lower than in Sepang for at least one of body parts while respectively.

Table 4.2: Prevalence of WMSDs reported among workers in food and beverages industry (N=151)

Location	Overall WMSDs prevalence	
	Frequency (n)	Percentage (%)
Overall (N=151)	130	86.1
Sepang (N=85)	77	90.6
Petaling Jaya (N=66)	53	80.3

WMSDs reported in any part of body

Next, the highest body parts reported with WMSDs symptoms were neck (84.1%), followed by lower back (79.5%) and the third highest WMSDs symptoms reported were right lower legs, and both right and left foot which were (78.8%) for each of the body parts. In the F&B industry at Sepang branch (N=85), neck (90.6%), right upper arm (82.4%) and followed by left shoulder (81.2%), upper back (81.2%), lower back (81.2%) were the highest body parts reported with WMSDs among the workers. In the Petaling Jaya branch (N=66), lower back (77.3%), both left and right lower leg (77.3%) and both left and right foot (77.3%) were the highest body parts reported with WMSDs among the workers. Table 4.3 below summarize the result for the prevalence of WMSDs for each body parts as reported among the workers.

Table 4.3: Prevalence of WMSDs reported (Body Discomfort) among workers in food and beverages industry

Body Parts with WMSDs discomfort	Location		
	Overall (N=151)	**Sepang (N=85)**	**Petaling Jaya (N=66)**
	n (%)	**n (%)**	**n (%)**
Neck	**127 (84.1%)**	77 (90.6%)	**50 (75.8%)**
Shoulder (R)	117 (77.5%)	68 (80.0%)	**49 (74.2%)**
Shoulder (L)	118 (78.1%)	**69 (81.2%)**	**49 (74.2%)**
Upper back	118 (78.1%)	**69 (81.2%)**	**49 (74.2%)**
Lower back	**120 (79.5%)**	**69 (81.2%)**	**51 (77.3%)**
Upper arm (R)	104 (68.9%)	**70 (82.4%)**	34 (51.5%)
Upper arm (L)	93 (61.6%)	60 (70.6%)	33 (50.0%)
Forearm (R)	94 (62.3%)	59 (69.4%)	35 (53.0%)
Forearm (L)	90 (59.6%)	56 (65.9%)	34 (51.5%)
Wrist (R)	85 (56.3%)	55(64.7%)	30 (45.5%)
Wrist (L)	80 (53.0%)	51 (60.0%)	29 (43.9%)

Table 4.3: (Continue)

Body Parts with WMSDs discomfort	Location		
	Overall (N=151)	Overall (N=151)	Overall (N=151)
	n (%)	n (%)	n (%)
Hip/Buttocks	94 (62.3%)	50 (58.8%)	44 (66.7%)
Thigh (R)	101 (66.9%)	54 (63.5%)	47 (71.2%)
Thigh (L)	106 (70.2%)	59 (69.4%)	47 (71.2%)
Knee (R)	98 (64.9%)	59 (69.4%)	39 (59.1%)
Knee (L)	93 (61.6%)	55 (64.7%)	38 (57.6%)
Lower leg (R)	106 (70.2%)	55 (64.7%)	**51 (77.3%)**
Lower leg (L)	**119 (78.8%)**	68 (80.0%)	**51 (77.3%)**
Foot (R)	**119 (78.8%)**	68 (80.0%)	**51 (77.3%)**
Foot (L)	**119 (78.8%)**	68 (80.0%)	**51 (77.3%)**

(R): Right, (L): Left

The bold value indicated the highest body part reported with WMSDs

For the hand parts, the highest hand parts reported with WMSDs for the overall workers (N=151) were right ring, middle, index (57.0%), both left and right wrist crease (45.7%), and followed by left palmar (43.0%). In the Sepang branch (N=85), right ring, middle, index (81.2%), left wrist crease (55.3%), and followed by right wrist crease (54.1%) and right pinkie ring (54.1%) were the highest hand pasts reported with WMSDs among the workers. In the Petaling Jaya branch (N=66), less than half of the workers reported WMSDs symptoms at their hand parts, where the highest WMSDs prevalence reported were right wrist crease (34.8%), right palmar (33.3%), right thenar (33.3%), left wrist crease (33.3%) and followed by the left ring, middle, index (30.3%), right thumb (30.3%) and left palmar (30.3%). The result was as tabulated in Table 4.4 below.

Table 4.4: Prevalence of WMSDs reported (Hand Discomfort) among workers in food and beverages industry

Hand Parts with WMSDs discomfort	Location		
	Overall (N=151)	**Sepang (N=85)**	**Petaling Jaya (N=66)**
	n (%)	**n (%)**	**n (%)**
Ring, middle, index (R)	**86 (57.0%)**	**69 (81.2%)**	17 (25.8%)
Ring, middle, index (L)	59 (39.1%)	39 (45.9%)	**20 (30.3%)**
Pinkie, ring (R)	62 (41.1%)	**46 (54.1%)**	16 (24.2%)
Pinkie, ring (L)	54 (35.8%)	37 (43.5%)	17 (25.8%)
Thumb (R)	56 (37.1%)	36 (42.4%)	**20 (30.3%)**
Thumb (L)	60 (39.7%)	41 (48.2%)	19 (28.8%)
Palmar (R)	62 (41.1%)	40 (47.1%)	**22 (33.3%)**
Palmar (L)	**65 (43.0%)**	45 (52.9%)	**20 (30.3%)**
Thenar (R)	60 (39.7%)	38 (44.7%)	**22 (33.3%)**
Thenar (L)	64 (42.4%)	45 (52.9%)	19 (28.8%)
Wrist crease (R)	**69 (45.7%)**	**46 (54.1%)**	**23 (34.8%)**
Wrist crease (L)	**69 (45.7%)**	**47 (55.3%)**	**22 (33.3%)**

(R): Right, (L): Left

The bold value indicated the highest body part reported with WMSDs

4.3 Ergonomics Risk Factors among workers in food and beverages industry

The third objective of this study is to determine the ergonomics risk factors among workers in food and beverages industry. The factors that included in this study were awkward posture, static and sustained work posture, forceful exertion (manual handling that include lifting and lowering, carrying load and pushing and pulling), repetitive motion and vibration and the environmental factors (lighting, temperature, ventilation, and noise). The results were as shown in Table 4.5 below. For awkward posture, more than half of the workers (70.9%) were reported to exposed to these ergonomic risks while less than half of them (36.4%) were exposed to static and sustained work posture risk. For the forceful exertion risk, most of the workers are exposed to work task with risk of manual handling task, where lifting and lowering (74.8%), carrying load (64.2%), pushing and pulling (68.9%) respectively. Next, (65.6%) from the total workers were exposed to work task with repetitive motion risk factors and less than half of the workers were exposed to vibration risk (43.0%). For the environmental factor in the workplace, the perception of the workers towards adequate lighting were (92.1%), comfortable temperature (88.7%), good surrounding ventilation (90.7%) and no presence of noise at their workplace (82.1%).

Next, for the exposure to ergonomics risk factors among F&B workers in the Sepang branch (N=85), this study reported that more than half of the workers, (85.9%) were exposed to awkward posture while (43.5%) of them were exposed to static and sustained work posture. Next, for the exposure to forceful exertion factors, (82.4%) of them were exposed to lifting and lowering, (70.6%) of them were exposed to carrying the load, and (57.6%) of them were exposed to pushing and pulling risk factors. Besides, this study shows that (80.0%) of them were exposed to repetitive motion while (48.2%)

of them were exposed to vibration risk during their working period. To add, for the environmental factor in their workplace, (89.4%) of the overall workers perceived that there was adequate lighting, (88.2%) of them perceived that the temperature was comfortable, (89.4%) of the workers perceived that the ventilation was good, and only (20.0%) of the workers perceived that there was noise present at the workplace.

Furthermore, for the exposure to ergonomics risk factors among F&B workers in the Petaling branch (N=66), this study found that half of the workers, (51.2%) were exposed to awkward posture while only (27.3%) of them were exposed to static and sustained work posture. Next, for the exposure to forceful exertion factors, (65.2%) of them were exposed to lifting and lowering, (56.1%) of them were exposed to carrying the load, and (83.3%) of them were exposed to pushing and pulling risk factors. Besides, this study shows that only (47.0%) of them were exposed to repetitive motion, and (36.4%) of them were exposed to vibration risk during their working period. Lastly, for the environmental factor in their workplace, (95.5%) of the overall workers perceived there was adequate lighting, (89.4%) of them perceived that the temperature was comfortable, (92.4%) of the workers perceived that the ventilation was good, and only (15.2%) of the workers perceived there was noise present at the workplace.

