UNIVERSITI PUTRA MALAYSIA

FACTORS ASSOCIATED WITH THE PREVALENCE OF MUSCULOSKELETAL DISORDERS (MSDs) AMONG EMPLOYEES WORKING IN HYPERMARKETS IN KLANG VALLEY

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BY

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ABSTRACT

FACTORS ASSOCIATED WITH THE PREVALENCE OF MUSCULOSKELETAL DISORDERS (MSDs) AMONG EMPLOYEES WORKING IN HYPERMARKETS IN KLANG VALLEY

NURUL KHAIRINA BINTI KAMARUDIN

Introduction: Studies in developed countries has shown significant ergonomics concern in wholesale and retail sector which were detrimental to the industry as a whole. Primarily, musculoskeletal disorders has been the most commonly reported disabilities which not only affects the employees but also the employers as productivities became a major concern. Specifically, hypermarkets employee requires employees to carry out a broad range of manual handling and repetitive task which includes arrangement of products on the shelves repeatedly, lift, push or pull heavy loads, or standing and sitting for a long time with minimal movement, all of which increase the risk of developing MSDs. However, based on literature search, there is a lack of data available on the prevalence of MSDs among hypermarkets workers in Malaysia which shows the lack and underreporting cases of MSDs in this sector. **Objectives:** To determine the factors associated with the prevalence of musculoskeletal disorders (MSDs) among hypermarkets workers in Klang Valley. **Methodology:** This was a cross-sectional study conducted among hypermarket workers in Klang Valley. The main research instruments used in this study was self-administered questionnaire which consists of six sections: sociodemographic background, medical history, social lifestyle, occupational history, modified Nordic Musculoskeletal Questionnaire (NMQ) and ergonomics risk factors. **Results and Discussion:** A total of 261 employees have participated in this study. From the data obtained, the prevalence of self-reported MSDs (total in any body part) among the respondents was 81.6% highest being the lower back (42.5%) followed by the upper back (35.2%), the neck (25.3%) and shoulder (25.3%). It was found that age, gender, education, marital status, children, physical activity, and its frequency, working experience, static and sustained posture, lifting and lowering loads, handling loads in seated position, temperature and ventilation were significantly associated with the prevalence of MSDs among the respondents with $p<0.05$. From the multivariate analysis, total MSDs was mainly contributed by the children factor (OR=11.745, 95% CI=2.772 - 49.764). **Conclusion:** This study showed that most of the hypermarket workers have developed MSDs in the past 12 months. There are multifactorial factors in causing MSDs that were self-reported by the workers.

Keywords: *ergonomics, musculoskeletal disorders, ergonomic risk factors, hypermarket workers*

ABSTRAK

FAKTOR YANG BERHUBUNG KAIT DENGAN KES GANGGUAN MUSKULOSKELETAL DALAM KALANGAN PEKERJA YANG BEKERJA DI PASAR RAYA BESAR DI LEMBAH KLANG

NURUL KHAIRINA BINTI KAMARUDIN

Pengenalan: Kajian di negara maju menunjukkan terdapatnya kebimbangan ergonomik yang signifikan di dalam sektor borong dan runcit yang memudaratkan industri secara keseluruhan. Terutamanya, gangguan muskuloskeletal yang merupakan ketidakupayaan yang paling kerap dilaporkan yang bukan sahaja memberikan kesan kepada pekerja tetapi juga kepada majikan kerana produktiviti telah menjadi kebimbangan utama. Khususnya, pekerja di pasar raya besar yang memerlukan para pekerjanya untuk melakukan pelbagai jenis kerja pengendalian manual dan tugasan berulang termasuk menyusun produk di rak berulang kali, mengangkat, menolak atau menarik beban yang berat, atau berdiri dan duduk untuk jangka masa yang lama dengan pergerakan yang minima, di mana semua akan meningkatkan risiko untuk mendapat MSDs. Walau bagaimanapun, daripada kajian literatur yang dibuat, terdapat kekurangan data yang wujud mengenai kes gangguan muskuloskeletal dalam kalangan pekerja yang bekerja di pasar raya di Malaysia di mana ia menunjukkan kekurangan dan kurang laporan kes untuk gangguan musculoskeletal dalam sektor ini. **Objektif:** Untuk mengenalpasti faktor yang berkait dengan kes gangguan muskuloskeletal dalam kalangan pekerja yang bekerja di pasar raya besar di Lembah Klang. **Metodologi:** Kajian ini merupakan kajian keratan rentas yang dijalankan dalam kalangan pekerja pasar raya besar di Lembah Klang. Instrumen utama yang digunakan dalam kajian ini ialah soal selidik tadbiran kendiri yang mempunyai 6 bahagian: ciri-ciri sosiodemografi, sejarah kesihatan, gaya hidup, sejarah pekerjaan, *Nordic Musculoskeletal Questionnaire (NMQ)* dan faktor risiko ergonomik. **Keputusan dan Perbincangan: S**ejumlah 261 pekerja telah menyertai kajian ini. Daripada data yang diperoleh, kes gangguan muskuloskeletal yang dilapor sendiri (jumlah di mana-mana bahagian badan) dalam kalangan responden ialah 81.6% di mana bahagian tertinggi ialah belakang bawah (42.5%), diikuti belakang atas (35.2%), leher (25.3%) dan bahu (25.3%). Didapati bahawa umur, jantina, pendidikan, status perkahwinan, anak, aktiviti fizikal, dan kekerapannya, pengalaman pekerjaan, statik dan postur yang berterusan, mengangkat dan menurunkan beban, menguruskan beban dalam keadaan duduk, suhu dan pengudaraan berkait secara signifikan dengan kes gangguan muskuloskeletal dalam kalangan responden dengan $p<0.05$. Daripada analisis *multivariate*, jumlah MSDs disumbangkan oleh faktor anak (OR=11.745, 95% CI=2.772 - 49.764). **Kesimpulan:** Kajian ini menunjukkan majoriti pekerja pasar raya besar mempunyai gangguan muskuloskeletal pada 12 bulan lepas. Terdapat pelbagai faktor yang menyebabkan MSDs yang dilaporkan oleh pekerja.

Kata kunci: *ergonomik, gangguan musculoskeletal, faktor risiko ergonomik, pekerja pasar raya besar*

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LIST OF ABBREVATIONS

MSDs	Musculoskeletal Disorders
WHO	World Health Organization
DOSH	Department of Occupational Safety and Health
DOSM	Department of Statistics Malaysia
CCOHS	Canadian Centre for Occupational Health and Safety
WMSDs	Work-related Musculoskeletal Disorders
EU-OSHA	European Agency for Safety and Health at Work
CTS	Carpal Tunnel Syndrome
HSE	Health and Safety Executive
BMI	Body mass index
CNS	Central nervous system
COVID-19	Coronavirus disease 2019

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Wholesaler comprises of people that sell goods for resale without transforming it to other products. On the other hand, a retailer is the one that will sell the goods to consumers usually with small quantities. Wholesaling process is an intermediate step while retailing process will be the final step in the distribution of goods to the desired consumers (Anderson et al., 2010). Wholesalers will buy products in bulk or high quantities from producers or manufacturers. Retailers then may buy the products sold by wholesalers to be sold to consumers. Department of Statistics Malaysia (DOSM) (2019) in year 2018 alone had recorded 468,930 new establishment of wholesale and retail trades in Malaysia with Selangor continue to lead the charts having 94,857 establishment in the wholesale and retail markets. In March 2021, sales by wholesale and retail trade were RM 112.8 billion, and it has been one of the active sectors in Malaysia (Department of Statistics Malaysia, 2021).

Mui et al. (2003) identified four retailing categories in Malaysia: the informal sector, small-scale or single-proprietary shops along the major roads in town areas, large-

scale department stores and supermarkets built in 1970s and 1980s super-regional shopping centers built in the late 1980s and beyond. Hypermarket is considered as a retail sector which sell daily necessities such as food, vegetables and cleaning materials (Hassan & Rahman, 2005; Hassan, 2012). In Malaysia, there are about 296 hypermarket outlets which almost half of the outlets are in Selangor due to the high population. The main hypermarkets in Malaysia are Carrefour, Econsave, Giant, Mydin, and Tesco (Hassan, 2012).

1.2 Problem statement

MSDs are one of the most common occupational health problems that affect workers in many sectors, including people working in hypermarkets. Grocery job was listed in the top 25 jobs for injuries such as neck pain, carpal tunnel syndrome (CTS) and back pain which leads to a program conducted by Washington State Safety & Health Assessment Research for Prevention (SHARP) that conclude grocery job as one of the top 12 industries in need of focused research and prevention efforts (Anton & Weeks, 2016). In a study, Anton & Weeks (2016) reported as high as 78% of grocery workers had experienced musculoskeletal symptoms. Several more study (Sansone et al., 2014; Sirge et al., 2014) also found that supermarket cashiers are at risk of developing MSDs, where 46.4% and 86.6% of the cashiers in respective studies had suffered musculoskeletal discomfort due to their work activities.

However, based on literature search using Google Scholar, Scopus and Science Direct, there is a lack of data available on the prevalence of MSDs among

hypermarkets workers in Malaysia This indirectly shows the lack and underreporting cases of MSDs in this sector whereby evidence from developed and other developing countries had reported a very high prevalence of MSDs. This target group does not receive enough attention on the development of MSDs. Without the statistics on the severity on the issues of the MSDs problems among workers in this sector, it is not possible to set a priority to assist the employees in this industries following that the sector might be suffering from productivity losses due to absenteeism and presenteeism among the employees resulting in low productivity and increased healthcare and compensation costs (Bz et al., 2018; Centres for Diseases Control and Prevention, 2021).

1.3 Study Justification

This research will provide an insight on the prevalence of MSDs and the factors associated with MSDs among hypermarkets workers in Klang Valley. The data obtained can be used to give an overview on the current situation and the urgency of the need for control measures.

Next, conducting this research can help to identify which risk factors might have influenced the development of MSDs and help to reduce the prevalence of MSDs among hypermarkets worker which in the end results in improving the productivity and quality of work shown by the workers.

1.4 Research Questions

In order for this research to achieve its intention, the following research questions have been outlined:

i. What is the 12 months prevalence of musculoskeletal disorders (MSDs) among hypermarkets workers in Klang Valley?

ii. What are the factors that are associated with prevalence of MSDs among hypermarkets workers?

1.5 Objectives

1.5.1 General Objective

To determine the factors associated with the prevalence of musculoskeletal disorders (MSDs) among hypermarkets workers in Klang Valley.

1.5.2 Specific Objectives

The specific objectives for this study are:

1. To determine the sociodemographic characteristics, medical history, social lifestyle, occupational history, and ergonomics risk factors of hypermarkets workers in Klang Valley.
2. To determine the 12 months prevalence of musculoskeletal disorders (MSDs) among hypermarkets workers in Klang Valley.

3. To determine the association between sociodemographic characteristics, medical history, social lifestyle, occupational history, and ergonomics risk factors with the prevalence of MSDs.
4. To determine the factors associated with the prevalence of MSDs among hypermarkets workers.

1.6 Hypothesis

i. Sociodemographic characteristics, medical history, social lifestyle, occupational history, and ergonomics risk factors are significantly associated with the prevalence of MSDs among hypermarkets workers.

1.7 Conceptual and Operational Definition

1.7.1 Musculoskeletal disorders (MSDs)

i. Conceptual

Musculoskeletal disorders (MSDs) refer to the problems that affect the back, neck, shoulder, and joints of the musculoskeletal system ranging from minor aches to chronic pain that leads to disabilities (European Agency for Safety and Health at Work, 2019).

ii. Operational

The prevalence of MSDs is the self-reported experience of ache, pain, or discomfort experienced by employees at the 9 body parts in the past 12 months measured using a musculoskeletal questionnaire (Kuorinka et al., 1987).

1.7.2 Sociodemographic characteristics

i. Conceptual

Socio is defined as studying something while demographic refers to data related to a specific population (Oxford Advanced Learner's Dictionaries, 2021). Hence, the sociodemographic characteristic is a study to know information such as age, gender, or ethnicity on a specific population.

ii. Operational

Sociodemographic characteristics are self-reported of respondent information using a self-administered questionnaire, which may influence the developments of MSDs among the respondents.

1.7.3 Social lifestyle

i. Conceptual

Lifestyle is defined as how the individual lives and is related to the activities or objects that will be done by certain parts (Cambridge Dictionary, n.d.).

ii. Operational

Social lifestyle is self-reported of respondent lifestyle using a self-administered questionnaire which will indicate behaviors that induce the development of MSDs by the respondents.

1.7.4 Medical History

i. Conceptual

Medical history is related to information on individual health, including details on illnesses, allergies, surgeries, and immunizations (National Cancer Institute, n.d.).

ii. Operational

Medical history is self-reported of respondent disease, illness, or injuries using a self-reported questionnaire to exclude the respondents with medical history.

1.7.5 Occupational exposures

i. Conceptual

Occupational exposures is a process to determine if there is any hazards present in the workplace and the probability for the workers to get injuries from the hazards (Huang et al., 2020).

ii. Operational

Occupational exposures are self-reported of respondent history of work using self-administered questionnaire.

1.7.6 Ergonomics risk factors

i. Conceptual

Ergonomics risk factor is defined as any features, characteristics or exposure that contribute to musculoskeletal injury (DOSH, 2017).

ii. Operational

Ergonomics risk factors are self-reported of daily activities or works of respondents that related to ergonomics using self-administered questionnaire.

1.8 Conceptual Framework

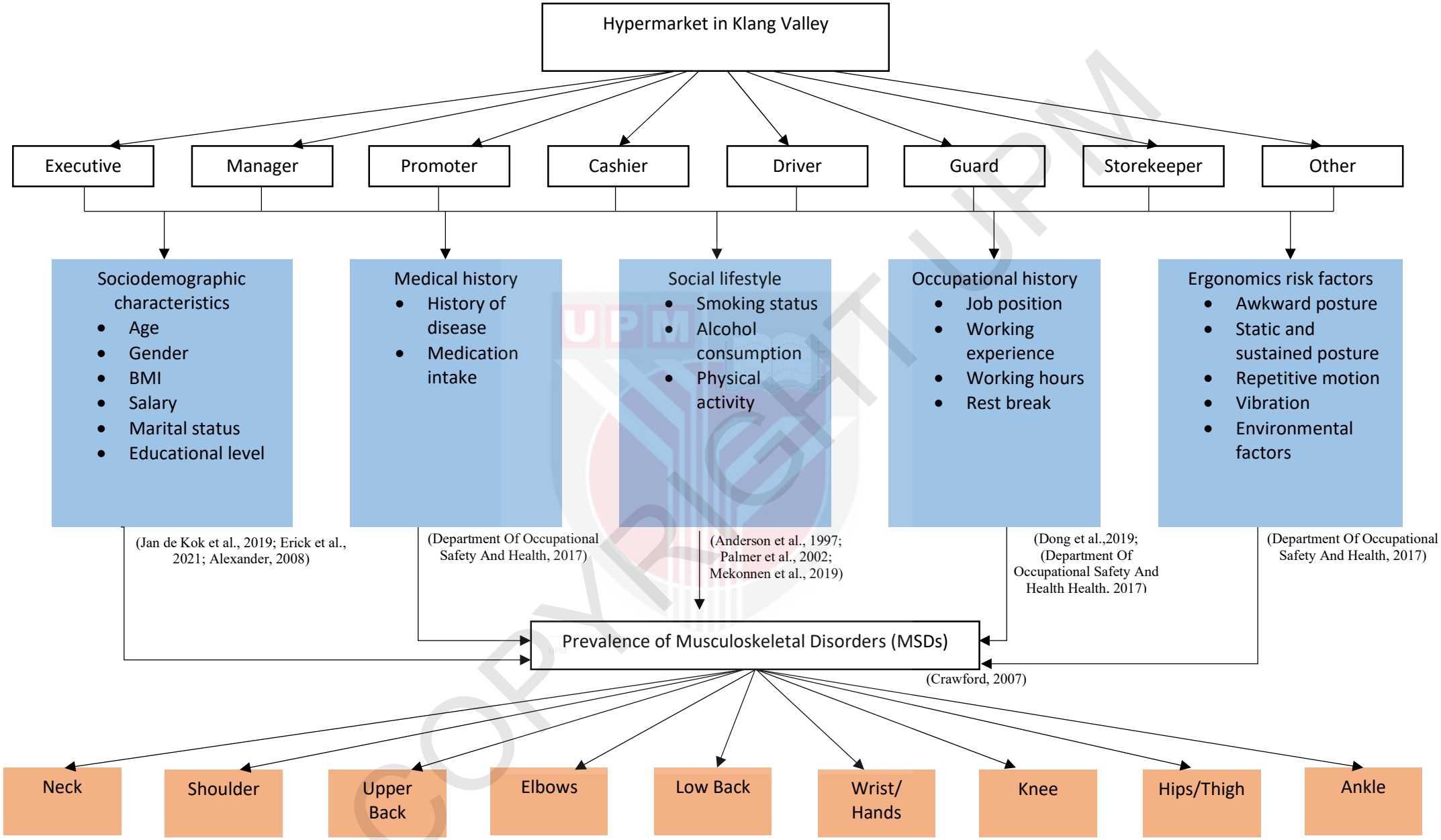

Figure 1.1. Conceptual Framework

CHAPTER 2

LITERATURE REVIEW

2.1 Musculoskeletal disorders (MSDs)

Musculoskeletal disorders (MSDs) are injuries that cause adverse effects to the human body, including the musculoskeletal system such as muscles, tendons, ligaments, nerves, discs, and blood vessels (Middlesworth, 2011). The time for experiencing musculoskeletal injuries varies from short-term conditions like sprains and fractures to lifelong moments such as disabilities in certain body parts (World Health Organization (WHO), 2021). MSDs were defined as connective tissues and musculoskeletal system injuries or disorders that develop due to bodily reactions such as climbing, crawling, and twisting any body parts (Centers for Disease Control and Prevention, 2020). According to the Guidelines on Ergonomics Risk Assessment at Workplace, musculoskeletal disorders are related to the musculoskeletal system, mainly the muscles, ligaments, or soft tissues of body joints like nerves, tendons, and spinal nerves (Department Of Occupational Safety And Health (DOSH), 2017)

Some of the common parts of the body that may be affected by these disorders are low back, neck, shoulder, forearm, and hand (Charles et al., 2018). Tendon

inflammations, bursitis, epicondylitis, carpal tunnel syndrome, myalgia, osteoarthrosis, and low back pain are examples of conditions that the affected person may be experiencing (Punnett & Wegman, 2004). The development of MSDs may vary from mild to severe (Canadian Centre for Occupational Health and Safety, 2014). Several terms that can be used to define MSDs are Occupational Overuse Syndrome, Repetitive Strain Injury, Repetitive Stress Injury, Repetitive Motion Injuries, Cumulative Trauma Disorders, Upper Limb Disorders, and Upper Extremity Musculoskeletal Disorders (DOSH, 2017). Work-Related Musculoskeletal Disorders (WMSDs) are related to the work environment of the workers, whereas the disorders develop after a series of exposure. The effects are usually shown after the workers are exposed to the related risk factors for a long time (Lop et al., 2017).