Table 4.5: Ergonomics risk factors among workers in food and beverages industry

Variables	Location		
	Overall (N=151)	Sepang (N=85)	Petaling Jaya (N=66)
	n (%)	n (%)	n (%)
Awkward Posture			
Yes	107 (70.9%)	73 (85.9%)	34 (51.5%)
No	44 (29.1%)	12 (14.1%)	32 (48.5%)
Static and Sustained Work Posture			
Yes	55 (36.4%)	37 (43.5%)	18 (27.3%)
No	96 (63.6%)	48 (56.5%)	48 (72.7%)
Forceful Exertion			
Lifting and lowering			
Yes	113 (74.8%)	70 (82.4%)	43 (65.2%)
No	38 (25.2%)	15 (17.6%)	23 (34.8%)
Carrying load			
Yes	97 (64.2%)	60 (70.6%)	37 (56.1%)
No	54 (35.8%)	25 (29.4%)	29 (43.9%)
Pushing and pulling			
Yes	104 (68.9%)	49 (57.6%)	55 (83.3%)
No	47 (76.2%)	36 (42.2%)	11 (16.7%)
Repetitive Motion			
Yes	99 (65.6%)	68 (80.0%)	31 (47.0%)
No	52 (34.4%)	17 (20.0%)	35 (53.0%)

Table 4.5: (Continue)

Variables	Location		
	Overall (N=151)	Sepang (N=85)	Petaling Jaya (N=66)
	n (%)	n (%)	n (%)
Vibration			
Yes	65 (43.0%)	41 (48.2%)	24 (36.4%)
No	86 (57.0%)	44 (51.8%)	42 (63.6%)
Environmental Factor			
Lighting			
Too bright	6 (4.0%)	5 (5.9%)	1 (1.5%)
Too dim	6 (4.0%)	4 (4.7%)	2 (3.0%)
Adequate	139 (92.1%)	76 (89.4%)	63 (95.5%)
Temperature			
Too hot	7 (4.6%)	3 (3.5%)	4 (6.1%)
Too cold	10 (6.6%)	7 (8.2%)	3 (4.5%)
Comfortable	134 (88.7%)	75 (88.2%)	59 (89.4%)
Ventilation			
Good	137 (90.7%)	76 (89.4%)	61 (92.4%)
Bad	14 (9.3%)	9 (10.6%)	5 (7.6%)
Noise			
Yes	27 (17.9%)	17 (20.0%)	10 (15.2%)
No	124 (82.1%)	68 (80.0%)	56 (84.8%)

4.4 Association between risk factors with the prevalence of WMSDs among the food and beverages industry workers

The fourth objective of this study is to determine the association between socio-demographic characteristics, work-related characteristics, and ergonomics risk factors with the prevalence of WMSDs among the food and beverages industry workers. The results were analysed using Chi-Square and Binary Logistic Regression to determine the association between the risk factors with the prevalence of reported WMSDs.

4.4.1 Overall association between risk factors with the prevalence of WMSDs among the food and beverages industry workers (N=151)

Table 4.6 shows the result of overall association between the risk factors with WMSDs reported by the workers (N=151) .In this study, the factors which were significantly associated with WMSDs prevalence among all of the workers were awkward posture ($p=0.012$, $\varkappa^2=6.381$), lifting and lowering risk ($p=0.044$, $\varkappa^2=4.054$), carrying load ($p=0.028$, $\varkappa^2=4.854$), repetitive motion ($p<0.001$, $\varkappa^2=18.834$), vibration ($p<0.001$, $\varkappa^2=11.181$) and noise ($p=0.015$). Nevertheless, there was no significant association between the prevalence of WMSDs reported with the other factors including socio-demographic characteristics (age, gender, BMI, marital status, educational level, smoking status), work-related factors (working experience, employment type, break time), and the ergonomics risk factors including (static and sustained work posture, pushing and pulling, and environmental factor [lighting, temperature, ventilation]).

Table 4.6: Chi Square test for the overall association between risk factors and prevalence of WMSDs among workers in food and beverages industry (N=151)

Variables	Overall prevalence of WMSDs reported (N=151) (for last working week)			
	Yes (%)	No (%)	χ^2	p-value
(1) Socio-demographics				
Age (Years)				
18-25 years old	54 (80.6%)	13 (19.4%)	-	0.237[a]
26-35 years old	50 (87.7%)	7 (12.3%)		
36-45 years old	15 (100.0%)	0 (0.0%)		
≥ 46 years old	11 (91.7%)	1 (8.3%)		
Gender				
Male	77 (87.5%)	11 (12.5%)	0.349	0.555
Female	53 (84.1%)	10 (15.9%)		
Body Mass Index (BMI)				
Normal (<25)	77 (82.7%)	16 (17.3%)	4.873	0.181
Overweight (≥25)	53 (91.7%)	5 (8.3%)		
Marital status				
Single	96 (83.5%)	19 (16.5%)	-	0.327[a]
Married	32 (94.1%)	2 (5.9%)		
Divorced	2 (100.0%)	0 (0.0%)		
Educational level				
No formal education	2 (100.0%)	0 (0.0%)	-	0.438[a]
Primary education	0 (0.0%)	0 (0.0%)		
Secondary education	73 (83.0%)	15 (17.0%)		
Tertiary education	55 (90.2%)	6 (9.8%)		

[a]Fisher's Exact Test

Table 4.6: (Continue) (N=151)

Variables	Overall prevalence of WMSDs reported (N=151) (for last working week)			
	Yes (%)	No (%)	χ^2	p-value
Smoking status				
Yes	36 (78.3%)	21 (21.7%)	3.389	0.066
No	94 (89.5%)	11 (10.5%)		
(2) Work-related information				
Working experience				
Less than one year	10 (90.9%)	1 (9.1%)	-	1.000[a]
More than one year	120 (85.7%)	20 (14.3%)		
Employment type				
Part time	9 (9.0%)	1 (10.0%)	-	1.000[a]
Full time	121 (85.8%)	20 (14.2%)		
Break time				
Yes	124 (85.5%)	21 (14.5%)	-	0.596[a]
No	0 (0.0%)	6 (100.0%)		
(3) Ergonomics Risk Factor				
Awkward posture				
Yes	97 (90.7%)	10 (9.3%)	6.381	**0.012***
No	33 (75.0%)	11 (25.0%)		
Static and sustained work posture				
Yes	50 (90.9%)	5 (9.1%)	1.676	0.195
No	80 (83.3%)	16 (16.7%)		

[a]Fisher's Exact Test
*Significant level at $p<0.05$

Table 4.6: (Continue) (N=151)

Variables	Overall prevalence of WMSDs reported (N=151) (for last working week)			
	Yes (%)	**No (%)**	**χ^2**	**p-value**
Forceful exertion				
Lifting and lowering				
Yes	101 (89.4%)	12 (10.6%)	4.054	**0.044***
No	29 (76.3%)	9 (23.7%)		
Carrying load				
Yes	88 (90.7%)	9 (9.3%)	4.854	**0.028***
No	42 (77.8%)	12 (22.2%)		
Pushing and pulling				
Yes	88 (84.6%)	16 (15.4%)	0.609	0.435
No	42 (89.4%)	5 (10.6%)		
Repetitive motion				
Yes	94 (94.9%)	5 (5.1%)	18.834	**< 0.001****
No	36 (69.2%)	16 (30.8%)		
Vibration				
Yes	63 (96.9%)	2 (3.1%)	11.181	**< 0.001****
No	67 (77.9%)	19 (22.1%)		
Environmental factor				
Lighting				
Inadequate	12 (100.0%)	0 (0.0%)	2.106	0.349
Adequate	118 (84.9%)	21 (15.1%)		

*Significant level at p<0.05
*****Significant level at p<0.001

Table 4.6: (Continue) (N=151)

Variables	Overall prevalence of WMSDs reported (N=151) (for last working week)			
	Yes (%)	No (%)	χ^2	p-value
Temperature				
Uncomfortable	17 (100.0%)	0 (0.0%)	3.095	0.213
Comfortable	113 (84.3%)	21 (15.7%)		
Ventilation				
Inadequate	14 (100.0%)	0 (0.0%)	-	0.219[a]
Adequate	116 (84.7%)	21 (15.3%)		
Noise				
Yes	27 (100.0%)	0 (0.0%)	-	**0.015 a***
No	103 (83.1%)	21 (16.9%)		

[a]Fisher's Exact Test
*Significant level at p<0.05

Next, binary logistic regression was performed to analyse for the factor that was statistically significant with the prevalence of WMSDs among the workers from the result of the Chi-Square test. The analysis of the significant risk factors obtained from the Chi-Square test was run with adjustment to the age and BMI of the F&B workers. The result showed that workers who exposed to awkward posture were 1.978 times (95% CI 0.698 – 5.608) more likely to develop WMSDs compared to unexposed workers. Besides, workers who exposed to lifting and lowering risk were 2.324 times (95% CI 0.842 – 6.410) more likely to develop WMSDs, followed with workers who exposed to carrying load risk were 2.032 times (95% CI 0.731 – 5.642) more likely to report WMSDs symptoms compared to the unexposed group. Additionally, workers with repetitive motion risk were 5.148 times (95% CI 1.638 – 16.178) more likely to

develop WMSDs, while workers who exposed to vibration risk were 6.646 times (95% CI 1.366 – 32.328) more likely to develop WMSDs. Lastly, workers with exposure to noise were 2.152 times (95% CI 0.784 – 5.903) more likely had the tendency to develop WMSDs compared to those who were not exposed to the vibration risk. Table 4.7 below shows the summary of binary logistic regression result analyzed for the overall workers (N=151).