2.2 Prevalence of MSDs

WHO (2021) has estimated that a total of 1.71 billion people have experienced MSDs globally. European Agency for Safety and Health at Work (2010) states that there is an increasing trend in the MSDs among the European workers, whereas 24.7% and 45.5% of them reported experiencing backache and muscular pain. Furthermore, there is also an increase by 32% in the trends of the cases of Carpal Tunnel Syndrome (CTS) and MSDs from 2002 to 2005. In Great Britain, there are about 480,000 reported cases of work-related musculoskeletal disorders where the most affected area is on the upper limbs or neck (44%), followed by the back (37%) and the lower limbs (19%) (Health and Safety Executive, 2020).

According to WHO (2021), around 441 million people in high-income countries are affected by MSDs, followed by countries in the WHO Western Pacific Region with 427 million, and lastly, countries in the South-East-Asia region 369 million people affected. The prevalence of MSDs varies across countries due to the differences in measures implemented to prevent the development of MSDs among the workers (Jan de Kok et al., 2019).

In Denmark, during 2016, the most reported cases of occupational diseases, about 6,850 cases out of 19,940 are due to the MSDs (Jan de Kok et al., 2019). Cieza et al. (2020), in a study, found that low back pain is leading the chart for musculoskeletal conditions, whereas 134 out of 204 countries had analyzed that they require rehabilitation services to treat these disorders. In Iran, most of the workers had experienced MSDs in the lower back (48.9%), shoulders (45.9%), neck (44.2%), upper back (43.8%), and knees (43.8%) (Choobineh et al., 2016).

2.2.1 Prevalence of MSDs in hypermarkets

Due to the hypermarkets nature of work that requires them to arrange new things on the shelves repeatedly, lift, push or pull heavy loads, or standing and sitting for a long time with minimal movements might increase the chances for them to develop MSDs. More than half of the grocery workers reported that they experienced musculoskeletal symptoms (Anton & Weeks, 2016). A study among workers who work in supermarket warehouses found that low back pain is the most significant pain experienced by the workers (Basahel, 2015). A study by

Violante et al. (2005) among supermarket workers found that the prevalence of low back pain for 12 months among this target population is 34.5%. A study by Agrawal & Panjwani (2015) among male grocery stores found that 89% of the respondents had experienced pain at least at one site. The highest reported site is in the lower back region, which accounted for 60%. In a central market in Calcutta, India, 95% of the manual workers had experienced MSDs symptoms for the last 12 months which low back pain is the most reported symptom (Sarkar et al., 2016). This might occur due to the heavy loads that they had to handle repetitively during works.

Deng et al. (2020), in their study among supermarket cashiers, revealed that the most reported body parts of MSDs are on the hands, specifically the wrist, compared to shoulders or neck. Moreover, in a study by Sansone et al. (2014), they found that female supermarket cashiers had a high prevalence of shoulder pain which is 46.4%, compared to the general female population, which is only 25.5%. There is a high prevalence of Carpal Tunnel Syndrome (CTS) symptoms reported among full-time cashiers (31.0%) compared to part-time cashiers (19.3%) or controls (16.3%) (Bonfiglioli et al., 2007). A study by Sirge et al. (2014) among the cashier also found the same results whereas 86.6% had experienced musculoskeletal discomfort in the last 6 months and 56.8% had experienced in the last 7 days. Other than that, Erick et al. (2021) in their study among supermarket cashiers, found that back pain has the highest prevalence, which is 68.3%, compared to only 35% for neck pain. There is a high prevalence of low back pain

(21.4%) reported among cashiers who were seeking physiotherapy treatment in a clinic that provides health services for a supermarket chain (Silva et al., 2015).

2.2.2 Prevalence of MSDs in Malaysia

According to the DOSH (2021), in 2019, 409 reported cases on occupational musculoskeletal disorders were reported, where 338 of the total cases had already been confirmed. There are 78.8% of self-reported cases of MSDs symptoms among manual material handling that works at Computer Numerical Control (CDC) in Malaysia (Abdullah & Dawal, 2020). However, there is a lack of research on the MSDs among workers in the hypermarkets that was not published through a general search.

2.3 Factors associated with MSDs

MSDs are caused by multiple factors which are interrelated between one and another, such as sociodemographic and individual risk factors mainly related to the gender, age or education level, ergonomics risk factors, psychosocial and organizational risk factors as well as physical or biomechanical risk factors such as lifting people, working in tiring positions and carrying heavy loads (Bz et al., 2018; Jan de Kok et al., 2019).

2.3.1 Sociodemographic background

Age may have relations with the development of MSDs. Long exposure is needed for someone to develop chronic MSDs making older people more prone to experience these MSDs. (Jan de Kok et al., 2019). In Europe, around 24.2% of workers aged more than 55 years old had experienced backache, while 17.7% of workers under 25 years old reported having the same health problems (European Agency for Safety and Health at Work, 2010). According to the U.S. Bureau of Labor Statistics (2020) data, the highest cases of MSDs were on workers from age 45 to 54 years, which accounted for 65,720 cases in 2018.

A study by We et al. (2004) stated that for lifting and hand-arm vibration, men are more prone to have back, neck, and shoulder complaints compared to women. There is a high risk of neck and shoulder complaints for women due to activities related to arm posture. Nordander et al. (2007) also obtained the same outcome, whereas women have a high prevalence of MSDs, specifically on the neck and upper extremity, when doing the same activity with men. Erick et al. (2021), in their study, concluded that there is an association between gender with neck and upper back pain, whereas women are more prone to experience those two compared to men.

According to Alexander (2008), individuals with low educational levels are more prone to get musculoskeletal pain on the neck, shoulder, low back, and knee than those who study until university level. Cardoso et al. (2009) found that teachers

with college-level schooling have a low prevalence of musculoskeletal pain than teachers with a high-school education. According to Kibret et al. (2020) in the study stated that individuals with low educational levels were 4.2 times more prone to experience work-related musculoskeletal diseases (WMSDs) compared to those with master's degrees. It might be due to the lack of knowledge and skills related to ergonomics in the workplace.

According to Shariat et al. (2018), there is an association between total pain scores and the respondents' body mass index (BMI). A study by Sotrate Gonçalves & De Oliveira Sato (2020) among cleaners has found an association between BMI and symptoms of pain in the ankle or foot region. In addition, Viester et al. (2013) also obtained the same outcome where an increase in BMI will increase the prevalence of musculoskeletal symptoms for 12 months. A study by Algarni et al. (2020) among the majority of supermarket cashiers with overweight BMI obtained a high prevalence of MSDs symptoms. There is a significant association between the severity of pain in the lower back and BMI of the workers (Shariat et al., 2017).

2.3.2 Occupational exposures

The nature of work for wholesale and retail workers might contribute to the development of MSDs. According to Dong et al. (2019), a total of work hours per week increases, and the time allocated for the workers to rest decreases, the development of MSDs may increase due to the increased time for the workers to

perform their work activities. Sirge et al. (2014) in their study, state that long work duration may contribute to musculoskeletal symptoms among supermarket cashiers where there is a high prevalence of musculoskeletal symptoms mainly on low back and neck regions.

In a study by Anthony Ryan (1989) among workers in seven supermarkets found that there is an association between duration of standing and musculoskeletal symptoms specifically in the feet and lower limb of the workers where the most affected workers are the one that is in checkout department that spent most of their time standing in a place. According to the DOSH (2017), static and sustained posture refers to either minimal or restricted or no body movement for some time. Some examples include prolonged sitting or standing that can lead to fatigue. Maintaining a static posture for a long time can prevent blood flow that will bring nutrients and carry away waste products from muscles (JR Ergonomics, n.d.). The longer the time for the workers to be in a static position, the higher the risk of injury.

Awkward posture is defined as the position of the body that is different from natural positions during working. This may include twisting, bending, overreaching, working with the hands above the head, elbows above the shoulders, and working with the neck or back bent over 30 degrees without support (DOSH, 2017). The joint on the body may not be neutral, causing muscles to become shorter or longer than resting length (Seri et al., 2013). The longer the duration of the body to be in an awkward posture, the higher the possibility for the workers to

develop work-related musculoskeletal disorders (WMSDs) (Canadian Centre for Occupational Health and Safety, 2014). A study conducted by Bz et al. (2018) found a significant association between body posture and the risk of developing MSDs.

According to Christensen et al. (2015), in their research among material handlers, lifting and moving heavy loads while twisting, leaning, or bending the waist has a high risk that may result in the development of MSDs. Park et al. (2018) reported that 45.4% and 43.2% of both male and female workers in wholesale and retail trade in Korea had exposed to carrying and lifting heavy objects. High amounts of mechanical loads on the muscles, tendons, ligaments, and joints may cause irritation, inflammation, strains to the muscles, wrist sprains, back sprains, and other related injuries (Kamat et al., 2017; DOSH, 2018). Works that require workers to perform forceful and sustained exertions may limit the time for their muscles to have enough recovery time. Hence, it may lead to fatigue or injuries to the body parts involved (Halim, 2005). In Korea, 58.5% and 64.9% of male and female workers in the wholesale and retail trade sector had been exposed to repetitive motion in their work (Park et al., 2018). Repetitive motion required the workers to do the same work repeatedly. Works required to workers performing repetitive motion may increase the workers chances to develop MSDs since they have limited time to recover from muscle fatigue (Canadian Centre for Occupational Health and Safety, 2014). Performing repetitive motion can be hazardous if there are involvements of the same muscle and joints frequently or lasts for a longer period. A task with about 30 seconds or less cycle time is

considered a highly repetitive motion (DOSH, 2018). DOSH (2017) had established a Guidelines on Ergonomics Risk Assessment at Workplace that covers on physical ergonomics in the workplace as stated under Occupational Safety and Health Act 1994 (OSHA) that can be used by employer, employee and occupational safety and health practitioner. This guideline consists of the methodology on how to conduct initial ergonomics assessment which consists of the ergonomics risk factors such as awkward posture, static and sustained posture, forceful exertion, repetitive motion, vibration, and environmental risk factors.

2.3.3 Medical History

High blood pressure or hypertension can affect the development of MSDs when the size of arteries in the lower body becomes narrow and resulting in pain or cramps (Beckerman, 2021). Other than that, a person with cancer may also experience muscle aches either on specific sites or on the whole body as the side effect of the disease and treatment (Cancer. Net, n.d.).

2.3.4 Social Lifestyle

Lifestyle such as physical activity and smoking habits of a person might affect the development of MSDs. Anderson et al. (1997) stated that even though performing physical activity may result in injuries if the individual does not have enough physical activity, it has high susceptibility to getting an injury and after injury. The individual that does not perform physical activity were 2.9 times more prone

to develop WMSDs Kibret (2020). A study by Mekonnen et al. (2019) also had the same outcome whereas the probability for barbers who do physical activity will reduce by twice compared to those who do not perform it.

For smoking, Palmer et al. (2002), from their study about smoking and musculoskeletal disorders had found that there is an association between smoking and regional pain among smokers and ex-smokers. Mekonnen et al. (2019) found that individuals who consume alcohol every day are 3.56 times more likely to have upper extremity musculoskeletal disorders than those who consume only during an occasion or once a week. Due to the aftereffect of drinking, the body may not function properly as the alcohol will affect the central nervous system (CNS) of the individual (Cafasso, 2018).

2.4 Impacts of MSDs

The impacts of MSDs should not be taken lightly. The long-term effects may cause many problems either to the employer or employees. According to (Badley et al., 1994), in the study, MSDs accounted for 40% of all chronic conditions, 54% resulted in disabilities, 24% cause restrictions in performing daily activities, and 20% of health care usage. MSDs have relations with absenteeism, increased number of leave workers had to take, decreased productivity to complete works, and increased the cost for healthcare and worker's compensation costs (Bz et al., 2018; Centers for Disease Control and Prevention, 2020). Workers with MSDs

have high absenteeism compared to workers who do not have the problem (Jan de Kok et al., 2019).

A study by Lötters & W-j (2005) had found that 75% and 60% of participants reported a decreasing pattern in work productivity after returning to work and after 12-month follow-up due to the sick leave taken because of MSDs. In their study, Qi & Ramalingam (2019) found that half of the respondents that have MSDs have difficulty performing their routine work, and the pain due to the MSDs also disturbs their sleep pattern. In European Union, WMSDs cause half of the workers not to come to work for more than three days, 49% of absences lasting for two weeks or more and 60% reported cases of permanent incapacity (Bevan, 2015).

MSDs cause an increase in the healthcare costs of the workers and affect the economic impact of a country. In 2006, MSDs caused seven million workdays lost in France, about 710 million EUR of enterprises contributions (European Agency for Safety and Health at Work, 2010). This large number is one of the proofs that MSDs can indirectly impact the economics of a country.

2.5 Summary of Literature Review

In conclusion, this chapter had discussed the prevalence of MSDs generally and among the workers that work in the hypermarkets obtained from various statistics and data from other countries. From the literature review, MSDs among these

target groups are very concerning because most of them had reported having MSDs. Next, risk factors contributing to the development of MSDs such as sociodemographic characteristics, social lifestyle, medical history, and occupational exposures were stated in this chapter. There are some negative impacts of developing MSDs, which are absenteeism, low productivity, high healthcare costs for treatments of workers, and indirectly impacts the economics of the company. Thus, data to develop effective control measures needed to reduce the negative impacts of the MSDs on the country's workers, company, or economy.

CHAPTER 3

METHODOLOGY

3.1 Study Design

Research design for this study was quantitative study specifically by cross-sectional study design which will determine the factors associated with the prevalence of musculoskeletal disorders (MSDs) among hypermarkets workers in Klang Valley from August 2021 to December 2021. A cross-sectional study was chosen as the study design due to a few reasons. Firstly, because of the time constraint, the allocated time to conduct this research is short. Next, to determine the relationship between risk factors and outcome of interest in the present without having any influence from the past and future exposure (Levin, 2006). Lastly, a cross-sectional study was used as this research wants to determine the prevalence of MSDs among the hypermarket workers in Klang Valley.

3.2 Study Location

The chosen location for this research was Klang Valley which is in the state of Selangor. Klang Valley covers several districts and two federal territory which are Petaling, Klang, Kuala Langat, Kuala Selangor, Sabak Bernam, Gombak, Hulu

Selangor, Hulu Langat, Sepang, Federal Territory of Kuala Lumpur and Federal Territory of Putrajaya. As was provided in 1.1 background of study, Selangor registered the highest number of hypermarkets because of the rapid development with highly populated areas. Figure 3.1 below shows the map of Klang Valley.

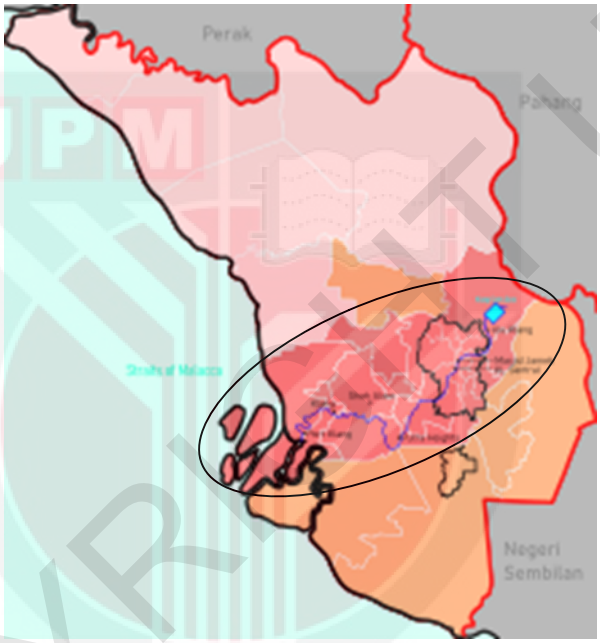

Figure 3.1 Map of Klang Valley
Source: shorturl.at/jpOQ2

3.3 Sampling Strategy

3.3.1 Sampling Method

This sampling method used in this research was convenience sampling. According to Battaglia (2021), convenience sampling is a non-probability sampling, whereas not all peoples in the population had the probability to be chosen as a subject for the study. It will be done by distributing the online self-administered questionnaire through online platforms such as Whatsapp, Facebook, and Instagram until sample size needed for this research were reached.

3.3.2 Sampling Population

The target population for this study was the hypermarkets workers around Klang Valley.

3.3.3 Sampling Unit

The sampling unit for this study were hypermarkets workers in Klang Valley who fulfilled the inclusion and exclusion criteria as follows:

3.3.3.1 Inclusion Criteria

i. Respondents between age of 18 to 55

ii. More than 1 year of working experience in the hypermarkets

3.3.3.2 Exclusion Criteria

i. Workers with any history of musculoskeletal injuries within the past 12 months such as road traffic accident or being involved in other misfortune

3.3.4 Sample Size Calculation

This research was designed to determine the association between musculoskeletal disorders (MSDs) and its association with sociodemographic characteristics, social lifestyle, medical history, and occupational history within 5% of the true prevalence with 95% confidence. The expected non-response rate for this study was 18%. The sample size calculation was calculated based on the specific objective of this research, and the highest sample size obtained was applied for this study. The expected sample size required was 1811 respondents after considering 18% of anticipated non-response rate. The equation below shoes two proportion formula (Lemeshow et al., 1991) used to calculate the sample size in this study:

$$n = \frac{\left\{ z_{1-\frac{\alpha}{2}} \sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta} \sqrt{P_1(1-P_1) + P_2(1-P_2)} \right\}^2}{(P_1 - P_2)^2}$$

Calculation of sample size using two-proportion formula:

$$n = \frac{\left\{z_{1-\frac{\alpha}{2}}\sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta}\sqrt{P_1(1-P_1) + P_2(1-P_2)}\right\}^2}{(P_1 - P_2)^2}$$

Where,

$z_{1-\frac{\alpha}{2}}$ = Z statistic at desired confidence level – set at 95% - 1.96

$z_{1-\beta}$ = Z statistic at a desired power of test – set at 80% = 0.842

$\bar{P} = (P_1 + P_2)/2 = 0.6075$

P_1 = prevalence of male supermarket cashiers with neck pain = 0.679

P_2 = prevalence of female supermarket cashiers with neck pain = 0.536

n = sample size required for this study

non-response rate for this study = 18%

$$\frac{\left\{(1.96)\sqrt{2(0.6075(1-0.6075)} + 0.842\sqrt{0.679\ (1-0.679) + 0.536\ (1-0.536)}\right\}^2}{(0.679-0.536)^2}$$

n = 163 x 2

n = 326 ÷ (18/100)

n = 1811.11 = 1811 (Thus, a minimum of 1811 respondents will be recruited)

3.4 Instrumentation

3.4.1 Self-administered Online Questionnaire

The self-administered questionnaire was prepared in English and Malay for better understanding of the respondents. A brief introduction and objective about this study were included in this questionnaire. The survey was conducted via online platform to allow researcher to collect data without risking anyone due to the COVID-19 situation.

i. Section A: Sociodemographic Characteristics

This section was a close-ended question, whereas respondents must fill in information such as age, gender, race, education, marital status, number of children, salary, height, and weight. The data from this part will be related to the prevalence of MSDs among hypermarkets workers.

ii. Section B: Medical History

For this section, respondents need to answer a few questions regarding the medical history and if the respondents taking any medication.

iii. Section C: Social Lifestyle

This section consists of questions on smoking behavior, alcohol consumption, physical activity, and its frequency to identify if these behaviors have relations with the prevalence of MSDs among hypermarkets in Klang Valley.

iv. Section D: Occupational History

This section will be about the job position, years of working in current position, working hours (in hours), rest breaks, type of rest break and its duration (in minutes) in a day.

v. Section E: Nordic Musculoskeletal Questionnaire (NMQ)

A Nordic group developed NMQ to have a standardized questionnaire related to musculoskeletal symptoms for the analysis and making a comparison with different studies (Kuorinka et al., 1987). NMQ can be used as a self-administered questionnaire or structured interview (Crawford, 2007). However, the musculoskeletal questionnaire was modified to suit this research.

The prevalence of MSDs symptoms for each body part was recorded for 2 periods which are in the past 12 months and the past

7 days. The respondents were required to choose the body part that they felt pain or discomfort/ or numbness. The body parts include neck, shoulder, upper back, upper arm, lower back, forearm, wrist, hand, hips or buttocks, thigh, knee, lower leg and ankle or feet. Skip logic condition was used in which if the respondents does not experience MSDs at the specific body part in the past 7 days, inter-related questions were skipped.

The inter-related question was related to the frequency on experiencing the pain, ache, discomfort, or numbness at the body part in a week, the severity, whether the pain interfere with normal activities and if the respondents have sought help from physician, self-medicate or treatment to relive the pain.

vi. Section E: Ergonomics Risk Factors

This section will be about the ergonomics risk factors that might contributes to the development of MSDs among the hypermarket workers. Questions related to awkward posture, static and sustained posture, repetitive motion, vibration, and environmental factors such as lighting, ventilation, temperature, and noise were asked in this section whereby the questions were derived from Guidelines on Ergonomics Risk Assessment at Workplace (DOSH, 2017). The respondents will be asked how long they had been exposed to the

risk factors in a day. Most of the questions for this section will be in multiple choice questions. However, some of the questions that are asking about the weight handled and the distance carrying or pushing loads will be in open-ended question.

To quantify the ergonomics risk factors specifically to awkward posture, static and sustained posture, manual handling, repetitive motion, and vibration, the results were categorized into 2 categories which are Yes if they are exposed to the factors and no if they are not exposed to those factors. The minimum requirement to categorize the respondents to Yes will be depending on the score for initial ERA that required advanced assessment.

3.4.2 IBM Statistical Package for Social Sciences (SPSS) Software Version 25

This software was used to analyze data collected from respondents to perform statistical analysis based on the specific objective of this study.

3.4.3 Research Platform: MoaForm

The research platform used to design questionnaire was Moaform software. The sample of the self-administered is shown in Appendix 1.

3.5 Data Collection Procedure

Data collection for this study was through an online questionnaire once approval and permission from the University Ethics Committee Involving Human Subjects of Universiti Putra Malaysia (JKEUPM) and respondents have been obtained. A brief description of the study, objectives, and declaration of anonymity and confidentiality in a consent form were given to the respondents before filling in the questionnaire. Respondents were required to answer all sections in the questionnaire. Figure 3.2 below showed the research flowchart for this study.

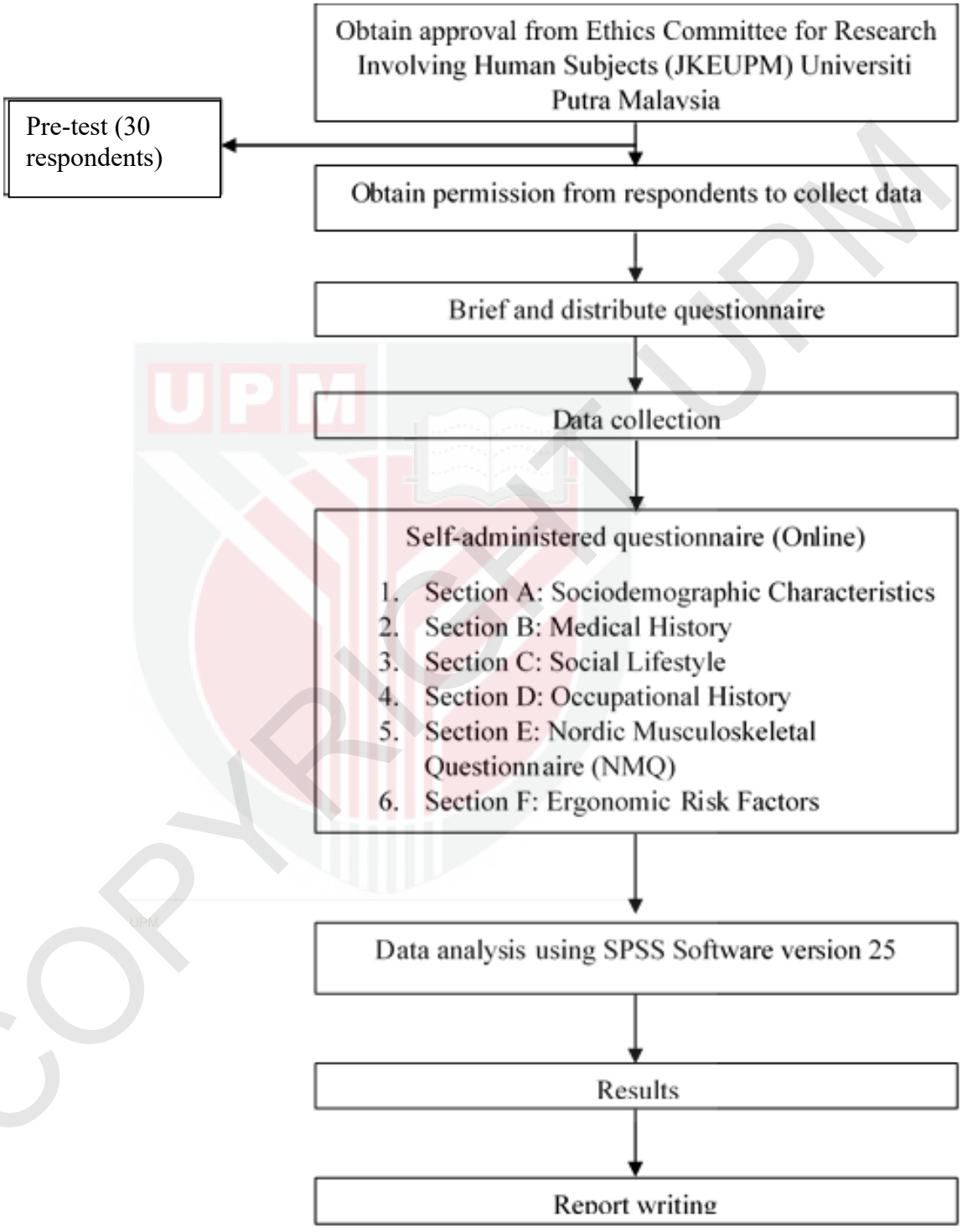

Figure 3.2. Research Flowchart

3.6 Quality Control

3.6.1 Content validity

Before conducting pre-test, the validity of the self-administered questionnaire was assessed by two experts in ergonomics field. This is to ensure that the questionnaire used will measured what it is supposed to measure and reflect the purpose of study. For content validity, the value for S-Content Validity Index (CVI) average and S-CVI universal agreement was 0.97 and 0.94 respectively. Based on Davis (1992), acceptable CVI value for two experts should be at least 0.80. Hence, both CVI score for the questionnaire was acceptable.

3.6.2 Pre-Test

A pre-test was done to test the reliability of the self-administered questionnaire. A total of 30 respondents who have similar characteristics with the target population were involved in the pre-test. For reliability test, the Krippendorff's alpha test was used (Hayes & Krippendorff, 2017) to estimate the inter-coder reliability for nominal dichotomous data. The results obtained for inter-coder reliability was $\alpha = 0.8512$.

3.7 Data Analysis

The data entry and statistical analysis were performed using statistical computer software (Statistical Package for the Social Sciences - IBM SPSS Version 25). Sociodemographic charcateristics, medical history, social lifestyle, occupational history, Nordic Musculoskeletal Questionnaire (NMQ) and ergonomics risk factors variables was expressed in frequencies and percentages. Total MSDs were expressed as complaints of MSDs of any body parts. For continuous parameter that was found to be normal such as age, children, BMI, amount of alcohol intake and duration of rest break, the data were expressed as mean and standard deviation. In contast, for the data that were not normally distributted such as duration of physical activity, working experience in year, the data were presented as median and interquartile range (IQR).

To determine the associated risk factors of MSDs, chi-square test were used to analyze MSDs with sociodemographic characteristics, medical history, social lifestyle, occupational history, and ergonomics risk factors. Significance level for chi-square test was set at 0.05. In addition, multiple logistic regression was used to determine the odds ratios of the risks factors towards MSDs based on the significant association of the chi-square test.

3.8 Ethical Considerations

As this research involves human subjects as respondent, a few forms were submitted to The University Ethics Committee Involving Human Subjects of Universiti Putra Malaysia (JKEUPM) to conduct this study (reference number: JKEUPM-2021-373) and can be found in Appendix 2. A brief description of the study, objectives, and declaration of anonymity and confidentiality were provided in the questionnaire for the respondents. In addition, consent form was developed to obtain permission from respondent for their information to be used for academic purposes. All the information about the respondents were remained private and confidential and used only for research purposes. Apart from that, as soon as the study was completed and the results were interpreted, all the data were not being stored by the researchers. The respondents have the right to withdraw from this study at any time there was no penalty given to them for leaving the study. The details for the consent form can be viewed in Appendix 3.

CHAPTER 4

RESULTS

This study aimed to answer the 4 research specific objectives as outlined in Chapter 1. To answer the specific objectives, a total of 261 respondents participated in answering the online questionnaire. Based on analysis on continuous parameter such as age, children, BMI, alcohol intake and duration of rest break specifically morning tea, evening tea and overtime break, they found to be normal, as such several data were presented as mean and standard deviation. In addition, for data that were not normally distributed like duration of physical activity, working experience and duration of rest break specifically lunch break and other type of break, the data were presented as median and interquartile range (IQR).

4.1 Specific Objective 1: Sociodemographic Characteristics, Medical History, Social Lifestyle and Occupational History of Respondents

The first objective was to determine the sociodemographic characteristics, medical history, social lifestyle, occupational history, and ergonomics risk factors of the respondents. Table 4.1 shows the results of sociodemographic characteristics, medical history, social lifestyle, and occupational history of the

respondents. Based on 261 responses, 51.3% (n = 134) of the respondents were in the age category 20 to 29 years old. There were more female respondents who (n = 155, 59.4%) participated in this study. Majority of the respondents had technical certificate/pre-university/matric/foundation/form 6 or A-level (n = 110, 42.1%). A total of 31.0% (n = 81) of respondents were married where 28.4% (n = 74) of the respondents have children. Most of the respondent total salary were below RM 4,850 (n = 234, 89.7%).

There were 7.7% (n = 20) of the respondents who had history of disease such as asthma, vertigo and high blood pressure diagnosed by doctors. With most of the respondents being healthy, majority of the respondents in the sample population does not take medication (n = 238, 91.2%). According to the results, 74.3% (n = 194) and 86.2% (n = 225) of respondents does not smoke or drink alcohol. Almost half of the respondents claimed to have performed physical activity (n =119, 45.6%) where the frequencies of physical activity were performed around 1 to 2 times per week (n = 72, 27.6%) less than 45 minutes in a single session (n = 71, 27.2%).

There were 78.9% (n = 76) of the respondents who belongs in the group blue-collar workers such as cashier, security personnel, storekeeper, and promoter, 42.5% (n = 111) of respondents had working experience. Most of the respondents works less or equal to 8 hours in a day (n = 214, 82.0%). In this study, 96.2% (n = 215) of the respondents reported to have rest break during works a minimum of lunch break in the questionnaire given (n = 219, 83.9%).