Table 4.7: Binary logistic regression analysis for factors associated with the overall prevalence of WMSDs (N=151)

Variable	Odds Ratio	95% Confidence Interval		p-value
		Lower	Upper	
WMSD symptoms reported				
Awkward posture	1.978	0.698	5.608	0.199
Lifting & lowering	2.324	0.842	6.410	0.103
Carrying load	2.032	0.731	5.642	0.174
Repetitive motion	5.148	1.638	16.178	**0.005***
Vibration	6.646	1.366	32.328	**0.019***
Noise	2.152	0.784	5.903	0.137

***Significant level at p<0.05**, enter method (adjusted for age and BMI)

4.4.2 Association between risk factors with the prevalence of WMSDs among the food and beverages industry workers (N=85)

Table 4.8 shows the result of association between the risk factors with WMSDs reported by the food and beverages workers who working in Sepang (N=85). In this study, the factors which were significantly associated with WMSDs prevalence among the workers were awkward posture ($p=0.012$, $p<0.05$), lifting and lowering ($p=0.004$, $p<0.05$), carrying load ($p=0.045$, $p<0.05$) and repetitive motion ($p<0.001$). However, there was no significant association between the prevalence of WMSDs reported with the other factors including socio-demographic characteristics (age, gender, BMI, marital status, educational level, smoking status), work-related factors (working experience, employment type, break time), and the ergonomics risk factors including (static and sustained work posture, pushing and pulling, vibration, and environmental factor [lighting, temperature, ventilation, and noise]).

Table 4.8: Chi Square test for the association between risk factors and prevalence of WMSDs among workers in food and beverages industry, Sepang (N=85)

Variables	Prevalence of WMSDs reported (Sepang, N=85) (for last working week)			
	Yes (%)	No (%)	χ^2	p-value
(1) Socio-demographics				
Age (Years)				
18-25 years old	29 (87.9%)	4 (12.1%)	-	0.731[a]
26-35 years old	29 (90.6%)	3 (9.4%)		
36-45 years old	12 (100.0%)	0 (0.0%)		
≥ 46 years old	7 (87.5%)	1 (12.5%)		
Gender				
Male	43 (95.6%)	2 (4.4%)	-	0.140[a]
Female	34 (85.0%)	6 (15.0%)		
Body Mass Index (BMI)				
Normal (<25)	40 (90.9%)	4 (9.1%)	-	0.252[a]
Overweight (≥25)	37 (90.2%)	4 (9.8%)		
Marital status				
Single	55 (88.7%)	7 (11.3%)	-	0.705[a]
Married	21 (95.5%)	1 (4.5%)		
Divorced	1 (100.0%)	0 ().0%)		
Smoking status				
Yes	21 (87.5%)	3 (12.5%)	-	0.682[a]
No	56 (91.8%)	5 (8.2%)		

[a]Fisher's Exact Test

Table 4.8: (Continue) (N=85)

Variables	Prevalence of WMSDs reported (Sepang, N=85) (for last working week)			
	Yes (%)	No (%)	χ^2	p-value
Educational Level				
No formal education	2 (100.0%)	0 (0.0%)	-	0.287[a]
Primary education	0 (0.0%)	0 (0.0%)		
Secondary education	41 (85.4%)	7 (14.6%)		
Tertiary education	34 (97.1%)	1 (2.9%)		
(2) Work-related information				
Working Experience				
Less than one year	6 (100.0%)	0 (0.0%)	-	1.000[a]
More than one year	71 (89.9%)	8 (10.1%)		
Employment Type				
Part time	7 (87.5%)	1 (12.5%)	-	0.563[a]
Full time	70 (90.9%)	7 (9.1%)		
Break Time				
Yes	72 (90.0%)	8 (10.0%)	-	1.000[a]
No	5 (100.0%)	0 (0.0%)		
(3) Ergonomics risk factors				
Awkward posture				
Yes	69 (94.5%)	4 (5.5%)	-	**0.012[a]***
No	8 (66.7%)	4 (33.3%)		
Static and sustained work posture				
Yes	32 (86.5%)	5 (13.5%)	-	0.287[a]
No	45 (93.8%)	3 (6.3%)		

[a]Fisher's Exact Test
*Significant level at p<0.05

Table 4.8: (Continue) (N=85)

Variables	Prevalence of WMSDs reported (Sepang, N=85) (for last working week)			
	Yes (%)	**No (%)**	**χ^2**	**p-value**
Forceful exertion				
Manual handling				
Yes	64 (94.1%)	4 (5.9%)	-	**0.047[a]***
No	13 (76.5%)	4 (23.5%)		
Lifting and lowering				
Yes	67 (95.7%)	3 (4.3%)	-	**0.004[a]***
No	10 (66.7%)	5 (33.3%)		
Carrying load				
Yes	57 (95.0%)	3 (5.0%)	-	**0.045[a]***
No	20 (80.0%)	5 (20.0%)		
Pushing and pulling				
Yes	45 (91.8%)	4 (8.2%)	-	0.717[a]
No	32 (88.9%)	4 (11.1%)		
Repetitive motion				
Yes	67 (98.5%)	1 (1.5%)	-	**<0.001[a]****
No	10 (58.8%)	7 (41.2%)		
Vibration				
Yes	40 (97.6%)	1 (2.4%)	-	0.059[a]
No	37 (84.1%)	7 (15.9%)		

[a]Fisher's Exact Test
*Significant level at p<0.05
**Significant level at p<0.001

Table 4.8: (Continue) (N=85)

Variables	Prevalence of WMSDs reported (Sepang, N=85) (for last working week)			
	Yes (%)	No (%)	χ^2	p-value
Environmental factor				
Lighting				
Inadequate	9 (100.0%)	0 (0.0%)	-	0.593[a]
Adequate	68 (89.5%)	8 (9.4%)		
Temperature				
Uncomfortable	10 (100.0%)	0 (0.0%)	-	0.555[a]
Comfortable	67 (89.3%)	8 (10.7%)		
Ventilation				
Inadequate	9 (100.0%)	0 (0.0%)	-	0.591[a]
Adequate	68 (89.5%)	8 (10.5%)		
Noise				
Yes	17 (100.0%)	0 (0.0%)	-	0.348[a]
No	60 (88.2%)	8 (11.8%)		

[a]Fisher's Exact Test

4.4.3 Association between risk factors with the prevalence of WMSDs among the food and beverages industry workers (N=66)

Table 4.9 shows the result of Chi-Square test for the overall association between the risk factors with WMSDs reported by the food and beverages workers who working in Petaling Jaya (N=66). The result shows that the factors which were significantly associated with WMSDs prevalence among the workers were static and sustained work posture ($p=0.014$, $p<0.05$) and vibration ($p=0.023$, $p<0.05$). The other factors were not significantly associated with the prevalence of WMSDs reported by the workers.

Table 4.9: Chi Square test for the association between risk factors and prevalence of WMSDs among workers in food and beverages industry, Petaling Jaya (N=66)

Variables	Prevalence of WMSDs reported (Petaling Jaya,N=66) (for last working week)			
	Yes (%)	No (%)	χ^2	p-value
(1) Socio-demographics				
Age (Years)				
18-25 years old	25 (73.5%)	9 (26.5%)	-	0.566[a]
26-35 years old	21 (84.0%)	4 (16.0%)		
36-45 years old	3 (100.0%)	0 (0.0%)		
≥ 46 years old	4 (100.0%)	0 (0.0%)		
Gender				
Male	34 (79.1%)	9 (20.9%)	-	1.000[a]
Female	19 (82.6%)	4 (17.4%)		

[a]Fisher's Exact Test

Table 4.9: (Continue) (N=66)

Variables	Prevalence of WMSDs reported (Petaling Jaya, N=66) (for last working week)			
	Yes (%)	No (%)	χ^2	p-value
Body Mass Index (BMI)				
Normal (<25)	37 (75.5%)	12 (24.5%)	-	0.258[a]
Overweight (≥25)	16 (94.1%)	1 (5.9%)		
Marital status				
Single	41 (77.4%)	12 (22.6%)	-	0.544[a]
Married	11 (91.7%)	1 (8.3%)		
Divorced	1 (100.0%)	0 (0.0%)		
Educational Level				
No formal education	0 (0.0%)	0 (0.0%)	0.006	0.939
Primary education	0 (0.0%)	0 (0.0%)		
Secondary education	32 (80.0%)	8 (20.0%)		
Tertiary education	21 (80.8%)	5 (19.2%)		
Smoking status				
Yes	15 (68.2%)	7 (31.8%)	-	0.105[a]
No	38 (86.4%)	6 (13.6%)		
(2) Work-related information				
Working Experience				
Less than one year	4 (80.0%)	1 (20.0%)	-	1.000[a]
More than one year	49 (80.3%)	12 (19.7%)		

[a]Fisher's Exact Test

Table 4.9: (Continue) (N=66)

Variables	Prevalence of WMSDs reported (Petaling Jaya, N=66) (for last working week)			
	Yes (%)	**No (%)**	**χ^2**	**p-value**
Employment Type				
Part time	2 (100.0%)	0 (0.0%)	-	1.000[a]
Full time	51 (79.7%)	13 (20.3%)		
Break Time				
Yes	52 (80.0%)	13 (20.0%)	-	1.000[a]
No	1 (100.0%)	0 (0.0%)		
(3) Ergonomics risk factors				
Awkward posture				
Yes	28 (82.4%)	6 (17.6%)	0.186	0.666
No	25 (78.1%)	7 (21.9%)		
Static and sustained work posture				
Yes	18 (100.0%)	0 (0.0%)	-	**0.014[a]***
No	35 (72.9%)	13 (27.1%)		
Forceful exertion				
Lifting and lowering				
Yes	34 (79.1%)	9 (20.9%)	-	1.000[a]
No	19 (82.6%)	4 (17.4%)		
Carrying load				
Yes	31 (83.8%)	6 (16.2%)	0.645	0.422
No	22 (75.9%)	7 (24.1%)		

[a]Fisher's Exact Test

*Significant level at $p<0.05$

Table 4.9: (Continue) (N=66)

Variables	Prevalence of WMSDs reported (Petaling Jaya, N=66) (for last working week)			
	Yes (%)	No (%)	χ^2	p-value
Pushing and pulling				
Yes	43 (78.2%)	12 (21.8%)	-	0.678[a]
No	10 (90.9%)	1 (9.1%)		
Repetitive motion				
Yes	27 (87.1%)	4 (12.9%)	1.706	0.192
No	26 (74.3%)	9 (25.7%)		
Vibration				
Yes	23 (95.8%)	1 (4.2%)	-	**0.023[a]***
No	30 (71.4%)	12 (28.6%)		
Environmental factor				
Lighting				
Inadequate	3 (100.0%)	0 (0.0%)	-	1.000[a]
Adequate	50 (79.4%)	13 (20.6%)		
Temperature				
Uncomfortable	7 (100.0%)	0 (0.0%)	-	0.781[a]
Comfortable	46 (78.0%)	13 (22.0%)		
Ventilation				
Inadequate	5 (100.0%)	0 (0.0%)	-	0.574[a]
Adequate	48 (78.7%)	13 (21.3%)		
Noise				
Yes	10 (100.0%)	0 (0.0%)	-	0.190[a]
No	43 (76.8%)	13 (23.2%)		

[a]Fisher's Exact Test
*Significant level at $p<0.05$

CHAPTER 5

DISCUSSION

5.1 Socio-demographic Characteristics and work-related information of workers in food and beverages industry

From this study, majority of the workers are aged between 18 to 35 years old, (82.1%) from the total of 151 workers. This shows that in food and beverages industry, many young workers are recruited compared to the older aged generations. From 151 total of workers being included in this study, male workers (58.3%) were slightly higher compared to female (41.7%), thus this indicates that the food and beverages industry are suitable for both genders. Additionally, the major race of workers in this studied food and beverages industry were Malay (92.7%) followed by others races such as Bengalis and Javanese (6.0%). There was no Chinese respondent being recorded in this study at all.

Next, half of the workers are within a normal Body Mass Index (BMI) where 55.6% of them had a BMI range between 18.5 to 24.9 which indicated the normal weight. In addition, most of the respondents were single (76.2%) and only 22.5% of them were married. The workers that were hired in the studied food and beverages industry were having up until secondary educational level (58.3%), followed by tertiary educational level (40.4%), and only (1.3%) of them did not have a formal education. Majority of the workers had been working in the industry for more than one year (92.7%) and this shows that they are skilful enough in understanding and adapting

with the nature of work in the industry. (93.4%) of them were a full-time worker and almost all of the workers were having a break time during their working period (96.0%). Lastly, only small numbers of the workers were a smoker (30.5%).

5.2 Prevalence of WMSDs among workers in food and beverages industry

From this study, the prevalence of reported WMSDs symptoms was high where the overall prevalence of WMSDs symptoms reported in any part of the body was 86.1%. This shows that almost all the workers experienced WMSDs symptoms for the last working week and many factors that could contribute with the reported symptoms. The finding from this study aligned with the finding that being reported in previous study where in Taiwan, it is reported that 84% from total of 905 workers from the restaurant experience WMSDs and the study reported that the workers experience disorders for different body parts (Chyuan et al., 2004). Another study reported the same finding where there was a high prevalence of reported WMSDs among food and beverages industry workers (Subramaniam & Murugesan, 2015).

Additionally, as mentioned in the result as tabulated in Table 4.3 previously, the highest body parts with WMSDs symptoms were the neck (84.1%), lower back (79.5%), and (78.8%) for left lower leg, right foot, and left foot. The prevalence rate was almost as similar to the finding gathered in the systematic review study conducted among F&B workers where the researchers found the lower back, neck, ankle, foot were the most commonly affected body parts (Xu et al., 2013). The reported WMSDs prevalence in this research is relevant as the other study conducted to investigate the ergonomics risk factors and the relationship with WMSDs among the catering workers also reported that the prevalence of musculoskeletal complaints in different body parts

reported that symptoms were major in upper back (65%), knees (58.3%), wrist (46.7%), lower back (43.3%) and followed by other body parts (Salleh et al., 2017). This previous data could support the finding in this current study where the workers also reported a high prevalence of WMSDs symptoms at the upper back (78.1%), left and right knees with (61.6%) and (64.9%) respectively, right wrist (56.3%), left wrist (53.0%) and lower back (79.5%).

However, the prevalence of WMSDs reported in the workers' hand parts was not as high as reported in body parts. A study conducted among F&B workers in Taiwan also reported that the prevalence of WMSDs at the hand parts was not as high compared to body parts (Chyuan, 2007). Workers from Sepang show a higher prevalence of WMSDs symptoms at their hand parts compared to workers in Petaling Jaya. This is due to the nature of the work operation between two branches were slightly different. From the observation during the walkthrough, workers in Sepang use their hands more extensively and repetitively compared to workers in Petaling Jaya. Study conducted among workers who performed extensive and repetitive task also reported a high prevalence of WMSDs at the hand and wrist (48.0%), thus this finding could support the prevalence of WMSDs at the hand part.

5.3 Association between risk factors among workers in food and beverages industry

5.3.1 Work-related information

Next, this study also aimed to determine the association between the ergonomics risk factors and work-related musculoskeletal disorders among workers in the selected food and beverages industry. For the work-related factor of all workers in this study (N=151), almost all the workers worked in the F&B industry for more than one year and only 7.3% of them worked for less than one year. This indicates that there was a low number of new employees being employed in the selected industry. This might be due to COVID-19 pandemic situation that our country facing since the disease spread in our country. According to the Department of Statistics Malaysia (2021), the number of employed person reduced to 65.1% until the end of December 2020, compared to December 2019 as the enforcement of Movement Control Order due to the pandemic. Thus, the employment rate decreases due to temporary closure of certain economic sectors in Malaysia. To add, most of the workers in the studied F&B industry were a full-time worker as the industry operate as normal business hour.

5.3.2 Awkward posture

Furthermore, for the ergonomics risk factors identified among all of the selected F&B workers (N=151), more than half of the workers exposed to awkward posture. According to study conducted among chef who worked in the F&B industry, one of the major causes for WMSDs among them has been recognised as working posture (Occupational Safety and Health Council, 2011). From the result obtained in this study, there was an association between awkward posture with the prevalence of

reported WMSDs among all of the workers. The high percentage of workers with awkward posture risk also in lined with study conducted by Xu and Cheng (2014), where from the ergonomic assessment performed among Taiwan food industry workers, they found that the work requires repeated flexion and extension postures could increases the risk of getting WMSDs. Additionally, result of workplace assessment being conducted among F&B workers in Hong Kong also demonstrated that the chefs are working in awkward postures such as bending and twisting for extended periods of time with repeated movements (Xu and Cheng, 2014). This finding supports the overall result obtained for studied F&B workers included in this study as the workers also reported to exposed to awkward posture risk factors during performing their work task.

5.3.3 Static and sustained work posture

In addition, for the static and sustained work posture risk, only a small percentage of workers (N=151) being exposed to static and sustained work posture (36.4%) and there was no association with the reported WMSDs among all of the workers. However, workers in Petaling Jaya (N=66) shows there was a significant association between static and sustained work posture with the reported WMSDs. This is due to several reason, where from the observation during walkthrough, the work task for most of the workers in Petaling Jaya were to serve the ready to eat food to the patient in a healthcare sector. Study conducted among Aziz et al. (2015) found that static posture among the studied population led to development to WMSDs reported by the workers. In this study, the Petaling Jaya workers need to stand for a longer period during their working hour especially during the time they served the patient which this situation could influenced the significant factors which lead to

WMSDs among the workers as tabulated in Table 4.9. Hembecker et al. (2017) found that prolonged standing contributes to long duration of mechanical stress on body tissues and structures. However, for workers in Sepang (N=85), the workspace area was adequate and large which allow the workers to move around their leg and walk rather than being standing in a static position, as well most of the workers were not working in a seated position as their work task requires them to perform in a standing position. Thus, this could influence the result which there was no significant association between static and sustained work posture with the development of WMSDs among the Sepang workers as tabulated in Table 4.8.

5.3.4 Forceful exertion

Next, this study also determined the association between the forceful exertion risk which include the task of lifting and lowering, carrying load, pushing and pulling with the prevalence of reported WMSDs. This study found there was a significant association between lifting and lowering risk with the prevalence of WMSDs reported by all of the workers (N=151). However, only workers in Sepang (N=85) showed a significant association between lifting and lowering with the prevalence of WMSDs as shown in Table 4.8. From the walkthrough observation conducted in Sepang, most of the workers need to manually handle the load using their hand especially in the kitchen, logistic and store department. Additionally, most of the load were heavy, and weighted range between 5kg to 10kg. This situation could lead to the significant result between lifting and lowering the load with the prevalence of WMSDs as study conducted by Zein et al. (2015) stated that lifting work tasks more than five kilograms will lead to the risk of MSD, as high force is needed to perform the work task involving handling the heavy load. Another study conducted by Segar & Rahman (2019) found

there was a high force and more physical efforts needed to handle the load. Thus, the finding in this study was aligned with the previous study.