Table 4.1: Sociodemographic characteristics, medical history, social lifestyle, and occupational history of respondents (N = 261)

Variables	Frequency (n)	%	Mean ± SD	Median (IQR)
Age (years old)			30.03 ± 7.014	
< 20	3	1.1		
20 – 29	134	51.3		
30 – 39	92	35.2		
40 - 49	32	12.3		
Gender				
Male	106	40.6		
Female	155	59.4		
Education				
Secondary education	79	30.3		
Pre universities/ certificate	110	42.1		
Tertiary education	72	27.6		
Marital status				
Single	172	65.9		
Married	81	31.0		
Divorced / Widowed	8	3.1		
Children			1.87 ± 1.342	
No children	74	28.4		
Have children	187	71.6		
Salary (RM)				
< 4,850	234	89.7		
4,850 – 10,959	23	8.8		
> 10,959	4	1.5		
BMI			22.94 ± 3.524	
Underweight (< 18.5)	20	7.7		
Normal (18.5 – 24.9)	173	66.3		
Overweight (25.0 – 29.9)	52	19.9		
Obese (30.0)	16	6.1		
History of disease				
Yes	20	7.7		
No	241	92.3		
Medication				
Yes	23	8.8		
No	238	91.2		
Smoking				
Yes	67	25.7		
No	194	74.3		
Alcoholic beverages				
Yes	36	13.8		
No	225	86.2		

Variables	Frequency (n)	%	Mean ± SD	Median (IQR)
Alcohol intake (liter)			0.5 ± 0.25	
> 0.5	9	3.4		
≤ 0.5	27	10.3		
Physical activity				
Yes	119	45.6		
No	142	54.4		
Frequency of physical activity				
Everyday	10	3.8		
5 to 6 times	10	3.8		
3 to 4 times	24	9.2		
1 to 2 times	72	27.6		
Other	2	0.8		
Duration of physical activity (minutes)				45.0(30.0)
> 45	48	18.4		
≤ 45	71	27.2		
Position in work				
White-collar worker	55	21.1		
Blue-collar worker	206	78.9		
Working experience (years)				2.0(0)
> 2	111	42.5		
≤ 2	150	57.5		
Working hours (hours)				8.0(0)
> 8	47	18.0		
≤ 8	214	82.0		
Rest break				
Yes	251	96.2		
No	10	3.8		
Type of rest break				
Morning Tea	18	6.9		
Lunch Break	219	83.9		
Evening Tea	29	11.1		
Overtime Rest	38	14.6		
Other	1	0.4		
Duration of rest break				
Morning Tea			36.67 ± 17.987	
Lunch Break				60.0(15.0)
Evening Tea			32.55 ± 15.604	
Overtime Rest			33.03 ± 18.836	
Other				30.0(0)

4.2 Ergonomics Risk Factors of Respondents

Table 4.2 shows the self-reported ergonomics risk factors of respondents. Most of the respondents did not perform tasks which required awkward posture (n = 210, 80.5%) but instead in static and sustained (88.1%, n = 230). On self-reported manual handling requirement at work, 28.4% (n = 74) of the respondents perform lifting and lowering of loads, 20.3% (n = 53) pushing or pulling objects, 24.5% (n = 64) carrying loads, and 19.9% (n = 52) handling loads in seated position while the remaining 61.7% (n = 161) of the respondents does not require to do manual handling works. The characteristics for manual handling categorization was shown in Appendix 4 (Table A.1).

A total of 40.6% (n = 106) of the respondents were required to perform repetitive motion during working while only 8% (n = 21) were exposed to vibration during works. Majority of the respondents in the sample population reported adequate lighting at the workplace (78.9%, n = 206), reported to have comfortable temperature, reported to have adequate ventilation and no noise present during works.

Table 4.2: Ergonomics risk factors of respondents (N = 261)

Variable	Frequency (n)	%
Awkward posture		
Yes	51	19.5
No	210	80.5
Static and sustained posture		
Yes	230	88.1
No	31	11.9
Manual handling		
Lifting & lowering loads		
Yes	74	28.4
No	187	71.6
Pushing & pulling objects		
Yes	53	20.3
No	208	79.7
Carrying loads		
Yes	64	24.5
No	197	75.5
Handling loads in seated position		
Yes	52	19.9
No	209	80.1
Not required to do manual handling	161	61.7
Repetitive motion		
Yes	106	40.6
No	155	59.4
Vibration		
Yes	21	8.0
No	240	92.0
Lighting		
Adequate	206	78.9
Inadequate	55	21.1
Temperature		
Comfortable	92	35.2
Uncomfortable	169	64.8
Ventilation		
Inadequate	76	29.1
Adequate	185	70.9
Noise		
No noise present	202	77.4
Has loud noise/irritating continuous sound/noise	59	22.6

4.3 Specific Objective 2: Prevalence of 12 months MSDs among Respondents

The second objective was to determine the prevalence of 12 months MSDs among the respondents. The summary results for prevalence of MSDs reported among the respondents was shown in Table 4.3 consists of 13 body parts. The highest MSDs complaints for the 12 months prevalence were the lower back (n = 111, 42.5%) followed by the upper back (n = 92, 35.2%) neck (n = 66, 25.3%) and shoulder (n = 66, 25.3%). The least affected body parts for the past 12 months were forearm (n = 10, 3.8%), thigh (n = 22, 8.4%), upper arm (n = 31, 11.9%) and knee (n = 32, 12.3%). From the data obtained, 81.6% (n = 213) of the respondents have reported to have total MSDs. In addition, data for the prevalence of 7 days MSDs, distribution of frequency, severity, interference, and treatment for MSDs complaints among employees in hypermarkets can be found in Appendix 4 (Table A.2).

Table 4.3: Prevalence of 12 months MSDs among employees in hypermarkets in Klang Valley (N = 261)

Body parts	Prevalence of MSDs (12 months)	
	Frequency (n)	%
Neck	66	25.3
Shoulder	66	25.3
Upper Back	92	35.2
Upper Arm	31	11.9
Lower Back	111	42.5
Forearm	10	3.8
Wrist	40	15.3
Hand	42	16.1
Hip or buttocks	48	18.4
Thigh	22	8.4
Knee	32	12.3
Lower Leg	42	16.1
Ankle or feet	45	17.2
*Total MSDs	213	81.6

* Considered to have total MSDs if developed anybody pain or aches in any body region

4.4 Specific Objective 3: Association between Sociodemographic Characteristics, Medical History, Social Lifestyle, and Occupational History with the Prevalence of 12 months MSDs

Table 4.4 showed the association between sociodemographic characteristic, medical history, social lifestyle, and occupational history with the prevalence of MSDs in 12 months among hypermarkets employees in Klang Valley. Based on the chi-square result, there was significant association between age and prevalence of MSDs at neck ($x^2 = 10.710$, $p = 0.013$), shoulder ($x^2 = 20.430$, $p = 0.000$), upper back ($x^2 = 10.663$, $p = 0.014$), knee ($x^2 = 16.003$, $p < 0.001$) and total MSDs ($x^2 = 12.875$, $p = 0.005$). Gender was significantly associated only with total MSDs ($x^2 = 4.464$, $p = 0.035$). Next, educational level was significantly associated with prevalence of MSDs at neck ($x^2 = 9.738$, $p = 0.008$), upper back ($x^2 = 11.094$, $p = 0.004$), wrist ($x^2 = 9.060$, $p = 0.011$) and total MSDs ($x^2 = 9.091$, $p = 0.011$).

Other than that, there was significant association between marital status with prevalence of MSDs at neck ($x^2 = 12.571$, $p = 0.002$), shoulder ($x^2 = 12.177$, $p = 0.002$), hand ($x^2 = 8.681$, $p = 0.013$), thigh ($x^2 = 16.154$, $p < 0.001$), ankle/feet ($x^2 = 16.000$, $p = 0.001$) and total MSDs ($x^2 = 12.477$, $p = 0.006$). Children variable was also significantly associated with prevalence of MSDs at neck ($x^2 = 10.565$, $p = 0.001$), shoulder ($x^2 = 3.946$, $p = 0.047$), wrist ($x^2 = 4.655$, $p = 0.031$), hand ($x^2 = 4.876$, $p = 0.027$), thigh ($x^2 = 5.542$, $p = 0.019$), ankle/feet ($x^2 = 16.704$, $p < 0.001$) and total MSDs ($x^2 = 16.937$, $p < 0.001$). Besides that, there was significant

association between salary with prevalence of MSDs at neck (x^2 = 12.535, p = 0.002) and lower back (x^2 = 8.020, p = 0.018). Lastly, BMI was significantly associated only with prevalence of MSDs at lower back (x^2 = 10.942, p = 0.012). Next, for medical history, there was significant association between history of disease and prevalence of MSDs at shoulder (x^2 = 0.121, p = 0.001) and knee (p = 0.023). Besides, there was significant association between medication prevalence of MSDs at neck (x^2 = 4.418, p = 0.036), upper back (x^2 = 7.792, p = 0.005), knee (p = 0.046) and ankle/feet (p = 0.018).

Based on the chi-square result on social lifestyle, there was significant association between smoking and prevalence of MSDs at shoulder (x^2 = 5.294, p = 0.021) and upper back (x^2 = 4.796, p = 0.029). Next, alcohol consumption was significantly associated with prevalence of MSDs at upper back (x^2 = 3.981, p = 0.046) and upper arm (p = 0.011). Other than that, there was significant association between physical activity and prevalence of MSD at upper back (x^2 = 4.273, p = 0.039), lower back (x^2 = 5.835, p = 0.016), forearm (p = 0.047), hip/buttocks (x^2 = 4.878, p = 0.027), ankle/feet (x^2 = 9.805, p = 0.002) and total MSDs (x^2 = 10.529, p = 0.001). Frequency of physical activity was associated with prevalence of MSDs at lower back (x^2 = 14.004, p = 0.016), ankle/feet (x^2 = 12.967, p = 0.024) and total MSDs (x^2 = 35.656, p < 0.001). However, there was no association between alcohol intake and duration of physical activity with prevalence of MSDs at all the body parts.

For occupational history, there was significant association between position in work with prevalence of MSDs at neck (x^2 = 17.828, p < 0.001), hand (x^2 = 8.007, p = 0.005) and hip/buttocks (x^2 = 5.739, p = 0.017). Other than that, working experience was also significantly associated with prevalence of MSDs at neck (x^2 = 9.914, p = 0.002), shoulder (x^2 = 6.618, p = 0.010), hand (x^2 = 3.989, p = 0.046), thigh (x^2 = 11.866, p = 0.001), ankle/feet (x^2 = 5.173, p = 0.023) and total MSDs (x^2 = 11.327, p = 0.001). There was significant association between working hours with 2 body parts which are prevalence of MSDs at neck (x^2 = 14.053, p < 0.001) and shoulder (x^2 = 6.953, p = 0.008). Lastly, there was also significant association between rest break with prevalence of MSDs at upper arm (p = 0.021) and lower back (p = 0.006).

Table 4.4: Association between sociodemographic characteristics, medical history, social lifestyle, occupational history with the prevalence of 12 months MSDs among employees in hypermarkets in Klang Valley (N = 261)

Variables	Prevalence of MSDs (12 Months); x^2 (p-value)												
	Neck	Shoulder	Upper Back	Upper Arm	Lower Back	Forearm	Wrist	Hand	Hips/ Buttocks	Thigh	Knee	Lower Leg	Ankle/ Feet	Total MSDs
Age (years old)														
< 20 20 – 29 30 – 39 40 - 49	10.710 (0.013)*	20.430 (<0.001)*	10.663 (0.014)*	2.235 (0.525)	5.844 (0.119)	1.613 (0.656)	1.986 (0.575)	5.794 (0.122)	3.320 (0.345)	6.617 (0.085)	16.003 (0.001)*	66.751 (0.080)	1.958 (0.581)	12.857 (0.005)*
Gender														
Male Female	1.941 (0.164)	0.054 (0.816)	0.186 (0.666)	0.384 (0.536)	0.554 (0.457)	-[a] (0.052)	0.617 (0.432)	3.009 (0.083)	0.027 (0.869)	0.180 (0.671)	2.367 (0.124)	1.019 (0.313)	0.181 (0.670)	4.464 (0.035)*
Education														
Secondary education Pre-universities / Certificates Tertiary education	9.738 (0.008)*	3.489 (0.175)	11.094 (0.004)*	0.695 (0.707)	0.691 (0.708)	0.554 (0.758)	9.060 (0.011)*	4.827 (0.090)	3.586 (0.166)	1.718 (0.424)	1.578 (0.454)	1.467 (0.480)	2.946 (0.229)	9.091 (0.011)*
Marital status														
Single Married Divorced/Widowed	12.571 (0.002)*	12.177 (0.002)*	1.422 (0.491)	2.263 (0.322)	1.097 (0.578)	1.040 (0.594)	2.652 (0.266)	8.681 (0.013)*	0.601 (0.740)	16.154 (0.000)*	1.574 (0.455)	2.460 (0.292)	16.000 (0.000)*	12.477 (0.006)*
Children														
Have children No children	10.565 (0.001)*	3.946 (0.047)*	1.997 (0.158)	0.112 (0.738)	0.471 (0.492)	-[a] (0.067)	4.655 (0.031)*	4.876 (0.027)*	0.047 (0.829)	5.542 (0.019)*	0.651 (0.420)	0.167 (0.683)	16.704 (<0.001)*	16.937 (<0.001)*

Variables	Prevalence of MSDs (12 Months); x^2 (p-value)													
	Neck	**Shoulder**	**Upper Back**	**Upper Arm**	**Lower Back**	**Forearm**	**Wrist**	**Hand**	**Hips/ Buttocks**	**Thigh**	**Knee**	**Lower Leg**	**Ankle/ Feet**	**Total MSDs**
Salary (RM)														
< 4,850	12.535	3.510	2.864	4.059	8.020	1.200	3.896	0.800	2.592	2.772	2.110	1.324	2.222	2.592
4,850 – 10,959	(0.002)*	(0.173)	(0.239)	(0.131)	(0.018)*	(0.549)	(0.143)	(0.670)	(0.274)	(0.250)	(0.348)	(0.516)	(0.329)	(0.274)
> 10,959														
BMI														
Underweight (< 18.5)														
Normal (18.5 – 24.9)	2.510	1.986	7.278	1,750	10.942	0.733	0.704	7.654	2.223	2.451	3.073	4.505	7.180	1.901
Overweight (25.0 - 29.9)	(0.474)	(0.575)	(0.064)	(0.626)	(0.012)*	(0.865)	(0.872)	(0.054)	(0.527)	(0.484)	(0.386)	(0.212)	(0.066)	(0.593)
Obese (30.0)														
History of disease														
Yes	0.321	0.121	0.261	-[a]	0.502	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]
No	(0.571)	(0.001)*	(0.609)	(0.273)	(0.478)	(1.000)	(0.205)	(0.750)	(0.224)	(0.074))	(0.023)*	(0.750)	(1.000)	(0.546)
Medication														
Yes	4.418	1.204	7.792	-[a]	0.119	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]
No	(0.036)*	(0.273)	(0.005)*	(0.167)	(0.730)	(0.608)	(0.763)	(0.772)	(1.000)	(1.000)	(0.046)*	(0.772)	(0.018)*	(1.000)
Smoking														
Yes	1.652	5.294	4.796	3.005	0.516	-[a]	0.796	3.400	0.960	1.823	1.448	0.732	0.295	2.499
No	(0.199)	(0.021)*	(0.029)*	(0.083)	(0.473)	(0.460)	(0.372)	(0.065)	(0.327)	(0.177)	(0.229)	(0.392)	(0.587)	(0.114)
Alcoholic beverages														
Yes	1.431	0.208	3.981	-[a]	3.718	-[a]	0.546	1.862	0.408	-[a]	-[a]	0.767	1.100	0.083
No	(0.232)	(0.649)	(0.046)*	(0.011)*	(0.054)	(0.366)	(0.460)	(0.172)	(0.523)	(0.096)	(1.000)	(0.381)	(0.294)	(0.774)

Variables	Prevalence of MSDs (12 Months); x^2 (p-value)													
	Neck	**Shoulder**	**Upper Back**	**Upper Arm**	**Lower Back**	**Forearm**	**Wrist**	**Hand**	**Hips/ Buttocks**	**Thigh**	**Knee**	**Lower Leg**	**Ankle/ Feet**	**Total MSDs**
Alcohol intake (liter)														
> 0.5	-[a]	-[a]	-[a]	N/A	-[a]	N/A	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]
≤ 0.5	(0.443)	(1.000)	(0.121)		(1.000)		(1.000)	(0.558)	(0.648)	(1.000)	(0.553)	(1.000)	(0.553)	(0.627)
Physical activity														
Yes	0.001	0.782	4.273	2.552	5.835	-[a]	0.182	1.696	4.878	1.838	0.963	0.392	9.805	10.529
No	(0.979)	(0.377)	(0.039)*	(0.112)	(0.016)*	(0.047)*	(0.669)	(0.193)	(0.027)*	(0.175)	(0.326)	(0.531)	(0.002)*	(0.001)*
Frequency of physical activity														
Everyday														
5 to 6 times	7.971	5.053	5.627	6.156	14.004	6.010	4.706	7.260	8.118	5.177	3.062	4.857	12.967	35.656
3 to 4 times	(0.158)	(0.409)	(0.344)	(0.291)	(0.016)*	(0.305)	(0.453)	(0.202)	(0.150)	(0.395)	(0.690)	(0.434)	(0.024)*	(0.000)*
1 to 2 times														
Other														
Duration of physical activity (minutes)	0.668	0.245	0.503	-[a]	0.331	-[a]	0.984	1.161	0.350	-[a]	-[a]	0.562	-[a]	0.212
> 45	(0.414)	(0.621)	(0.478)	(1.000)	(0.565)	(1.000)	(0.321)	(0.281)	(0.554)	(0.438)	(0.760)	(0.453)	(0.196)	(0.645)
≤ 45														
Position in work														
White collar worker	17.828	0.534	1.942	1.412	0.244	-[a]	1.047	8.007	5.739	-[a]	0.651	0.584	3.244	2.599
Blue collar worker	(<0.001)*	(0.465)	(0.163)	(0.235)	(0.621)	(1.000)	(0.306)	(0.005)*	(0.017)*	(0.789)	(0.420)	(0.445)	(0.072)	(0.107)

Variables	Prevalence of MSDs (12 Months); x^2 (p-value)													
	Neck	**Shoulder**	**Upper Back**	**Upper Arm**	**Lower Back**	**Forearm**	**Wrist**	**Hand**	**Hips/ Buttocks**	**Thigh**	**Knee**	**Lower Leg**	**Ankle/ Feet**	**Total MSDs**
Working experience (years)	9.914	6.618	0.087	0.100	0.312	-[a]	1.079	3.989	2.035	11.866	0.282	1.143	5.173	11.327
≤ 2	(0.002)*	(0.010)*	(0.768)	(0.752)	(0.576)	(0.748)	(0.299)	(0.046)*	(0.154)	(0.001)*	(0.595)	(0.285)	(0.023)*	(0.001)*
> 2														
Working hours (hours)	14.053	6.953	0.037	0.084	0.420	-[a]	0.971	0.037	0.072	-[a]	0.749	0.037	0.002	0.072
> 8	(<0.001)*	(0.008)*	(0.848)	(0.772)	(0.517)	(1.000)	(0.325)	(0.848)	(0.789)	(1.000)	(0.387)	(0.848)	(0.965)	(0.789)
≤ 8														
Rest break	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]	-[a]
Yes	(0.279)	(1.000)	(0.745)	(0.021)*	(0.006)*	(1.000)	(0.050)	(0.059)	(1.000)	(1.000)	(0.616)	(0.373)	(0.219)	(0.090)
No														

Chi-Square test was used to determine the association between the sociodemographic characteristics, medical history, social lifestyle, and occupational history with the prevalence of 12 months MSDs

[a] Fisher test was used

*Significant p-value < 0.05

N/A: No value in the analysis

4.5 Association between Ergonomics Risk Factors with the Prevalence of 12 months MSDs

Table 4.5 shows the association between ergonomics risk factors with the prevalence of MSDs among hypermarkets employees in Klang Valley. Based on the chi-square result, there was significant association between awkward posture with prevalence of MSDs at neck (x^2 = 15.903, p < 0.001), upper back (x^2 = 8.604, p = 0.003), hips/buttocks (x^2 = 4.699, p = 0.030) thigh (p = 0.010), and knee (x^2 = 4.097, p = 0.043). Other than that, there was significant association between static and sustained posture with prevalence of MSDs at neck (x^2 = 4.537, p = 0.033), wrist (p = 0.007), hip/buttocks (x^2 = 7.927, p = 0.005), ankle/feet (x^2 = 4.843, p = 0.028), and total MSDs (x^2 = 4.507, p = 0.034).