For carrying load task, there was a significant association with the prevalence of WMSDs reported by overall of the workers (N=151). However, according to the finding in this study, only Sepang workers (N=85) showed a significant association between the carrying load risk with the reported WMSDs. This outcome might be due to several reason, where in Sepang, most of the workers carry the load manually using their hand, especially in the kitchen and store department. This situation influenced by the design of the equipment (stacking food tray, hot chamber, dry and raw food material racks) which requires the workers to carry the load using their bare hands.

Besides, this study reported 68.9% from total of 151 workers involved in pushing and pulling activities. However, there was no significant association between this ergonomics risk with the prevalence of WMSDs reported by the workers in this study. This is due to several justification, where most of the workers used the trolley to transfer the load from one place to another, and the distance of workers pushed and pulled the load was less than 20m as stated in Guideline of Ergonomics Risk Assessment at Workplace 2017 (DOSH, 2017).

5.3.5 Repetitive motion

Moreover, this study also found that there was a significant association between the repetitive motion risk factors with the prevalence of reported WMSDs among the overall workers included in this study (N=151). Study conducted among workers department of F&B found that the workers were exposed to repetitive motion

while preparing or cooking the food which led to the development of WMSDs reported among them (Lee et al., 2013). This situation could support the finding in this current study, where from the walkthrough observation, the workers especially in the Sepang branch involves in performing work task of packaging the cooked food. They performed this task throughout the 8 hours working duration and with the high demand from the customer, they need to speed up their working pace in order to complete the work task within their 8 hours working period. Factors related to repetitive tasks, such as work frequency and duration and work demand during peak demand may contribute to the formation of WMSDs (Lee et al., 2013).

5.3.6 Vibration

Furthermore, this study shows there was a significant association between the vibration risk to the development of WMSDs among the overall workers (N=151). Exposure to vibration risk factors is mainly due to the used of vibrating and power hand tools. When the workers performed a work task that utilize the hand and power tools, this not only put them to injury, but the workers also exposed to vibration risk as most of the power tools can transfer the kinetic energy mechanically to the workers body part that involves in handling the tools. In this studied food and beverages industry, some of the work tasks involving the use of hand and power tools such as the blender, mixer etc. A study conducted by Aziz et. Al (2017) found that the use power hand tools lead to the risk of vibration exposure among the workers. The exposure to vibration risk would led to transmission of kinetic energy mechanically to the workers' hand during performing the task. The finding from this study was also aligned with the previous study conducted among workers who exposed to vibration risk where the

researcher found exposure to vibration lead to development of WMSDs symptoms reported by the workers (Nasaruddin et al., 2014).

5.3.7 Environmental factors

To add, from this study, it was found that the environmental risk factors that which led to significant prevalence of WMSDs reported among 151 workers in this study was only the noise exposure. Study conducted for (5th Universitas Ahmad Dahlan Public Health Conference (UPHEC 2019), 2020), the study found there was a significant association between the noise exposure with the musculoskeletal complaints by the workers. The study also concluded the workers who exposed to noise more likely to report musculoskeletal complaint compared to the unexposed group. Exposure to noise found that there will interference in the cardiovascular system and lead to increase of blood pressure to the workers with noise exposure. The finding in this current study was aligned with another study conducted by Cheţa et al. (2018) and Magnavita et al. (2011). However, the result for association between noise exposure with the reported WMSDs for only Sepang and Petaling Jaya respectively did not show any significant association with the WMSDs reported by workers from each of the branch.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

In conclusion, the prevalence of reported WMSDs among the workers in this study were high (86.1%), and this finding was aligned with the outcome observed in the previous study. Besides this study which purposely intended to determine the association between the ergonomics risk factors with the prevalence of WMSDs among the F&B industry workers found that some of the factors were significantly associated but some were not. This might be due to the slightly different in the job scope of the studied workers compared to another study conducted among the F&B workers. Besides, the development of WMSDs was due to multi-factors which include the socio-demographic factors, work-related factors and the ergonomics risk factors as well.

Moreover, the finding from this study would benefits both F&B industry management and the workers as this study could help them in identification of the risk which associated to the development of WMSDs. This could be an eye-opener for them to be more aware of the importance of ergonomics practice in the industry, which could prevent a more serious disease which is the WMSDs arise from the factors arise due to work task in this industry.

6.2 Study limitation

There are some limitations encountered during conduction this study. As the prevalence of WMSDs were obtained through Cornell Musculoskeletal and Hand Discomfort Questionnaire, the reported WMSDs could be exaggerated from the actual WMSDs condition that the workers experienced for the last working week. This is because the workers need to recall their condition for the previous week and their answer could be influenced with the current conditions they were having. Besides, as this study use a set of self-administered questionnaires, this could lead to bias such as the recall and information bias as the workers need to rememorize back their WMSDs symptoms for the last working week. The information gathered to determine the WMSDs prevalence was only based on the workers claimed. Even so, the finding gathered from this study was considered as accurate and acceptable as this condition is beyond the researchers' ability to control it and the finding from this study was aligned with the reported WMSDs from the previous study

6.3 Recommendation for the F&B industry

1. Ergonomics intervention is recommended to make the work environment fit the workers since the workers were exposed to ergonomics risk factors which are awkward posture, static and sustained work posture, repetitive motion, forceful exertions, and vibration which significantly contributed to MSD symptoms reported among the workers.
2. Conduct intervention program such as ergonomics training which focusing on the management of WMSD.
3. The top management should consider frequent short break between working hours to reduce exposure towards ergonomics risk.

4. Top management should be considered to do job rotation between the workers in order to reduce the frequency of exposure to the ergonomics risk.

6.4 Recommendation for future study

1. The prevalence of WMSD symptoms should also consider the severity and interference parts in CMDQ to classify the severity of reported WMSDs.
2. It is recommended for the future research to have face to face interview session with the workers in determine the prevalence of WMSDs using the Cornell Musculoskeletal and Hand Discomfort Questionnaire rather than they answered the questionnaire by their own to avoid over-reporting of WMSDs symptoms.
3. It is suggested to conduct Initial Ergonomic Risk Assessment in identification of the ergonomics risk factors that could associated with the prevalence of WMSDs to obtain more accurate data from the professional judgment of the researchers.

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APPENDIX 1

ETHICAL APPROVAL LETTER

APPENDIX 2

INFORMED CONSENT FORM

JAWATANKUASA ETIKA UNIVERSITIUNTUK PENYELIDIKAN MELIBATKAN MANUSIA (JKEUPM) UNIVERSITI PUTRA MALAYSIA, 43400 UPM SERDANG

FORM 2.4: RESPONDENT'S INFORMED CONSENT FORM

Please read the following information carefully and do not hesitate to discuss any questions you may have with the researcher.

1.STUDY TITLE: Association between ergonomics risk factors and work-related musculoskeletal disorders (WMSDs) among food and beverages industry workers.

2.**INTRODUCTION:** You are invited to participate in this research because you are at risk of experiencing musculoskeletal disorders due to ergonomics risk factors during performing the work task as the Food and Beverages workers. The ergonomics risk factors during performing work task could contribute to the development of musculoskeletal disorders (WMSDs). WMSDs could affect the work performance and productivity due to the musculoskeletal pain and discomfort experiences in any related body parts.

This study has been approved by the Ethics Committee Involving Human Subjects of University Putra Malaysia, JKEUPM. Your participation in this research is voluntary. You do not have to join this research if you do not want to. You also have the right not to answer any questions you do not want answered. Besides, you can withdraw from this research at any time. If you withdraw, everything information that has been obtained before you withdraw will still be used in this research. The numbers of participants needed in this study is 161 participants

3. WHAT WILL YOU HAVE TO DO?

You will be given a set of questionnaires that requires you to complete the answering the questions within the given period. The questionnaire will consist of **3 parts: Part A (Personal information and work-related information); Part B (Cornell Musculoskeletal and Hand Discomfort (CMHDQ)) and Part C (Ergonomics Risk Factors).** The time given for you to complete answering this questionnaire is within 20 minutes or less. Upon completion, please hands this questionnaire to the researcher.

4.WHO SHOULD NOT PARTICIPATE IN THE STUDY?

If you had any history of musculoskeletal injuries that is caused by non-occupational factors within the past 12 months, you are excluded from participating in the study. Besides, you are also excluded from this study if you already have been diagnosed with WMSDs.

5. WHAT WILL BE THE BENEFITS OF THE STUDY:

a) TO YOU AS THE SUBJECT?

This research may be beneficial or not at all beneficial to you. All information obtained from this research will help in order to make improvement on thetreatment or prevention methods towards the other respondents who might have the same risk exposure, illness or health problem regarding musculoskeletaldisorders. The result of the study may help the management of your company to provide the best ergonomic practices for you as the worker in order to preventany musculoskeletal injuries.

b) **TO THE INVESTIGATOR*?***

This research will be beneficial to the researcher. All the information obtained from this research will be used to evaluate the prevalence of musculoskeletal disorders among food and beverages workers and its association with ergonomicsrisk factors. This information could also be used as a reference towards other future research related to association between musculoskeletal disorders ergonomics risk factors among food and beverages workers.

6. WHAT ARE THE POSSIBLE RISKS?

The study will only pose a very minimal risk because it is non-invasive research.

7. WILL THE INFORMATION THAT YOU PROVIDE AND YOUR IDENTITY REMAIN CONFIDENTIAL?

All your information obtained in this research will be stored and conducted in a confidential manner, in accordance with regulations and / or laws concerned. If the results of this research are published or presented to the public, your identity will not be revealed without your prior permission. Only research team are allowed to access your information. By signing this consent form, you are agreed to the record review, information storage and data process as per described.

8. WHO SHOULD YOU CONTACT IF YOU HAVE ADDITIONALQUESTIONS DURING THE COURSE OF THE RESEARCH?

If you have any questions about this study, please contact:

1. Nurul Syazwani bt Mohd Rafaen (Researcher)
   H/p: 017-5968221
   Email: 198975@student.upm.edu.my

2. Prof Dr Shamsul Bahri Md Tamrin
   (H/p: 017- 3134792
   Email: shamsul_bahri@upm.edu.my

*Please initial here if you have read and understood the contents of this page*_____

9. RESPONDENT'S INFORMED CONSENT FORM

I ……Identity Card No. ……

address……
……..……..hereby voluntarily agree to take part in the research stated above *(video recording/interview-based/ questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential, and all information provided with regard to my identity will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable)

* delete where necessary

Signature…….…… Signature ……..……

(Respondent) (Witness)

Date:…… Name :…….…….

I/C No.:…...……..

I confirm that I have explained to the respondent the nature and purpose of the above-mentioned research.

Date ……..…… Signature ……..……..

(Researcher)

JAWATANKUASA ETIKA UNIVERSITI UNTUK PENYELIDIKAN MELIBATKAN MANUSIA (JKEUPM) UNIVERSITI PUTRA MALAYSIA, 43400 UPM SERDANG

BORANG 2.4: PENERANGAN DAN PERSETUJUAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

1. TAJUK KAJIAN

Hubungan antara faktor risiko ergonomik dan gangguan muskuloskeletal yang berkaitan dengan pekerjaan dalam kalangan pekerja makanan dan minumam di Sepang, Selangor.

2.PENGENALAN

Anda dijemput untuk mengambil bahagian dalam penyelidikan ini kerana anda berisiko tinggi untuk mengalami gangguan muskuloskeletal disebabkan faktor risiko ergonomik semasa menjalankan tugas sebagai pekerja makanan dan minuman. Faktor risiko ergonomik semasa menjalankan tugas boleh menyumbang kepada gangguan muskuloskeletal yang berkaitan dengan pekerjaan. Gangguan muskuloskeletal yang berkaitan dengan pekerjaan boleh mempengaruhi prestasi kerjadan produktiviti anda disebabkan oleh kesakitan dan ketidakselesaan yang dialami di mana-mana bahagian badan.

Kajian ini telah disetujui oleh Jawatankuasa Etika yang Melibatkan Subjek Manusia Universiti Putra Malaysia, JKEUPM. Penyertaan anda dalam penyelidikan ini adalah secara sukarela. Anda tidak perlu menyertai penyelidikan ini jika anda tidak mahu. Anda juga berhak untuk tidak menjawab sebarang pertanyaan yang anda tidak mahu. Anda boleh menarik dari penyelidikan ini pada bila-bila masa dan segalamaklumat yang telah diperoleh sebelum anda menarik diri akan tetap digunakan dalam penyelidikan ini. Kajian ini memerlukan jumlah penyertaan seramai 161 orang.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Anda akan diberikan satu set borang soal selidik yang perlu dijawab dalam masa yang diberikan. Borang soal selidik ini mempunyai **tiga bahagian: Bahagian A (Maklumat peribadi dan maklumat berkaitan pekerjaan)**; **Bahagian B (Soal Selidik Ketidakselesaan Tangan dan Muskuloskeletal dan Cornell) dan Bahagian C (Faktor Risiko Ergonomik).** Masa yang diberikan untuk anda menjawab semua soalan ini adalah 20 minit atau kurang. Setelah selesai menjawab, sila berikan borang soal selidik ini kepada pengkaji.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Sekiranya anda sudah mempunyai sejarah kecederaan muskuloskeletal atau kemalangan disebabkan factor bukan pekerjaan selama 12 bulan yang lalu, anda dikecualikan daripada menyertai kajian ini.. Selain itu, anda juga dikecualikan daripada kajian ini sekiranya anda telah disahkan menghidapi gangguan muskuloskeletal disebabkan pekerjaan.

5. APAKAH FAEDAH MENYERTAI KAJIAN INI?

a) KEPADA ANDA SEBAGAI PESERTA?

Penyelidikan ini mungkin bermanfaat atau sama sekali tidak bermanfaat bagi anda. Semua maklumat yang diperolehi daripada kajian ini akan membantu untuk melakukan penambahbaikan dalam kaedah rawatan dan pencegahan kepada responden lain yang mungkin mempunyai pendedahan risiko yang sama, kesakitan atau masalah berkaitan gangguan muskuloskeletal. Hasil kajian ini juga dapat membantu pihak pengurusan syarikat anda untuk menyediakan persekitaran kerja atau keadaan terbaik yang berkaitan dengan amalan ergonomik untuk menyediakan praktis ergonomik yang terbaik kepada anda sebagai perkeja bagi mencegah sebarang kecederaan muskuloskeletal.

.

b) KEPADA PENYELIDIK?

Penyelidikan ini akan bermanfaat bagi penyelidik. Smua maklumat yang diperoleh dari penyelidikan ini akan digunakan untuk menilai kelaziman gangguan muskuloskeletal yang berkaitan dengan pekerjaan di kalangan pekerja makanan dan minuman dan kaitannya dengan faktor risiko ergonomik. Maklumat penyelidikan ini juga boleh digunakan sebagai rujukan untuk kajian masa depan yang berkaitan dengan gangguan muskuloskeletal disebabkan pekerjaan dalam kalangan pekerja makanan dan minuman.

6. ADAKAH IA BERISIKO?

Risiko yang sangatt minima kerana kajian ini hanya menggunakan soal selidik dan tidak invansif.

7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?

Semua maklumat yang diperoleh dalam penyelidikan ini akan disimpan dan hanya akan digunakan untuk tujuan pengajian atau pendidikan dan maklumat tersebut akan tetap disulitkan mengikut peraturan dan keperluan undang-undang. Sekiranya keputusan penyelidikan ini dikeluarkan dan dibentangkan kepada umum, identitianda tidak akan didedahkan tanpa kebenaran. Hanya

pasukan penyelidikan sahaja dibenarkan untuk mengakses maklumat anda. Dengan menandatangani borang persetujuan ini, anda bersetuju untuk menyertai pengumpulan maklumat seperti yangdijelaskan di atas.

8. SIAPA YANG SAYA PERLU HUBUNGI SEKIRANYA SAYA MEMPUNYAI SOALAN TAMBAHAN SEMASA MENGIKUTI PENYELIDIKAN INI?

Sekiranya anda mempunyai sebarang pertanyaan mengenai kajian ini atau hak andadalam kajian ini, sila hubungi:

1. Nurul Syazwani bt Mohd Rafaen (Penyelidik)

   Tel: 017-5968221

   Email: 198975@student.upm.edu.my

2. Prof. Shamsul Bahri Md Tamrin

   Tel: 017- 3134792

   Email: shamsul_bahri@upm.edu.my

Sila tandatangan di sini sekiranya anda telah membaca dan memahami kandungan halaman ini _____

9. PERSETUJUAN

Saya……..No. Kad Pengenalan…….....

beralamat……
dengan ini bersetuju untuk mengambil bahagian secara sukarela dalam penyelidikan yang tersebut di atas *(kajian klinikal/percubaan ubat-ubatan/rakaman video/ kumpulan sasaran/temuduga/soal selidik).Saya telah diberi penjelasan secara menyeluruh mengenai penyelidikan ini dari segi metodologi, risiko dan komplikasi (seperti tertulis pada Helaian Penerangan Responden). Saya memahami bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa tanpa memberi sebarang alasan.Saya juga memahami bahawa sebarang maklumat yang berkaitan identiti saya akan dirahsiakan.

Saya* berminat / tidak berminat untuk mengetahui keputusan kajian yangmelibatkan saya.

Saya setuju/tidak bersetuju untuk imei/gambar/rakaman video/ rakaman suara digunakan dalam apa jua bentuk penerbitan atau pembentangan. (sekiranyaberkaitan).

*potong yang tidak berkenaan

Tandatangan ……..…… Tandatangan……..……

(*Responden)* (*Saksi*)

Tarikh :……..... Nama:……...

No. K/P: ……

Saya mengesahkan bahawa saya telah menerangkan kepada responden ini sifat dan tujuan penyelidikan yang tersebut di atas.