Next, lifting and lowering was significantly associated with prevalence of MSDs at neck x^2 = 5.938, p = 0.015), shoulder (x^2 =7.234, p = 0.007), upper back (x^2 = 4.147, p = 0.042) upper arm (x^2 = 9.370, p = 0.002), lower back (x^2 = 4.307, p = 0.038), hips/buttocks (x^2 = 11.604, p = 0.001), and total MSDs (x^2 = 11.082, p = 0.001). Besides that, pushing and pulling was significantly associated with prevalence of MSDs at shoulder (x^2 = 5.091, p = 0.024), upper back (p = 0.000), upper arm (x^2 = 21.305, p < 0.001), hips/buttocks (x^2 = 5.210, p = 0.022), knee (x^2 = 4.461, p = 0.035), and ankle/feet (x^2 = 3.922, p = 0.048). For carrying loads, it was significantly associated with prevalence of MSDs at upper arm (x^2 = 13.950, p < 0.001) and hips/buttocks (x^2 = 13.166, p < 0.001). For handling loads in seated position, it was

significantly associated with prevalence of MSDs at upper back (x^2 = 4.215, p = 0.040) and total MSDs (x^2 = 11.390, p = 0.001).

For repetitive motion, it was significantly associated with the prevalence of MSDs at neck (x^2 = 27.837, p < 0.001), upper back (x^2 = 16.429, p < 0.001), hips/buttocks (x^2 = 9.541, p = 0.002), thigh (x^2 = 5.012, p = 0.025), and knee (x^2 = 7.228, p = 0.007). For vibration, it was significantly associated with prevalence of MSDs at upper arm (p < 0.001), lower back (x^2 = 7.453, p = 0.006), and lower leg (p = 0.031). Next, lighting was significantly associated with prevalence of MSDs at neck (x^2 = 7.300, p = 0.026), upper back (x^2 = 4.414, p = 0.036), wrist (x^2 = 5.232 p = 0.022), knee (x^2 = 5.917, p = 0.015) and ankle/feet (x^2 = 14.623, p < 0.001). For temperature, it was significantly associated with prevalence of MSDs at neck x^2 = 12.074, p = 0.007), upper back (x^2 = 15.985, p = 0.001), knee (x^2 = 4.350, p = 0.037), ankle/feet (x^2 = 9.240, p = 0.002) and total MSDs (x^2 = 13.732, p < 0.001).

Ventilation was also significantly associated with prevalence of MSDs at neck (x^2 = 10.259, p = 0.001), upper back (x^2 = 5.483, p = 0.019), hips/buttocks (X^2 = 10.070, p = 0.002), knee (x^2 = 7.705, p = 0.006) and total MSDs (x^2 = 4.419, p = 0.036). Lastly, noise was significantly associated with prevalence of MSDs at shoulder (x^2 = 4.286, p = 0.038), upper arm (x^2 = 10.230, p = 0.001), lower back (x^2 = 4.506, p = 0.034), wrist (x^2 = 4.148, p = 0.042), and hand (x^2 = 4.917, p = 0.027).

Table 4.5: Association between ergonomics risk factors with the prevalence of 12 months MSDs among employees in hypermarkets in Klang Valley (N = 261)

Variables	Prevalence of MSDs (12 Months); x^2 (p-value)													
	Neck	Shoulder	Upper Back	Upper Arm	Lower Back	Forearm	Wrist	Hand	Hips/ buttocks	Thigh	Knee	Lower Leg	Ankle/ feet	Total MSDs
Awkward posture														
Yes	15.903 (0.000)*	0.157 (0.692)	8.604 (0.003)*	3.619 (0.057)	3.228 (0.072)	-[a] (1.000)	0.896 (0.344)	0.263 (0.608)	4.699 (0.030)*	-[a] (0.010)*	4.097 (0.043)*	3.194 (0.074)	0.107 (0.743)	3.467 (0.063)
No														
Static and sustained posture														
Yes	4.537 (0.033)*	0.655 (0.418)	0.185 (0.667)	-[a] (0.388)	0.100 (0.752)	-[a] (0.613)	-[a] (0.007)*	2.459 (0.117)	7.927 (0.005)*	-[a] (0.087)	-[a] (0.239)	1.097 (0.295)	4.843 (0.028)*	4.507 (0.034)*
No														
Manual handling														
Lifting & lowering loads	5.938 (0.015)*	7.234 (0.007)*	4.147 (0.042)*	9.370 (0.002)*	4.307 (0.038)*	-[a] (0.067)	0.261 (0.609)	0.167 (0.683)	11.604 (0.001)*	1.223 (0.269)	2.704 (0.100)	2.133 (0.144)	1.389 (0.239)	11.082 (0.001)*
Pushing & pulling objects	2.429 (0.119)	5.091 (0.024)*	3.349 (0.067)	21.305 (<0.001)*	0.625 (0.429)	-[a] (0.221)	0.643 (0.423)	3.505 (0.061)	5.210 (0.022)*	-[a] (1.000)	4.461 (0.035)*	1.121 (0.290)	3.922 (0.048)*	2.853 (0.091)
Carrying loads	1.111 (0.292)	1,885 (0.170)	0.221 (0.639)	13.950 (<0.001)*	2.306 (0.129)	-[a] (0.125)	0.006 (0.939)	1.119 (0.290)	13.166 (<0.001)*	0.098 (0.754)	0.256 (0.613)	0.259 (0.611)	1.276 (0.259)	3.773 (0.052)
Handling loads in seated position	3.371 (0.066)	1.830 (0.176)	4.215 (0.040)*	1.830 (0.176)	0.122 (0.727)	-[a] (1.000)	0.763 (0.382)	0.333 (0.564)	3.332 (0.068)	-[a] (1.000)	0.589 (0.443)	3.816 (0.051)	0.157 (0.692)	11.390 (0.001)*
Repetitive motion														
Yes	27.837 (<0.001)*	0.120 (0.729)	16.429 (<0.001)*	0.053 (0.818)	0.076 (0.783)	-[a] (0.209)	1.726 (0.189)	1.937 (0.164)	9.541 (0.002)*	5.012 (0.025)*	7.228 (0.007)*	0.498 (0.480)	2.035 (0.154)	0.665 (0.415)
No														
Vibration														
Yes	0.130 (0.718)	1.983 (0.159)	0.446 (0.504)	-[a] (<0.001)*	7.453 (0.006)*	-[a] (1.000)	3.088 (0.079)	-[a] (0.756)	-[a] (0.384)	-[a] (0.232)	-[a] (0.730)	-[a] (0.031)*	-[a] (0.546)	-[a] (0.238)
No														

Variables	Prevalence of MSDs (12 Months); x^2 (p-value)													
	Neck	**Shoulder**	**Upper Back**	**Upper Arm**	**Lower Back**	**Forearm**	**Wrist**	**Hand**	**Hips/ buttocks**	**Thigh**	**Knee**	**Lower Leg**	**Ankle/ feet**	**Total MSDs**
Lighting														
Adequate	5.819 (0.016)*	0.101 (0.751)	4.414 (0.036)*	1.340 (0.247)	1.817 (0.178)	-[a] (0.613)	5.232 (0.022)*	0.584 (0.445)	0.545 (0.460)	-[a] (0.271)	5.917 (0.015)*	0.004 (0.951)	14.623 (<0.001)*	0.191 (0.662)
Inadequate														
Temperature														
Comfortable	6.780 (0.009)*	0.665 (0.415)	13.264 (0.000)*	0.185 (0.667)	1.805 (0.179)	-[a] (0.502)	0.105 (0.746)	0.599 (0.439)	2.707 (0.100)	1.650 (0.199)	4.350 (0.037)*	0.405 (0.525)	9.240 (0.002)*	13.732 (<0.001)*
Uncomfortable														
Ventilation														
Adequate	10.259 (0.001)*	2.246 (0.134)	5.483 (0.019)*	2.800 (0.094)	0.035 (0.852)	-[a] (0.728)	0.060 (0.807)	0.082 (0.775)	10.070 (0.002)*	1.618 (0.203)	7.705 (0.006)*	0.082 (0.755)	1.975 (0.160)	4.419 (0.036)*
Inadequate														
Noise														
No noise presents	1.100 (0.294)	4.286 (0.038)*	1.383 (0.240)	10.230 (0.001)*	4.506 (0.034)*	-[a] (1.000)	4.148 (0.042)*	4.917 (0.027)*	2.163 (0.141)	1.166 (0.280)	0.011 (0.916)	0.362 (0.547)	1.227 (0.268)	0.500 (0.480)
Has loud/irritating or continuous sound/noise														

Chi-Square test was used to determine the association between the ergonomic risk factors and prevalence of 12 months MSDs

[a] Fisher test was used

*Significant p-value < 0.05

4.6 Predictors of Prevalence of MSDs

Table 4.6 shows the list of predictors associated with the prevalence of MSDs using simple logistic regression (SLR). Based on SLR, 12 variables, found associated significantly with the prevalence of MSDs among employees working in hypermarkets in Klang Valley which are age, gender, marital status, children, physical activity, frequency of physical activity, working experience, static and sustained posture, lifting and lowering loads, handling loads in seated position, temperature, and ventilation.

According to the results, respondents between 20 to 29 years old have 63.6% (95% CI = 0.185 – 0.178, p = 0.004) chances of having MSDs than respondents below 20 years old. Other than that, female employees in hypermarkets have 52.1% (95% CI = 0.240 – 0.957, p = 0.037) of having MSDs than male employees. Other than that, married employees reported higher odds of having MSDs when compared to single employees (OR = 3.804, 95% CI = 1.546 – 9.361, p = 0.004). Results showed that employees without children (OR = 11.745, 95% CI = 2.772 – 49.764, p = 0.001) reported having lower odds of having MSDs than those with children. Besides that, employees that do not performed physical activity reported higher odds of having MSDs compared to employees that performed physical activity (OR = 2.897, 95% CI = 1.498 – 5.601, p = 0.002). In addition, employees that performed physical activity around 5 to 6 times per week have 95.3% (95% CI = 0.010 – 0.231, p < 0.001) to get MSDs compared to employees that performed physical exercise every day.

Results showed that employees that are not required to remain in static and sustained position have 58.4% chances to not develop MSDs compared to those that required to be in static and sustained position during working (95% CI = 0.181 – 0.953, p = 0.038). Next, employees that are not required to do lifting and lowering loads during working have 65.8% of having MSDs than those that required (95% CI = 0.181 – 0.953, p = 0.001). Other than that, employees that are not required to handling loads in seated position reported higher odds of having MSDs compared to those that are needed to handle loads in seated position (OR = 3.159, 95% CI = 1.185 – 6.297, p = 0.001). Next, employees that choose comfortable temperature reported lower odds of having MSDs compared to those that have be in uncomfortable temperature (OR = 3.259, 95% CI = 1.711 – 6.208, p = 0.000). Lastly, employees without inadequate ventilation in their workplace reported 57.4% (95% CI = 0.189 – 0.961, p = 0.040) of having MSDs compared to those with adequate ventilation.

Table 4.6: List of the predictors associated with the prevalence of MSDs

Variable	Crude OR	β	SE	Wald	95% CI (Lower, Upper)	p
Age (years old)						
< 20	1.000					
20 - 29	0.364	-1.010	0.346	8.515	0.185, 0.178	0.004*
30 - 39	1.403	0.339	0.348	0.948	0.709, 2.775	0.330
40 - 49	4.28×10^8	19.876	7.10×10^3	0	0	0.998
Gender						
Male	1.000					
Female	0.479	-0.736	0.353	4.342	0.240, 0.957	0.037*
Education						
Secondary education	1.000					
Pre universities/ certificate	0.677	-0.390	0.321	1.478	0.361, 1.270	0.224
Tertiary education	0.566	-0.569	0.337	2.849	0.292, 1.096	0.091
Marital status						
Single	1.000					
Married	3.804	1.336	0.459	8.459	1.546, 9.361	0.004*
Divorced/Widowed	3.78×10^8	19.751	1.42×10^4	0	0	0.999
Children						
Have children	1.000					
No children	0.085	-2.463	0.737	11.181	0.020, 0.361	0.001*
Salary (RM)						
< 4,850	1.000					
4,850 – 10,959	2.516	0.923	0.758	1.481	0.569, 11.114	0.224
> 10,959	3.71×10^8	19.732	2×10^4	0	0	0.999
BMI						
Underweight (< 18.5)	1.000					
Normal (18.5 – 24.9)	0.773	-0.257	0.349	0.543	0.391, 1.532	0.461
Overweight (25.0 – 29.9)	1.302	0.264	0.423	0.389	0.569, 2.981	0.533
Obese (30.0)	0.657	-0.421	0.601	0.490	0.202, 2.132	0.484
History of disease						
Yes	1.000					
No	0.471	-0.753	0.763	0.973	0.106, 2.102	0.324
Medication						
Yes	1.000					
No	0.928	-0.074	0.575	0.017	0.301, 2.864	0.897
Smoking						
Yes	1.000					
No	0.522	-0.650	0.416	2.436	0.231, 1.181	0.119
Alcoholic beverages						
Yes	1.000					
No	0.871	-0.138	0.479	0.083	0.341, 2.227	0.774
Alcohol intake (litre)						
> 0.5	1.000					
≤ 0.5	0.609	-0.496	0.968	0.263	0.091, 4.056	0.608

Variable	Crude OR	β	SE	Wald	95% CI (Lower, Upper)	p
Physical activity						
Yes	1.000					
No	2.897	1.064	0.336	9.994	1.498, 5.601	0.002*
Frequency of physical activity						
Everyday	1.000					
5 to 6 times	0.047	-3.049	0.809	14.201	0.010, 0.231	0.000*
3 to 4 times	0.508	-0.677	0.481	1.984	0.198, 1.304	0.159
1 to 2 times	1.031	0.031	0.359	0.007	0.510, 2.085	0.931
Other	3.67×10^8	19.722	2.84×10^4	0	0	0.999
Duration of physical activity (minutes)						
> 45	1.000					
≤ 45	1.212	0.193	0.419	0.212	0.534, 2.754	0.645
Position in work						
White collar worker	1.000					
Blue collar worker	0.478	-0.738	0.466	2.509	0.192, 1.191	0.113
Working experience (years)						
> 2	1.000					
≤ 2	0.292	-1.232	0.381	10.451	0.138, 0.616	0.001*
Working hours (hours)						
> 8	1.000					
≤ 8	0.892	-0.114	0.426	0.072	0.387, 2.056	0.789
Rest break						
Yes	1.000					
No	0.319	-1.143	0.667	2.941	0.086, 1.177	0.086
Awkward posture						
Yes	1.000					
No	1.959	0.672	0.365	3.384	0.957, 4.009	0.066
Static and sustained posture						
Yes	1.000					
No	0.416	-0.878	0.423	4.303	0.181, 0.953	0.038*
Manual handling						
Lifting & lowering loads						
Yes	1.000					
No	0.342	-1.072	0.331	10.526	0.179, 0.654	0.001*
Pushing & pulling objects						
Yes	1.000					
No	1.837	0.608	0.364	2.797	0.901, 3.747	0.094
Carrying loads						
Yes	1.000					
No	1.937	0.661	0.344	3.692	0.987, 3.802	0.055

Variable	Crude OR	β	SE	Wald	95% CI (Lower, Upper)	p
Handling loads in seated position						
Yes	1.000					
No	3.159	1.150	0.352	10.679	1.585, 6.297	0.001*
Repetitive motion						
Yes	1.000					
No	1.299	0.262	0.322	0.662	0.692, 2.442	0.416
Vibration						
Yes	1.000					
No	1.886	0.634	0.512	1.535	0.691, 5.144	0.215
Lighting						
Adequate	1.000					
Inadequate	1.194	0.177	0.406	0.190	0.539, 2.643	0.663
Temperature						
Comfortable	1.000					
Uncomfortable	3.259	1.182	0.329	12.920	1.711, 6.208	0.000*
Ventilation						
Adequate	1.000					
Inadequate	2.345	0.852	0.414	4.232	1.041, 5.281	0.040*
Noise						
No noise present	1.000					
Has loud irritating or continuous sound/ noise	1.329	0.285	0.404	0.497	0.603, 2.932	0.481

Simple logistic regression was used to predict the predictors of the prevalence of MSDs.
OR = Odds ratio
SE = Standard error
CI = Confidence interval
* Variables with $p < 0.05$

Based on simple logistic regression, age, gender, education, marital status, children, salary, salary, smoking, physical activity, frequency of physical activity, position in work, working experience, rest break, awkward posture, static and sustained posture, lifting and lowering loads, pushing, and pulling objects, carrying loads, handling loads in seated position, vibration, temperature and ventilation with p-value < 0.25 were included in multiple logistic regression (MLR) (as cited in Zhang Z., 2016). Table 4.7 shows the predictor associated with the prevalence of MSDs among employees working in hypermarkets in Klang Valley.