Tarikh ……..…… Tandatangan ……..……..…

(Penyelidik)

APPENDIX 3

QUESTIONNAIRE

Tarikh:	ID. NO.:

BORANG SOAL SELIDIK

TAJUK KAJIAN:	**HUBUNGAN DI ANTARA FAKTOR RISIKO ERGONOMIK DAN GANGGUAN MUSKULOSKELETALDISEBABKAN PEKERJAAN DALAM KALANGAN PEKERJA INDUSTRI MAKANAN DAN MINUMAN**
NAMA PENYELIDIK:	**NURUL SYAZWANI BINTI MOHD RAFAEN**
KURSUS PENGAJIAN:	**BACELOR SAINS KESIHATAN PERSEKITARAN DAN PEKERJAAN DENGAN KEPUJIAN**

Arahan

Borang kaji selidik ini mengandungi **3 bahagian**:

1) **Bahagian A: Maklumat peribadi dan maklumat berkaitan pekerjaan**
2) **Bahagian B: Soal Selidik Ketidakselesaan Musculoskeletal dan Tangan Cornell (CMDQ)**
3) **Bahagian C: Faktor Risiko Ergonomik**

Anda diminta untuk menjawab semua soalan dengan **menandakan pilihan jawapan** dan juga **mengisi jawapan** di ruangan yang disediakan dalam boring kaji selidik ini.

BAHAGIAN A: MAKLUMAT PERIBADI DAN MAKLUMAT BERKAITAN PEKERJAAN

Arahan: Sila jawab SEMUA soalan dalam bahagian ini dengan **mengisi tempat kosong** dan **tandakan (/)** pada pilihan jawapan.

1. Nama penuh: _____

2. Umur: _____ tahun

3. Jantina:
- ☐ Lelaki
- ☐ Perempuan

4. Bangsa:
- ☐ Melayu
- ☐ Cina
- ☐ India
- ☐ Lain-lain, sila nyatakan: _____

5. Tinggi: _____cm

6. Berat: _____kg

7.Status perkahwinan:
- ☐ Bujang
- ☐ Berkahwin
- ☐ Bercerai
- ☐ Lain-lain, sila nyatakan: _____

8.Tahap pendidikan:
- ☐ Tidak bersekolah
- ☐ Sekolah rendah
- ☐ Sekolah menengah
- ☐ Pengajian tinggi

9.Pengalaman bekerja:
- ☐ Kurang dari 1 tahun
- ☐ Lebih dari 1 tahun

10. Tempoh bekerja dalam industri makanan dan minuman: _____ tahun

11.Jenis pekerjaan:
- ☐ Pekerja sepenuh masa
- ☐ Pekerja sambilan

12. Bahagian kerja:

☐	Logistik
☐	Stor (bahan kering dan basah)
☐	Dapur utama
☐	Dapur sejuk
☐	Pastri
☐	Pembungkusan makanan
☐	Penghidang makanan
☐	Lain-lain. Sila nyatakan: _____

13. Jumlah **hari bekerja** dalam seminggu: _____hari dalam seminggu

14. Jumlah **jam bekerja** dalam sehari: _____jam dalam hari

15. Adakah anda mempunyai **masa berehat dalam tempoh sehari bekerja**?

☐ Ya
☐ Tidak

16. Status merokok:

☐ Ya
☐ Tidak

BAHAGIAN B: SOAL SELIDIK KETIDAKSELESAAN MUSKULOSKELETAL CORNELL (CMDQ) UNTUK LELAKI

Gambarajah di bawah menunjukkan kedudukan bahagian badan seperti dirujuk dalam soalan. Sila jawab dengan menandakan kotak yang bersesuaian.

	Sepanjang minggu bekerja yang lepas, berapa kerapkah anda mengalami kesakitan atau ketidak selesaan di:					Jika anda mengalami kesakitan atau ketidak selesaan, bagaimanakah tahapnya?			Jika anda mengalami kesakitan atau ketidak selesaan, adakah ia mengganggu kebolehan anda untuk bekerja?		
	Tidak pernah	1-2 kali lepas	3-4 kali lepas	Sekali setiap hari	Beberapa kali setiap hari	Sedikit kurang menyenangkan	Agak tidak menyenangkan	Sangat tidak menyenangkan	Tidak sama sekali	Sedikit mengganggu	Sangat mengganggu
Leher	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bahu (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bahu (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Belakang atas	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lengan (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lengan (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Belakang bawah	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lengan bawah (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lengan bawah (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pergelangan tangan (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pergelangan tangan (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pinggul/Punggung	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Peha (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Peha (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lutut (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lutut (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Betis (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Betis (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Kaki (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Kaki (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

BAHAGIAN B: SOAL SELIDIK KETIDAKSELESAAN MUSKULOSKELETAL CORNELL (CMDQ) UNTUK PEREMPUAN

Gambarajah di bawah menunjukkan kedudukan bahagian badan seperti dirujuk dalam soalan. Sila jawab dengan menandakan kotak yang bersesuaian.	Sepanjang minggu bekerja yang lepas, berapa kerapkah anda mengalami kesakitan atau ketidak selesaan di:					Jika anda mengalami kesakitan atau ketidak selesaan, bagaimanakah tahapnya?			Jika anda mengalami kesakitan atau ketidak selesaan, adakah ia mengganggu kebolehan anda untuk bekerja?		
	Tidak pernah	1-2 kali lepas	3-4 kali lepas	Sekali setiap hari	Beberapa kali setiap hari	Sedikit kurang menyenangkan	Agak tidak menyenangkan	Sangat tidak menyenangkan	Tidak sama sekali	Sedikit menggangu	Sangat menggangu
Leher	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bahu (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Bahu (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Belakang atas	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lengan (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lengan (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Belakang bawah	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lengan bawah (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lengan bawah (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pergelangan tangan (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pergelangan tangan (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pinggul/Punggung	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Peha (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Peha (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lutut (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Lutut (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Betis (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Betis (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Kaki (kanan)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Kaki (kiri)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

BAHAGIAN B: SOAL SELIDIK KETIDAKSELESAAN MUSKULOSKELETAL TANGAN KIRI

Gambarajah di bawah menunjukkan kedudukan bahagian badan seperti dirujuk dalam soalan. Sila jawab dengan menandakan kotak yang bersesuaian.

Lengkapkan hanya untuk TANGAN KIRI

	Sepanjang minggu bekerja yang lepas, berapa kerapkah anda mengalami kesakitan atau ketidakselesaan di:	Jika anda mengalami kesakitan atau ketidakselesaan, bagaimanakah tahapnya?	Jika anda mengalami kesakitan atau ketidakselesaan, adakah ia mengganggu kebolehan anda untuk bekerja?
Kawasan A (Kawasan berlorek)	☐ Tidak pernah ☐ 1-2 kali minggu lepas ☐ 3-4 kali minggu lepas ☐ Sekali setiap hari ☐ Beberapa kali setiap hari	☐ Sedikit kurang menyenangkan ☐ Agak tidak menyenangkan ☐ Sangat tidak menyenangkan	☐ Tidak sama sekali ☐ Sedikit menganggu ☐ Sangat menganggu
Kawasan B (Kawasan berlorek)	☐ Tidak pernah ☐ 1-2 kali minggu lepas ☐ 3-4 kali minggu lepas ☐ Sekali setiap hari ☐ Beberapa kali setiap hari	☐ Sedikit kurang menyenangkan ☐ Agak tidak menyenangkan ☐ Sangat tidak menyenangkan	☐ Tidak sama sekali ☐ Sedikit menganggu ☐ Sangat menganggu
Kawasan C (Kawasan berlorek)	☐ Tidak pernah ☐ 1-2 kali minggu lepas ☐ 3-4 kali minggu lepas ☐ Sekali setiap hari ☐ Beberapa kali setiap hari	☐ Sedikit kurang menyenangkan ☐ Agak tidak menyenangkan ☐ Sangat tidak menyenangkan	☐ Tidak sama sekali ☐ Sedikit menganggu ☐ Sangat menganggu
Kawasan D (Kawasan berlorek)	☐ Tidak pernah ☐ 1-2 kali minggu lepas ☐ 3-4 kali minggu lepas ☐ Sekali setiap hari ☐ Beberapa kali setiap hari	☐ Sedikit kurang menyenangkan ☐ Agak tidak menyenangkan ☐ Sangat tidak menyenangkan	☐ Tidak sama sekali ☐ Sedikit menganggu ☐ Sangat menganggu
Kawasan E (Kawasan berlorek)	☐ Tidak pernah ☐ 1-2 kali minggu lepas ☐ 3-4 kali minggu lepas ☐ Sekali setiap hari ☐ Beberapa kali setiap hari	☐ Sedikit kurang menyenangkan ☐ Agak tidak menyenangkan ☐ Sangat tidak menyenangkan	☐ Tidak sama sekali ☐ Sedikit menganggu ☐ Sangat menganggu
Kawasan F (Kawasan berlorek)	☐ Tidak pernah ☐ 1-2 kali minggu lepas ☐ 3-4 kali minggu lepas ☐ Sekali setiap hari ☐ Beberapa kali setiap hari	☐ Sedikit kurang menyenangkan ☐ Agak tidak menyenangkan ☐ Sangat tidak menyenangkan	☐ Tidak sama sekali ☐ Sedikit menganggu ☐ Sangat menganggu

BAHAGIAN B: SOAL SELIDIK KETIDAKSELESAAN MUSKULOSKELETAL TANGAN KANAN

Gambarajah di bawah menunjukkan kedudukan bahagian badan seperti dirujuk dalam soalan. Sila jawab dengan menandakan kotak yang bersesuaian.

Lengkapkan hanya untuk TANGAN KANAN

		Sepanjang minggu bekerja yang lepas, berapa kerapkah anda mengalami kesakitan atau ketidakselesaan di:					Jika anda mengalami kesakitan atau ketidakselesaan, bagaimanakah tahapnya?			Jika anda mengalami kesakitan atau ketidakselesaan, adakah ia mengganggu kebolehan anda untuk bekerja?		
		Tidak pernah	1-2 kali minggu lepas	3-4 kali minggu lepas	Sekali setiap hari	Beberapa kali setiap hari	Sedikit kurang menyenangkan	Agak tidak menyenangkan	Sangat tidak menyenangkan	Tidak sama sekali	Sedikit mengganggu	Sangat mengganggu
	Kawasan A (Kawasan berlorek)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Kawasan B (Kawasan berlorek)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Kawasan C (Kawasan berlorek)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Kawasan D (Kawasan berlorek)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Kawasan E (Kawasan berlorek)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Kawasan F (Kawasan berlorek)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

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BAHAGIAN C: FAKTOR-FAKTOR RISIKO ERGONOMIK

Arahan: Sila tandakan **(✔)** pada pilihan jawapan di bawah:

Adakah kerja anda memerlukan anda untuk bekerja seperti situasi:

1. a) Mengangkat lengan atas dari paras kepala atau siku atas dari paras bahu semasa kerja?

☐	Ya, lebih dari 2 jam secara keseluruhan (sehari tempoh bekerja)
☐	Ya, lebih dari 2 jam secara berterusan (sehari tempoh bekerja)
☐	Ya, tapi kurang dari 2 jam
☐	Tidak

1. b) Mengangkat bahu semasa kerja?

☐	Ya, lebih dari 2 jam secara keseluruhan (sehari tempoh bekerja)
☐	Ya, lebih dari 2 jam secara berterusan (sehari tempoh bekerja)
☐	Ya, tapi kurang dari 2 jam (sehari tempoh bekerja)
☐	Tidak

1. c) Mendongak kepala, menunduk kepala atau menoleh kepala ke sisi semasa kerja?

☐	Ya, lebih dari 2 jam secara keseluruhan (sehari tempoh bekerja)
☐	Ya, lebih dari 2 jam secara berterusan (sehari tempoh bekerja)
☐	Ya, tapi kurang dari 2 jam (sehari tempoh bekerja)
☐	Tidak

1. d) Membongkok badan ke depan atau membongkok badan ke sisi kiri/ kanan atau memusingkan badan ke sisi kiri/ kanan semasa kerja?

☐	Ya, lebih dari 2 jam secara keseluruhan (sehari tempoh bekerja)
☐	Ya, lebih dari 2 jam secara berterusan (sehari tempoh bekerja)
☐	Ya, tapi kurang dari 2 jam (sehari tempoh bekerja)
☐	Tidak

1. e) Membengkok pergelangan tangan ke bawah atau ke atas atau ke sisi semasa kerja?

	Ya, lebih dari 2 jam secara keseluruhan (sehari tempoh bekerja)
	Ya, lebih dari 2 jam secara berterusan (sehari tempoh bekerja)
	Ya, tapi kurang dari 2 jam (sehari tempoh bekerja)
	Tidak

1. f) Lengan ditarik ke hadapan badan atau ditarik ke belakang badan semasa kerja?

	Ya, lebih dari 2 jam secara keseluruhan (sehari tempoh bekerja)
	Ya, lebih dari 2 jam secara berterusan (sehari tempoh bekerja)
	Ya, tapi kurang dari 2 jam (sehari tempoh bekerja)
	Tidak

1. g) Mencangkung atau melutut semasa kerja?

	Ya, lebih dari 2 jam secara keseluruhan (sehari tempoh bekerja)
	Ya, lebih dari 2 jam secara berterusan (sehari tempoh bekerja)
	Ya, tapi kurang dari 2 jam (sehari tempoh bekerja)
	Tidak

2. a) Berdiri semasa kerja dengan kurang pergerakan (secara keseluruhan dalam tempoh bekerja)?

	Ya, lebih dari 2 jam secara keseluruhan (sehari tempoh bekerja)
	Ya, lebih dari 2 jam secara berterusan (sehari tempoh bekerja)
	Ya, tapi kurang dari 2 jam (sehari tempoh bekerja)
	Tidak

2. b) Duduk semasa kerja dengan kurang pergerakan (secara keseluruhan dalam tempoh bekerja)?

- ☐ Ya, lebih dari 30 minit secara keseluruhan (sehari tempoh bekerja)
- ☐ Ya, lebih dari 30 minit secara berterusan (sehari tempoh bekerja)
- ☐ Ya, tapi kurang dari 30 minit (sehari tempoh bekerja)
- ☐ Tidak

3. a) Adakah anda perlu ANGKAT atau TURUNKAN objek/ beban semasa kerja?

- ☐ Ya
- ☐ Tidak

3. b) Adakah anda perlu TOLAK atau TARIK objek/ beban semasa bekerja?

- ☐ Ya
- ☐ Tidak

4. Adakah anda **melakukan kerja secara berulang** seperti keadaan di bawah:

4. a) Pergerakan semasa kerja secara berulang:

- ☐ Ya, lebih dari 3 jam secara keseluruhan (sehari tempoh bekerja)
- ☐ Ya, lebih dari 1 jam secara berterusan (sehari tempoh bekerja)
- ☐ Ya, tapi kurang dari 3 jam (sehari tempoh bekerja)
- ☐ Tidak, kerja saya tidak berulang

4. b) Menggunakan JARI/TANGAN/PERGELANGAN TANGAN semasa kerja secara intensif (giat/kerap):

- ☐ Ya, lebih dari 3 jam secara keseluruhan (sehari tempoh bekerja)
- ☐ Ya, lebih dari 1 jam secara berterusan (sehari tempoh bekerja)
- ☐ Ya, tapi kurang dari 3 jam (sehari tempoh bekerja)
- ☐ Tidak, kerja saya tidak berulang

4. c) Pergerakan BAHU/TANGAN semasa kerja secara berulang:

	Ya, lebih dari 3 jam secara keseluruhan (sehari tempoh bekerja)
	Ya, lebih dari 1 jam secara berterusan (sehari tempoh bekerja)
	Ya, tapi kurang dari 3 jam (sehari tempoh bekerja)
	Tidak, kerja saya tidak berulang

4. d) Menggunakan TUMIT/PANGKAL TAPAK TANGAN semasa kerja sebagai 'PENUKUL secara berulang:

	Ya, lebih dari 2 jam secara keseluruhan (sehari tempoh bekerja)
	Ya, lebih dari 1 jam secara berterusan (sehari tempoh bekerja)
	Ya, tapi kurang dari 2 jam (sehari tempoh bekerja)
	Tidak, kerja saya tidak berulang

4. e) Menggunakan LUTUT semasa kerja sebagai 'PENUKUL' secara berulang:

	Ya, lebih dari 2 jam secara keseluruhan (sehari tempoh bekerja)
	Ya, lebih dari 1 jam secara berterusan (sehari tempoh bekerja)
	Ya, tapi kurang dari 2 jam (sehari tempoh bekerja)
	Tidak, kerja saya tidak berulang

5. Adakah kerja anda TERDEDAH DENGAN GEGARAN seperti situasi berikut:

5. a) Menggunakan ALAT BERKUASA ELEKTRIK (blender, mixer, grinder, etc) lebih dari 50 minit dalam sehari bekerja:

	Ya
	Tidak

5. b) Adakah syarikat anda menyediakan SARUNG TANGAN ANTI GEGARAN bagi menjalankan kerja menggunakan ALAT BERKUASA ELEKTRIK (blender, mixer, grinder, etc)?

	Ya
	Tidak

5. c) Adakah kerja anda melibatkan pendedahan kepada GEGARAN kepada seluruh badan lebih daripada 5 jam sehari?

	Ya
	Tidak

5. d) Adakah kerja anda melibatkan pendedahan kepada GEGARAN kepada seluruh badan dengan BADAN BERGEGAR lebih daripada 3 jam sehari?

	Ya
	Tidak

6.a) Bagaimanakah pencahayaan di tempat kerja anda?

	Terlalu cerah atau silau (terlebih cahaya)
	Terlalu gelap atau malap (kurang cahaya)
	Cahaya mencukupi

6.b) Bagaimanakah suhu di tempat kerja anda?

	Selesa
	Terlalu sejuk
	Terlalu panas

6.c) Bagaimanakah pengudaraan di tempat kerja anda?

	Bagus (Kipas eksos/ Eksos pengudaraan tempatan (LEV)/ Kipas MASIH berfungsi dengan baik atau terdapat pengudaraan semula jadi seperti tingkap/pintuterbuka atau bekerja dia ruang kerja yang terbuka)
	Tidak bagus (Kipas eksos/ Eksos pengudaraan tempatan (LEV)/ Kipas TIDAK berfungsi dengan baik atau TIADA pengudaraan semula jadi seperti tingkap/pintuterbuka atau bekerja dia ruang kerja yang tertutup)

6. d) Adakah tempat kerja anda bising?

	Mempunyai bunyi bising (contoh: hampir dengan mesin beroperasi yangmengeluarkan bunyi)
	Mempunyai bunyi bising atau suara berpanjangan yang mengganggu kerja anda
	Tiada bunyi bising