Table 4.7: Predictor associated with the prevalence of MSDs, multiple logistic regression

Variable	Adjusted OR	Adjusted β	SE	Wald	95% CI (Lower, Upper)	p
Children						
No children	1.000					
Have children	11.745	2.463	0.737	11.181	2.772, 49.764	0.001*

Model assumptions are met. There was no interaction and multicollinearity problems. Omnibus test was statistically significant (x^2 = 79.133, df = 11, p < 0.001). Cox & Snell R^2 = 0.262, Nagelkerke R^2 = 0.425. Overall percentage = 84.3%. Hosmer-Lemeshow goodness of fitness test shows the model was fit (x^2 = 10.423, df = 8, p < 0.001). Variable selection method = Forward (Likelihood Ratio)' OR = Odds Ratio, SE = Standard Error, CI = Confidence Interval
*Variable significant with p < 0.05

The results indicated that number of children was statistically significant factor in MSDs during the last 12 months among hypermarkets employees where the odds of MSDs in employees with children were nearly 12 times greater than the employees without children (p = 0.001).

CHAPTER 5

DISCUSSION

In this study, all independent variables (i.e., sociodemographic, medical history, social lifestyle, and ergonomics risk factors) are contributed to the prevalence of MSDs among hypermarket employees in Klang Valley.

This study found that 81.6% of employees working in hypermarkets in Klang Valley have experienced MSDs symptoms in the previous 12 months (Table 4.3). Comparably, Anton & Weeks (2016) and Forcier et al. (2008) reported approximately 80% and 83% of the hypermarkets workers had musculoskeletal symptoms at least one in any body parts. However, based on study by Anthony Ryan (1989) reported only one third of the workers had reported MSDs symptoms. The differences on the number of reported MSDs between these studies might be due to the different in how long the workers had to report their MSDs symptoms. The study by both Anton & Weeks and Forcier et al. required the workers to report their MSDs symptoms for the past 12 months while in Ryan's study, the workers only required to report the presence of MSDs symptoms in the past 2 months. Furthermore, the differences on the decades of study might gave different outcomes since the knowledge on MSDs has developed greatly over the past decades. Most of the respondents reported to have MSDs in the lower back. The

results for the most affected area were in line with other study among supermarket workers whereby this low back region have the highest prevalence compared to the other body parts (Ryan, 1989; Anton & Weeks, 2016).

This study found that the older respondents were more likely to have MSDs symptoms because they might be working in this sector for a long time compared to the younger employees (Table 4.6). In addition, from the results, employees that have more than 2 years working experience was more likely to get MSDs. However, according to Health and Safety Executive (2010), age was not considered as an independent risk factor for MSDs as health of someone was influenced by their lifestyle, nutrition intake and physical exercise. Nevertheless, it should be acknowledged that older respondents are indeed more prone to develop MSDs symptoms because of the naturally declining in their functional capacity as the body ages.

Gender was associated with prevalence of MSDs which female employees were 0.521 less likely to develop MSDs compared to male (Table 4.6). However, Anton & Weeks (2016) found that females have higher probability to get MSDs symptoms compared to male employees. It may be because female have high proportion of types 1 muscles fibers that cause them to have high endurance and led them to perform chores or works for extended periods of time (Moser & Vu, n.d.). Moreover, biological differences such as size of the body, muscular capacity, hormonal conditions, and work-life balance may contributed to the reasons on

why females would have higher chances to develop MSDs (Kilbom et al. 1998; de Zwart et al., 2000, as cited in Collins and O'Sullivan, 2015).

This study findings revealed that all hypermarket employees were literate with at least secondary level of education. Employees with secondary level of education was 0.323 less likely to develop MSDs compared to those with pre-universities or tertiary level of education (Table 4.6). Research by Alexander (2008) among Ullensaker municipality in Norway also have the same findings with this study. One of the possible reasons might be because employees with high education level have more job opportunity with a better prospect offered as compared to the others (OECD, 2102).

Having children was significantly associated with the prevalence of MSDs whereas based on the multiple logistic regression, workers with children are nearly 12 times more likely to develop MSDs compared to those without children. Having a child is a huge responsibility to provide the best environment for them. A study by Fassa et al. (2005) found that increase in involvement in household domestic activities such as carrying children, washing, and hanging clothes and cleaning the house was related with musculoskeletal pain.

Next, this study found that marital status was significantly associated with the prevalence of MSDs. Respondents who were divorced or widowed were more likely to get MSDs (Table 4.6). Psychosocial factors especially social support is important for someone to stay healthy and prevent from being ill. According to

World Health Organization (1984), individual with good social support have ability to cope better compared to those that lack of social support. Being a single parent reduce the social support from their spouses and they might be stressed out due to the facts that they are being a single parent causing them to be more likely to develop MSDs.

On the other hand, physical exercise and its frequency also give significant impact on the prevalence of MSDs to the employees. It has been mentioned by Johnston (2021) that by performing physical exercise can helps in stretching body muscles and joint which resulting in increasing the flexibility and reduce the possibility of getting injuries. Additionally, in research from Collins and O'Sullivan (2015) stated that by performing physical exercise during leisure time may have positive effect on musculoskeletal health especially for lower back.

For ergonomics aspects, all variables are contributed to the prevalence of MSDs among hypermarkets employees. Based on this study, there was a relationship between awkward posture with neck, upper back, hips or buttocks, thigh, and knee. Due to the nature of their work such as organized products for displays in high or low shelves, employees were required to be in an awkward position such as back bent forward, trunk twisted or sideway bending for more than 2 hours per day. This might be one of the reasons that lower back was the most reported body parts among the others. Being in awkward posture might require more force for the body to operate efficiently which increase susceptibility for the muscles to get injuries and pains.

Majority of the respondents were required to be in a static and sustained position such as standing for more than 2 hours in a day as well as being in seated position with minimal movement for more than 30 minutes which was found to be associated with the prevalence of MSDs. Standing for a long time will reduced circulation of blood in lower leg and localized muscle fatigue (Madeleine et. al, 1998, as cited in Isa & Omar, 2011). Other than that, prolonged standing transfers the loads on upper limb to the lower limb that resulted in lower back pain (Isa & Omar, 2011).

Next, lifting and lowering loads was significantly associated with neck, shoulder, upper back, upper arm, lower back and hips or buttocks (Table 4.5). The results on the affected body parts were in line with a study by Afshari et al. (2020) among Iranian women workers whereas the highest reported prevalence among body parts were the same as this study. For pushing and pulling, it was associated with shoulder, upper arm, hips or buttocks, knee and ankle or feet (Table 4.5). Both lifting or lowering and pushing or pulling heavy loads was physically demanding for the physiological state of the employees. According to National Health Service (NHS), (2022), lifting or handling goods inappropriately was a leading cause of back injury at work.

Research by Abdullah, N. S., & Dawal, S. Z. M. (2020) among material handler found that there was a significant association between repetitive tasks and MSDs. This study also finds employees that perform repetitive have significant association in body parts such as in neck, upper back, hips or buttocks, thigh, and

knee (Table 4.5). The tasks including arranging foods or small objects in large quantity like stationary or employees that are working in office like admin or accountant which involved in intensive keying data and information during working for more than 4 hour per day. For vibration factor, it was associated with upper arm, lower back, and lower leg. The employees might be exposed to the vibration during the usage of machines or equipment. However, from the data obtained, it was found that only 21 respondents were exposed to the vibration during working at the hypermarkets. This number of workers involved can be reduced by making sure the amount of time for the workers exposed to vibration would be less than 40% of their total working hours.

For environmental aspects, only temperature and ventilation were appeared to give significant association with the prevalence of total MSDs. For temperature, most of the respondents have reported comfortable temperature during working. Uncomfortable temperature including those who reported hot, cold, or warm environment. Exposures to high temperature may leads to heat stress, dehydration, heat cramps or heat stroke. This is because, according to DOSH (2018), if the person has high body temperature, the transfer of heat in the body cannot be transferred effectively which in resulting in those symptoms.

CHAPTER 6

CONCLUSION

6.1 Conclusion

In conclusion, this study found that the prevalence of musculoskeletal disorders (MSDs) among hypermarket workers were considerably quite high (with total prevalence of MSDs of 81.6%). Primarily, the lower back was most affected body part, followed by upper back, neck and shoulder. Based on chi-square analysis, the result indicates that the age, gender, education, marital status, children, physical activity, and its frequency, working experience, static and sustained posture, lifting and lowering loads, handling loads in seated position, temperature, and ventilation were significantly associated with the prevalence of MSDs among hypermarket workers.

The results obtained can provide an insight on the prevalence of MSDs among hypermarkets employees in Klang Valley. Moreover, the findings from this study can give overview on the current situation and recommendation for suitable control measures in this sector.

6.2 Limitations

Throughout this study, there are some limitations that cannot be avoided by researcher. Firstly, as all the information gathered in this study was mainly based on self-administered questionnaire and no observation or medical diagnosis involved in this study. In addition, since the question for the prevalence of MSDs asked if the respondents have experienced MSDs in the past 12 months which can be considered a long time, the respondents might have difficulty to recall on the prevalence of MSDs for the past 12 months which resulted in recall bias. Lastly, since this study used self-administered questionnaire, all the data obtained was depending on the respondent honesty while answering the questionnaire. However, all the data was considered accurate as it is beyond control to verify the information obtained.

6.3 Recommendations

This study had found that the prevalence of MSDs is high among the hypermarket workers. For future study, it is suggested to use probability sampling such as simple random sampling as the study method to select the respondents so that the results can be generalized for the populations. Next, the findings from this study can give be used by stakeholders or employers to develop suitable control measures as recommended in the Guidelines on Ergonomic Risk Assessment by Department of Occupational Safety and Health to reduce the chances for this target group to develop MSDs. In addition, as stated in the Occupational Safety

and Health Act 1994 (OSHA), that it is the duty of employer to ensure the safety, health, and welfare of their employees at the workplace, the employers should find the best way to reduce the prevalence of MSDs among hypermarket workers.

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APPENDIX 1

QUESTIONNAIRE/ *BORANG KAJI SELIDIK*

RESEARCH TITLE/ *TAJUK KAJIAN*	**RESEARCHER NAME**/ *NAMA PENGKAJI*
FACTORS ASSOCIATED WITH THE PREVALENCE OF MUSCULOSKELETAL DISORDERS (MSDs) AMONG EMPLOYEES WORKING IN HYPERMARKET IN KLANG VALLEY Faktor yang berhubung kait dengan kes muskuloskeletal dalam kalangan pekerja yang bekerja di pasar raya besar di Lembah Klang	Nurul Khairina binti Kamarudin

THIS QUESTIONNAIRE CONSISTS OF 6 SECTIONS:
Borang kaji selidik ini mengandungi 6 bahagian:

1. **SECTION A: SOCIODEMOGRAPHIC CHARACTERISTICS**
   Bahagian A: Ciri-ciri sosiodemografik

2. **SECTION B: MEDICAL HISTORY**
   Bahagian B: Sejarah Kesihatan

3. **SECTION C: SOCIAL LIFESTYLE**
   Bahagian C: Gaya Hidup

4. **SECTION D: OCCUPATIONAL HISTORY**
   Bahagian D: Sejarah Pekerjaan

5. **SECTION E: NORDIC MUSCULOSKELETAL QUESTIONNAIRE (NMQ)**
   Bahagian E: Nordic Musculoskeletal Questionnaire (NMQ)

6. **SECTION F: ERGONOMICS RISK FACTORS**
   Bahagian F: Faktor Risiko Ergonomik

SECTION A: SOCIODEMOGRAPHIC CHARACTERISTICS

Bahagian A: Ciri-ciri sosiodemografik

Age : ☐☐ **Years Old** / T*ahun*

Umur

GENDER : ☐ **Male** ☐ **Female**

Jantina *Lelaki* *Perempuan*

Race

Bangsa

☐ **Malay**

Melayu

☐ **Chinese**

Cina

☐ **Indian**

India

☐ **Others. Please Specify: _____**

Lain-lain. Sila nyatakan: _____

Education :

Tahap Pendidikan

☐ **No Formal Education**

Tiada pembelajaran formal

☐ **Primary Education**

Sekolah Rendah

☐ **Secondary Education**

Sekolah Menengah

☐ **Tertiary Education**

Sijil/Diploma/Ijazah

Marital Status :

Status perkahwinan

☐ **Single**

Bujang

☐ **Married**

Berkahwin

☐ **Divorced**

Bercerai

☐ **Widowed**

Balu atau janda

***Number Of Children (s)** ☐☐

Bilangan anak

(If Have No Children, Please State "0")

Jika tiada anak, sila tulis 0.

Total salary

Jumlah gaji

☐ **Below RM 4,850 per month**

Bawah RM 4,850 sebulan

☐ **Between RM 4,850 – RM 10,959 per month**

Di antara RM 4,850 – RM 10,959 sebulan

☐ **Above RM 10,959 per month**

Lebih RM 10,959 sebulan

Height (cm) : ☐☐☐ cm

Tinggi (cm)

Weight (kg) : ☐☐ kg

Berat (kg)

Note: Question with * will only be answered if the respondent selects either married, divorced, or widowed.

*Nota: Soalan dengan tanda * hanya perlu dijawab jika responden memilih sama ada kahwin, bercerai atau balu/janda.*

SECTION B: MEDICAL HISTORY
Bahagian B: Sejarah Kesihatan

Were you diagnosed of any diseases by the doctors? *Adakah anda mempunyai apa-apa spenyakit yang sudah disahkan oleh doctor?*	:	☐ **Yes** / *Ya*	☐ **No** / *Tidak*
***If yes, please state.** *Jika ya, nyatakan.*	:		
Are you taking any medication? *Adakah anda mengambil apa-apa ubatan?*	:	☐ **Yes** / *Ya*	☐ **No** / *Tidak*
***If yes, what medication are you taking?** *Jika ya, apakah ubat yang anda ambil?*	:		

Note: Question with * will only be answered if the respondent selects "yes" for the questions before.
*Nota: Soalan dengan tanda * hanya perlu dijawab jika responden memilih "ya" untuk soalan sebelumnya.*

SECTION C: SOCIAL LIFESTYLE
Bahagian C: Gaya Hidup Sosial

Do you currently smoke? : ☐ **Yes** / *Ya* ☐ **No** / *Tidak*
Adakah anda merokok?

Do you consume alcohol? : ☐ **Yes** / *Ya* ☐ **No** / *Tidak*
Adakah anda mengambil arak?

If yes, how many times a week? : ☐☐ **Times Per Day** / *Kali seminggu*
Jika ya, berapa kali seminggu?

***How much (in ml) in average over a week?** : ☐ ml
Berapa kali (dalam ml), purata dalam seminggu?

Guide / *Panduan*
1 shot = *44.36 ml*
1 pint = *473 ml*
1 can = *320 ml*
1 bottle = *500 ml*

Do you perform physcial activity? (i.e.: jogging, running, cycling, etc) : ☐ **Yes** / *Ya* ☐ **No** / *Tidak*
Adakah anda melakukan aktiviti fizikal? (contohnya: jogging, berlari, berbasikal?

***How frequent do you perform physical activity in a week?** :
Berapa kalikah anda melakukan aktiviti fizikal dalam seminggu?

☐ **Every day**
Setiap hari

☐ **5 to 6 times**
5 hingga 6 kali

☐ **3 to 4 times**
3 hingga 4 kali

☐ **1 to 2 times**
1 hingga 2 kali

☐ **Other**
Lain-lain

***How long (in minutes) do you perform physical exercise per session?**
Berapa lama (dalam minit) anda melakukan aktiviti fizikal dalam satu sesi?

: ☐ **Minutes**/*minit*

Note: Question with * will only be answered if the respondent selects "yes" for the question before.
*Nota: Soalan dengan tanda * hanya perlu dijawab jika responden memilih "ya" untuk soalan sebelumnya.*

SECTION D: OCCUPATIONAL HISTORY
Bahagian D: Sejarah Pekerjaan

Position in work : ☐ **Executive**
Jawatan *Eksekutif*

☐ **Manager**
Pengurus

☐ **Cashier**
Juruwang

☐ **Store Keeper**
Penjaga stor

☐ **Driver**
Pemandu lori

☐ **Promoter**
Pembantu jualan

☐ **Security Personnel**
Anggota keselamatan

☐ **Others. Please specify:** _____
Lain-lain. Sila nyatakan: _____

Working experience (in years) for current position : ☐☐ **year(s)***/tahun*
Pengalaman bekerja (dalam tahun) untuk jawatan sekarang

How many hours do you work in a day (exclude rest break)? : ☐☐ **hour(s)***/jam*
Berapa jamkah anda bekerja dalam sehari (tidak termasuk waktu rehat)?

Do you have rest break during work? : ☐ **Yes** / *ya* ☐ **No** / *tidak*
Adakah anda mempunyai waktu rehat semasa bekerja?

***What are the rest break(s) provided?**
Apakah waktu rehat yang disediakan? :

- ☐ **Morning Tea/Rest Break**
  Minum Pagi/Waktu Rehat
- ☐ **Lunch Break**
  Makan Tengah Hari
- ☐ **Evening Tea/Rest Break**
  Minum Petang/Waktu Rehat
- ☐ **Overtime Rest/Break**
  Waktu Rehat untuk Kerja Lebih Masa
- ☐ **Other**
  Lain-lain

***Duration (in minutes) for morning tea/rest break** : ☐☐☐ **Minute(s)**/*minit*
Tempoh masa (dalam minit) untuk minum pagi/waktu rehat

***Duration (in minutes) for lunch break** : ☐☐☐ **Minute(s)**/*minit*
Tempoh masa (dalam minit) untuk makan tengah hari

***Duration (in minutes) for evening tea/rest break** : ☐☐☐ **Minute(s)**/*minit*
Tempoh masa (dalam minit) untuk minum petang/waktu rehat

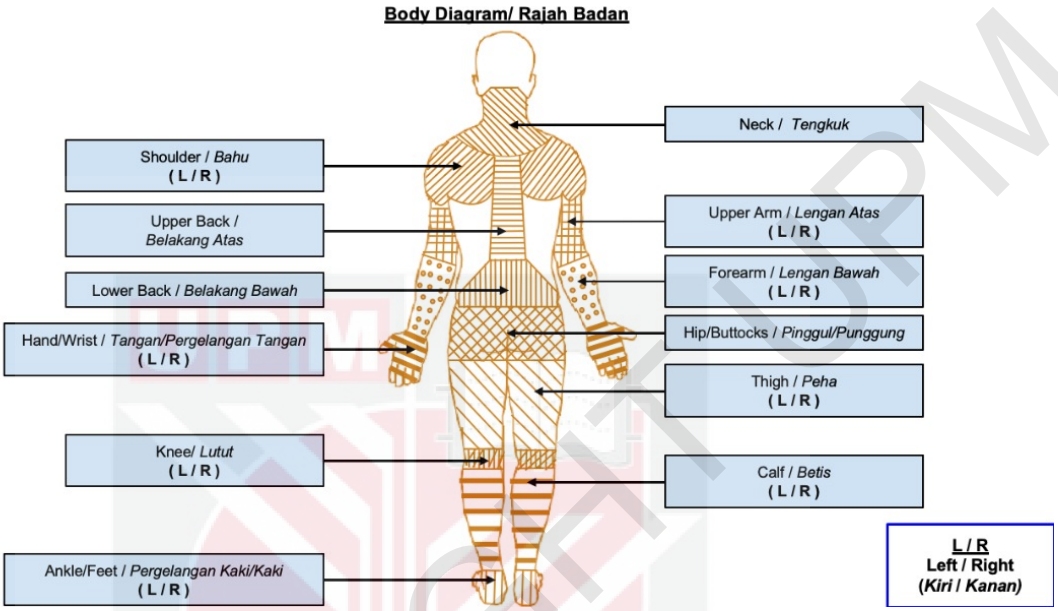
***Duration (in minutes) for overtime rest/break** : ☐☐☐ **Minute(s)**/*minit*
Tempoh masa (dalam minit) untuk waktu rehat untuk kerja lebih masa

***Duration (in minutes) for other break** : ☐☐☐ **Minute(s)**/*minit*
Tempoh masa (dalam minit) untuk waktu rehat lain-lain

Note: Question with * will only be answered if the respondent selects "yes" for the question before and for the duration, the respondent only required to answer for their chosen rest break.
*Pesanan: Soalan dengan tanda * hanya perlu dijawab jika responden memilih "ya" untuk soalan sebelumnya dan untuk tempoh masa, responden hanya perlu menjawab mengikut pilihan waktu rehat yang dipilih.*

SECTION E: NORDIC MUSCULOSKELETAL QUESTIONNAIRE

Bahagian E: Nordic Musculoskeletal Questionnaire



Have you at any time during the last *12 month* had trouble (such as ache, pain, discomfort, numbess) in:
Adakah anda pada bila-bila masa dalam tempoh 12 bulan yang lepas menghadapi masalah (seperti sakit, ketidakselesaan, kebas) pada bahagian:

If "None", please tick "None".
Jika *"Tiada"*, sila tandakan *"Tiada"*

:

- ☐ **None** *Tiada*
- ☐ **Neck** *Leher*
- ☐ **Shoulder (Right)** *Bahu (Kanan)*
- ☐ **Shoulder (Left)** *Bahu (Kiri)*
- ☐ **Upper Back** *Belakang Atas*
- ☐ **Upper Arm (Right)** *Lengan (Kanan)*
- ☐ **Upper Arm (Left)** *Lengan (Kiri)*
- ☐ **Lower Back** *Belakang Bawah*
- ☐ **Forearm (Right)** *Lengan Bawah (Kanan)*
- ☐ **Forearm (Left)** *Lengan Bawah (Kiri)*

☐ **Wrist (Right)**
Pergelangan Tangan (Kanan)

☐ **Wrist (Left)**
Pergelangan Tangan (Kiri)

☐ **Hand (Right)**
Tangan (Kanan)

☐ **Hand (Left)**
Tangan (Kiri)

☐ **Hips or Buttocks**
Pinggan atau Punggung

☐ **Thigh (Right)**
Peha (Kanan)

☐ **Thigh (Left)**
Peha (Kiri)

☐ **Knee (Right)**
Lutut (Kanan)

☐ **Knee (Left)**
Lutut (Kiri)

☐ **Lower Leg (Right)**
Betis (Kanan)

☐ **Lower Leg (Left)**
Betis (Kiri)

☐ **Ankle or Feet**
Pergelangan Kaki atau Kaki

Have you at any time during the last 7 days had trouble (such as ache, pain, discomfort, numbess) in: :
Adakah anda pada bila-bila masa dalam tempoh 7 hari yang lepas menghadapi masalah (seperti sakit, ketidakselesaan, kebas) pada bahagian:

If "None", please tick "None".
Jika *"Tiada"*, sila tandakan *"Tiada"*

☐ **None**
Tiada

☐ **Neck**
Leher

☐ **Shoulder (Right)**
Bahu (Kanan)

☐ **Shoulder (Left)**
Bahu (Kiri)

☐ **Upper Back**
Belakang Atas

☐ **Upper Arm (Right)**
Lengan (Kanan)

☐ **Upper Arm (Left)**

Lengan (Kiri)

☐ **Lower Back**

Belakang Bawah

☐ **Forearm (Right)**

Lengan Bawah (Kanan)

☐ **Forearm (Left)**

Lengan Bawah (Kiri)

☐ **Wrist (Right)**

Pergelangan Tangan (Kanan)

☐ **Wrist (Left)**

Pergelangan Tangan (Kiri)

☐ **Hand (Right)**

Tangan (Kanan)

☐ **Hand (Left)**

Tangan (Kiri)

☐ **Hips or Buttocks**

Pinggan atau Punggung

☐ **Thigh (Right)**

Peha (Kanan)

☐ **Thigh (Left)**

Peha (Kiri)

☐ **Knee (Right)**

Lutut (Kanan)

☐ **Knee (Left)**

Lutut (Kiri)

☐ **Lower Leg (Right)**

Betis (Kanan)

☐ **Lower Leg (Left)**

Betis (Kiri)

☐ **Ankle or Feet**

Pergelangan Kaki atau Kaki

Body Parts *Bahagian Badan*	***In the past week, how frequent did you experienced the pain / ache / discomfort / numbness at the body part?*** *Pada minggu lepas, berapa kerapkah anda mengalami sakit / ketidakselesaan / kebas di bahagian badan?*			***When experiencing pain / ache / discomfort / numbness at the, how uncomfortable was it?*** *Semasa mengalami sakit / ketidakselesaan / kebas, bagaimanakah keadaan ketidakselesaan itu?*		
	Everyday in the past week Setiap hari pada minggu lalu	**3 - 4 times in the past week** 3 - 4 kali dalam minggu lalu	**1 - 2 times in the past week** 1 - 2 kali dalam minggu lalu	**Is/was Slightly Uncomfortable** Sedikit Tidak Selesa	**Is/was Moderately Uncomfortable** Sederhana Tidak Selesa	**Is/was Very Uncomfortable** Sangat Tidak Seles
Neck *Leher*						
Shoulder (Right) *Bahu (Kanan)*						
Shoulder (Left) *Bahu (Kiri)*						
Upper Back Belakang Atas						
Upper Arm (Right) Lengan (Kanan)						
Upper Arm (Left) Lengan (Kiri)						
Lower Back Belakang Bawah						
Forearm (Right) Lengan Bawah (Kanan)						

Forearm (Left) Lengan Bawah (Kiri)						
Wrist (Right) *Pergelangan Tangan (Kanan)*						
Wrist (Left) *Pergelangan Tangan (Kiri)*						
Hand (Right) *Tangan (Kanan)*						
Hand (Left) Tangan (Kiri)						
Hip/Buttocks Pinggul/Punggung						
Thigh (Right) Peha(Kanan)						
Thigh (Left) Peha (Kiri)						
Knee (Right) Lutut (Kanan)						
Knee (Left) Lutut (Kiri)						
Lower Leg (Right) Betis (Kanan)						

Lower Leg (Left) Betis (Kiri)						
Ankle/Feet Pergelangan Kaki/ Kaki						

Body Parts *Bahagian Badan*	***When experiencing pain / ache / discomfort / numbness at body part did it interfere from carrying out normal activities? (i.e.: job, housework, hobbies)** Semasa mengalami sakit / ketidakselesaan / kebas di bahagian badan, adakah ia menganggu anda daripada menjalankan aktiviti seperti biasa (i.e.: pekerjaan, kerja rumah, hobi)			***When experiencing pain / ache / discomfort / numbess at body part, did you see the physician / self-medicate / treatement to relieve the pain? (Tick all that apply)** Semasa mengalami sakit / ketidakselesaan / kebas di bahagian badan, adakah anda berjumpa dengan doktor / mengubati diri / rawatan untuk melegakan kesakitan? *(Tanda pada semua yang berkenaan)*		
	Not interfere with my work Tidak menganggu kerja saya	**Slightly interfere with my work** Sedikit menganggu kerja saya	**Substantially interfere with my work** Sebahagian besarnya menganggu kerja saya	**Is/was Slightly Uncomfortable** Sedikit Tidak Selesa	**Is/was Moderately Uncomfortable** Sederhana Tidak Selesa	**Is/was Very Uncomfortable** Sangat Tidak Seles
Neck *Leher*						
Shoulder (Right) *Bahu (Kanan)*						
Shoulder (Left) *Bahu (Kiri)*						
Upper Back Belakang Atas						
Upper Arm (Right) Lengan (Kanan)						
Upper Arm (Left) Lengan (Kiri)						
Lower Back Belakang Bawah						

Forearm (Right) Lengan Bawah (Kanan)						
Forearm (Left) Lengan Bawah (Kiri)						
Wrist (Right) *Pergelangan Tangan (Kanan)*						
Wrist (Left) *Pergelangan Tangan (Kiri)*						
Hand (Right) *Tangan (Kanan)*						
Hand (Left) Tangan (Kiri)						
Hip/Buttocks Pinggul/Punggung						
Thigh (Right) Peha(Kanan)						
Thigh (Left) Peha (Kiri)						
Knee (Right) Lutut (Kanan)						
Knee (Left) Lutut (Kiri)						

Lower Leg (Right) Betis (Kanan)						
Lower Leg (Left) Betis (Kiri)						
Ankle/Feet Pergelangan Kaki/ Kaki						

Note: Question with * will only be answered based on selected body parts in the question before (Have you at any time during the last 7 days had trouble (such as ache, pain, discomfort, numbess) in:).

*Pesanan: Soalan dengan tanda * hanya akan dijawab berdasarkan pada anggota badan yang dipilih sebelumnya (Pada minggu lepas,* berapa kerapkah anda mengalami sakit ketidakselesaan / kebas di bahagian badan?).

SECTION F: ERGONOMICS RISK FACTORS

Bahagian F: Faktor Risiko Ergonomik

1. Do your work tasks require you to work in the following ergonomics risk factors?
Adakah tugasan kerja anda memerlukan anda bekerja dengan faktor ergonomik seperti berikut?

Look upward, downward, twist your neck or sideway bending
Mendongak, menunduk, memusing leher atau lenturan sisi :

- ☐ **Yes, cumulatively for > 2 hours**
  Ya, lebih dari 2 jam secara kumulatif
- ☐ **Yes, continuously for > 2 hours**
  Ya, berterusan lebih dari 2 jam
- ☐ **Yes, less than 2 hours**
  Ya, kurang dari 2 jam
- ☐ **No**
  Tidak

Shoulder shrugged, arm above head or elbow above shoulders
Mengangkat bahu, lengan di atas paras kepala atau siku di atas paras bahu :

- ☐ **Yes, cumulatively for > 2 hours**
  Ya, lebih dari 2 jam secara kumulatif
- ☐ **Yes, continuously for > 2 hours**
  Ya, berterusan lebih dari 2 jam
- ☐ **Yes, less than 2 hours**
  Ya, kurang dari 2 jam
- ☐ **No**
  Tidak

Back bent forward, trunk twisted or sideway bending
Belakang membongkok ke hadapan, dipusing atau dibengkok ke sisi :

- ☐ **Yes, cumulatively for > 2 hours**
  Ya, lebih dari 2 jam secara kumulatif
- ☐ **Yes, continuously for > 2 hours**
  Ya, berterusan lebih dari 2 jam
- ☐ **Yes, less than 2 hours**
  Ya, kurang dari 2 jam
- ☐ **No**
  Tidak

Arm extended to the front or to the back
Lengan dipanjangkan ke hadapan atau belakang badan

:

- ☐ **Yes, cumulatively for > 2 hours**
  Ya, lebih dari 2 jam secara kumulatif
- ☐ **Yes, continuously for > 2 hours**
  Ya, berterusan lebih dari 2 jam
- ☐ **Yes, less than 2 hours**
  Ya, kurang dari 2 jam
- ☐ **No**
  Tidak

Wrist bent or deviated, sideway or twisted
Pergelangan tangan dibengkok, disimpang atau dipusing

:

- ☐ **Yes, cumulatively for > 2 hours**
  Ya, lebih dari 2 jam secara kumulatif
- ☐ **Yes, continuously for > 2 hours**
  Ya, berterusan lebih dari 2 jam
- ☐ **Yes, less than 2 hours**
  Ya, kurang dari 2 jam
- ☐ **No**
  Tidak

Squat or kneeling position
Cangkung atau melutut

:

- ☐ **Yes, cumulatively for > 2 hours**
  Ya, lebih dari 2 jam secara kumulatif
- ☐ **Yes, continuously for > 2 hours**
  Ya, berterusan lebih dari 2 jam
- ☐ **Yes, less than 2 hours**
  Ya, kurang dari 2 jam
- ☐ **No**
  Tidak

2. Do your work required:
Adakah kerja anda perlu:

Prolonged standing for more than 2 hours per day
Berdiri lebih daripada 2 jam sehari

: ☐ **Yes** / *ya* ☐ **No** / *tidak*

Seated position with minimal movement for more than 30 minutes
Duduk dengan kurang pergerakan lebih daripada 30 minit

: ☐ **Yes** / *ya* ☐ **No** / *tidak*

3. Did you do the following job tasks:
Adakah anda melakukan tugasan di bawah:

If "None", please tick "None".
Jika *"Tiada",* sila tandakan *"Tiada"*

: ☐ **Lifting and lowering loads**
Mengangkat dan menurunkan (objek)

☐ **Pushing and pulling objects**
Menolak dan menarik objek

☐ **Carrying loads**
Membawa barang

☐ **Handling loads in seated position**
Menguruskan objek dalam keadaan duduk

☐ **None. I am not required to do manual handling works.**
Tiada. Saya tidak perlu melakukan kerja-kerja pengendalian manual.

4. *How many objects/products (quantity) you were required to LIFT/LOWER on a typical working day?
Berapa jumlah objek/produk (kuantiti) yang anda perlu A*NGKAT/ TURUNKAN* pada hari kerja biasa?

: ☐☐☐

5. *What is the maximum weight (in kg) of a single objects/products you were required to LIFT/LOWER on a typical working day?
Berapa *berat maksimum (dalam kg)* untuk sebuah objek/produk yang anda perlu *ANGKAT/TURUNKAN* pada
hari kerja biasa?

: ☐☐☐ **kg**

6. *What is the average weight (in kg) of all objects/products you were required to LIFT/LOWER on a typical working day?
Berapa *purata berat (dalam kg)* untuk semua objek atau produk yang anda perlu *ANGKAT/TURUNKAN* pada hari kerja biasa?

: | | | | **kg**

7. *What is the maximum weight (in kg) of objects/products cumulatively that you were required to PUSH/ PULL on a typical working day?
Berapa *berat maksimum (dalam kg)* objek atau produk secara kumulatif yang perlu anda *TOLAK/TARIK* pada hari kerja biasa?

: | | | | **kg**

8. *What is the average weight (in kg) of all objects/products that you were required to PUSH/PULL on a typical working day?
Berapa *purata berat (dalam kg)* untuk semua objek atau produk yang perlu anda *TOLAK/TARIK* pada hari kerja biasa?

: | | | | **kg**

9. *What is the maximum distance (in metre) of objects/products you were required to PUSH/PULL on a typical working day?
Berapa *jarak maksimum (dalam meter)* objek/produk yang perlu anda *TOLAK/TARIK* pada hari kerja biasa?

: | | | | metre

10. *What is the average distance (in metre) of objects/products you were required to PUSH/PULL on a typical working day?
Berapa *purata jarak (dalam meter)* objek/produk yang perlu anda *TOLAK/TARIK* pada hari kerja biasa?

: ☐☐☐ metre

11. *How many number of trips (to and from) you were required to PUSH/PULL on a typical working day?
Berapa banyak *bilangan trip* (ke dan dari) yang perlu anda *TOLAK/TARIK* pada hari kerja biasa?

: ☐☐☐

12. *What is/are the conditions of wheels of the trolley or pushcart or pallet-truck
Bagaimanakah keadaan tayar *troli atau kereta sorong atau trak palet*

:
☐ **Poor or Unacceptable**
Lemah atau tidak boleh diteri
☐ **Good or Acceptable**
Bagus atau boleh diterima
☐ **Other**
Lain-lain

13. *Are the loads you carry block the view?
Adakah objek yang anda bawa enghalang pendangan anda?

: ☐ **Yes** / *ya* ☐ **No** / *tidak*

12. *What is/are the conditions of wheels of the trolley or pushcart or pallet-truck
Bagaimanakah keadaan tayar *troli atau kereta sorong atau trak palet*

:
☐ **Wet**
Basah
☐ **Oily**
Berminyak
☐ ***Uneven surface***
Permukaan tidak sekat
☐ **Unsuitable footwear provide**
Kasut yang tidak sesuai
☐ **Other**
Lain-lain

15. *Is there any obstacles on the route? (i.e.: wires, cable, ropes, strings, steep slopes, closed door, use ladder, etc.)
Adakah terdapat halangan pada laluan? (i.e.: wayar, kabel, tali, cerun curam, pintu tutup, penggunaan, tangga,etc)

: ☐ **Yes** / *ya* ☐ **No** / *tidak*

16. *What is the maximum distance (in metre) of CARRYING LOADS on a typical working day?
Berapa *jarak maksimum (dalam meter)* untuk anda *MENGANGKAT BARANG* pada hari kerja biasa?

☐☐☐ metre

17. *Have you ever received a proper manual handling training from company you are working with?
Pernahkah anda menerima latihan pengendalian manual daripada tempat kerja anda?

: ☐ **Yes** / *ya* ☐ **No** / *tidak*

18. *Is there any lift assissting or manual handling devices that company provides in your workplace? (i.e. forklift, trolley, etc)
Adakah terdapat alat bantuan yang disediakan oleh syarikat anda di tempat kerja? (i.e: forklift, troli, etc)

: ☐ **Yes** / *ya* ☐ **No** / *tidak*

19. Are you required to repeatedly carry out your tasks with respect to the following?
Adakah anda perlu melakukan *kerja secara berulang* seperti di bawah?

Repeated sequence of movement
Pergerakan yang berul

:

☐ **Yes, for more than 3 hours cumulatively on a typical workday**
Ya, lebih daripada 3 jam secara kumulatif untuk hari kerja biasa

☐ **Yes, for more than 1 hour continuously on a typical workday**
Ya, lebih dari 1 jam secara berterusan untuk hari kerja biasa

☐ **Yes, but less than 3 hours on a typical workday**
Ya, tetapi kurang dari 3 jam untuk hari kerja biasa

☐ **No, my tasks are not repetitive**
Tidak, kerja saya tidak berulang

Involve intensive use of the fingers, hand or wrists :
Melibatkan penggunaan jari atau tangan atau pergelangan tangan secara intensif

- ☐ **Yes, for more than 3 hours cumulatively on a typical workday**
  Ya, lebih daripada 3 jam secara kumulatif untuk hari kerja biasa
- ☐ **Yes, for more than 1 hour continuously on a typical workday**
  Ya, lebih dari 1 jam secara berterusan untuk hari kerja biasa
- ☐ **Yes, but less than 3 hours on a typical workday**
  Ya, tetapi kurang dari 3 jam untuk hari kerja biasa
- ☐ **No, my works does not require intensive use of the fingers, hand or wrists**
  Tidak, kerja saya tidak melibatkan penggunaan jari atau tangan atau pergelangan tangan secara intensif

Using the heel or base of palm as 'hammer' more than once per min :
Menggunakan tumit atau pangkal tapak tangan sebagai 'penukul' lebih daripada sekali dalam seminit

- ☐ **Yes, for more than 3 hours cumulatively on a typical workday**
  Ya, lebih daripada 3 jam secara kumulatif untuk hari kerja biasa
- ☐ **Yes, for more than 1 hour continuously on a typical workday**
  Ya, lebih dari 1 jam secara berterusan untuk hari kerja biasa
- ☐ **Yes, but less than 3 hours on a typical workday**
  Ya, tetapi kurang dari 3 jam untuk hari kerja biasa
- ☐ **No, my work does not require using heel or base of palm as 'hammer'**
  Tidak, kerja saya tidak melibatkan penggunaan tumit atau pangkal tapak tangan sebagai 'penukul'

Using the knee as 'hammer' more than once per min :
Menggunakan lutut sebagai 'penukul' lebih daripada sekali dalam seminit

- ☐ **Yes, for more than 3 hours cumulatively on a typical workday**
  Ya, lebih daripada 3 jam secara kumulatif untuk hari kerja biasa
- ☐ **Yes, for more than 1 hour continuously on a typical workday**
  Ya, lebih dari 1 jam secara berterusan untuk hari kerja biasa
- ☐ **Yes, but less than 3 hours on a typical workday**
  Ya, tetapi kurang dari 3 jam untuk hari kerja biasa
- ☐ **No, my work does not require using knee as 'hammer'**
  Tidak, kerja saya tidak melibatkan penggunaan lutut sebagai 'penukul

20. Do your work expose you to vibration as follow?
Adakah pekerjaan anda mendedahkan anda kepada getaran seperti di bawah?

If "None", please tick "None".
Jika *"Tiada"*, sila tandakan *"Tiada"*

- ☐ **Work using power tools for > 50 mins per day without anti-vibration gloves**
  Bekerja menggunakan alat berkuasa lebih daripada 50 minit sehari tanpa sarung tangan anti getaran
- ☐ **Work using power tools for > 5 hours per day with antivibration gloves (i.e.: using drill, grinder, disc cutter, food processor, nail gun, etc.)**
  Bekerja menggunakan alat berkuasa lebih daripada 50 minit sehari dengan sarung tangan anti getaran (i.e.: menggunakan penggerudi, pengisar, pemotong cakera, pemproses makanan, pistol paku, etc.)
- ☐ **Work involved exposure to whole body vibration for > 5 hours in a day**
  Bekerja melibatkan pendedahan kepada getaran seluruh badan lebih daripada 5 jam sehari
- ☐ **Work involved exposure to whole body vibration with excessive body shaking for > 3 hours in a day (i.e.: driving forklift, stacker, lifter, etc.)**
  Bekerja melibatkan pendedahan kepada getaran seluruh badan dengan gegaran badan yang banyak lebih daripada 3 jam sehari (i.e.: memandu forklift, stacker, lifter, etc.)
- ☐ **None. I am not exposed to the vibration during my work.**
  Tiada. Saya tidak terdedah kepada getaran semasa kerja

21. How is the following environment in your workplace:
Bagaimana dengan keadaan persekitaran di tempat kerja anda:

Lighting :
Pencahayaan

- ☐ **Too bright or glaring**
  Terlalu cerah atau silau
- ☐ **Too dim or dark**
  Tetlalu malap atau gelap
- ☐ **Adequate**
  Cuk*up*

Temperature :
Suhu

- ☐ **Hot**
  Panas
- ☐ **Warm**
  Suam
- ☐ ***Cold***
  Sejuk
- ☐ **Comfortable**
  Selesa

Ventilation :
Pengudaraan

- ☐ **Adequate**
  Cukup
- ☐ **Inadequate**
  Tidak cukup

Noise
Bunyi bising

:

☐ **Has loud noise (i.e.: machineries operating nearby)**
Mempunyai bunyi bising (i.e.: hampir dengan mesin yangberoperasi)

☐ **Has irritating continuous sound or noise**
Mempunyai bunyi bising atau suara yang menjengkelkan secara berpanjangan

☐ **No noise present**
Tiada bunyi bising

Note:
• If in question 3, the respondent answer lifting and lowering loads, then they are required to answer question 4, 5, 6, 17 and 18.
• If in question 3, the respondent answer pushing and pulling objects, then they are required to answer question 7, 8, 9, 10, 11, 12, 17 and 18.
• If in question 3, the respondent answer carrying loads, then they are required to answer question 13, 14, 15 , 16, 17 and 18.

Nota:
• Jika pada soalan 3, responden menjawab mengangkat dan menurunkan beban, jadi mereka perlu menjawab soalan 4, 5, 6, 17 dan 18.
• Jika pada soalan 3, responden menjawab menolak dan menarik objek, jadi mereka perlu menjawab soalan 7, 8, 9, 10, 11, 12, 17 dan 18.
• Jika pada soalan 3, responden menjawab membawa barang, jadi mereka perlu menjawab soalan 13, 14, 15, 16, 17 dan 18.

ETHICS COMMITTEE FOR RESEARCH INVOLVING HUMAN SUBJECTS
(JKEUPM)
UNIVERSITI PUTRA MALAYSIA

Research title	:	**Factors Associated with the Prevalence of Musculoskeletal Disorders (MSDs) Among Employees Working in Hypermarkets in Klang Valley.**
Study Site	:	**Klang Valley, Selangor**
JKEUPM Ref No.	:	**JKEUPM-2021-373**
Researcher	:	**Nurul Khairina Binti Kamarudin**
Supervisor	:	**Assoc. Prof. Dr. Ng Yee Guan**

Documents received and reviewed with reference to the above study:

1. Ethics Application Form, Version 1 dated 14/6/2021
2. Respondent Information Sheet & Consent (English), Version 1 dated 14/6/2021
3. Respondent Information Sheet & Consent (Malay), Version 1 dated 14/6/2021
4. Proposal (English), Version 1 dated 14/6/2021
5. Questionnaire/Interviews (English), Version 1 dated 14/6/2021
6. Questionnaire/Interviews (Malay), Version 1 dated 14/6/2021
7. Curriculum Vitae of:
    a. Assoc. Prof. Dr. Ng Yee Guan

The University Research Ethics Committee, Universiti Putra Malaysia (JKEUPM) operates in accordance to the ICH-GCP Guidelines.

Decision by JKEUPM:

[X] Approved

[X] **Permission MUST BE OBTAINED from the respective hospitals/ institutions before conducting the research**

[ ] Disapproved

Please note that the approval is **VALID UNTIL 7 JULY 2022**

Researchers should comply with the following:

I. Complete a Study Final Report upon study completion (Form 3.2).

II. Ethical approval is required in the case of amendments/ changes to the study documents/ study sites/ study team.

III. Applicable for Clinical Trial Studies and Clinical interventional Studies only: Progress Report has to be submitted to JKEUPM at every 6 months from the date of approval (Form 3.1). Report occurrences of all Serious Adverse Events (SAEs), Suspected Unexpected Serious Adverse Reaction (SUSARs) and Protocol Deviation/ Violation at all JKEUPM approved sites to JKEUPM. SAEs are to be reported within 15 calendar days from awareness of event by

APPENDIX 3

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

FORM 2.4: RESPONDENT'S INFORMATION SHEET AND 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:

Factors Associated with the Prevalence of Musculoskeletal Disorders (MSDs) Among Employees Working in Hypermarkets in Klang Valley

2. INTRODUCTION:

This study intends to determine the risk factors (sociodemographic characteristics, medical history, social lifestyle, occupational history, and ergonomic risk factors) and 12 months prevalence of musculoskeletal disorders (MSDs) among hypermarket workers in Klang Valley. Specifically, the inputs from respondent on risk factors and musculoskeletal disorders are the focus of this study.

This study would also intend to determine the significant association between sociodemographic characteristics, medical history, social lifestyle, occupational history, and ergonomic risk factors among the hypermarket's workers in Klang Valley.

3. WHAT WILL YOU HAVE TO DO?

This study is completely voluntary where respondents can withdraw at any point of time. Respondent are required to fill in 6 sections in the questionnaire, which are sociodemographic characteristics in section A, medical history in section B, social lifestyle in section C, occupational history in section D, Nordic Musculoskeletal Questionnaire (NMQ) in section E and ergonomic risk factors in section F. The questionnaire is estimated to take about 20 to 30 minutes.

4. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

You should NOT participate in this study if you:

a) Below 18 or above 55 years old or,

b) Have any history of musculoskeletal disease or road traffic accident that resulted in injuries in the past 12 months, or

c) Does not have at least 1 year experience as hypermarket workers

5. WHAT WILL BE THE BENEFITS OF THE STUDY?

(a) TO YOU AS THE SUBJECT

The input from respondents will be able to help your company to practise the best ergonomic practices for you as the worker to prevent any musculoskeletal disorders (MSDs) or injuries in the future.

There will be no compensation or reward for your participation in this research. However, the collective/summarized results of this research can be obtained after the completion of this research at your request.

(b) TO THE INVESTIGATOR

The investigator will be able to determine the factors associated with the prevalence of musculoskeletal disorders (MSDs) among hypermarket workers in Klang Valley. The data obtained could be used for future research and further improvements for effective control measures.

6. WHAT ARE THE POSSIBLE RISKS?

There is a minimal risk as this research does not involve biological specimens.

Throughout the process of answering the questionnaire, you may experience a minimal psychosocial risk such as confusion when encounter difficulty in understanding the questions in the questionnaire using any electronic devices of your preference (i.e.: desktop, laptop, phone, tablet, etc.).

If you experienced any depression, anxiety, and stress symptoms, stop immediately from answering the questionnaire. You are encouraged to seek help from a counsellor or any organization that can provide mental support.

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

All information and identity that obtained through this research will remain confidential and used only for this research. The data processing software will not contain your personal identifier or information while the physical questionnaire you filled up (if any) will be destroyed by shredding and disposed after all the data has been transferred (entered) to the data processing software within 1 month.

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

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Dept. Of Environmental and Occupational Health,
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Faculty of Medicine and Health Sciences,
Universiti Putra Malaysia.

Mobile No.: +6018 665 4527
Email address: nurulkhaairinaa@gmail.com

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

_____

9. CONSENT

I …… Identity Card No. ……

address……

.. ……..hereby voluntarily agree to take part in the research stated above *(~~clinical /drug trial/video recording/ focus group/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, SELANGOR, MALAYSIA

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

Faktor yang berhubung kait dengan kes gangguan muskuloskeletal dalam kalangan pekerja yang bekerja di pasar raya besar di Lembah Klang.

2. PENGENALAN

Kajian ini bertujuan untuk mengenalpasti faktor (ciri-ciri sosiodemografi, sejarah kesihatan, gaya hidup, sejarah pekerjaan dan faktor ergonomik) dan kes gangguan muskuloskeletal dalam kalangan pekerja yang bekerja di pasar raya besar di Lembah Klang. Secara khusus, input responden terhadap faktor dan gangguan muskuloskeletal adalah fokus utama dalam kajian ini.

Kajian ini akan mengenalpasti hubungan antara ciri-ciri sosiodemografi, sejarah penyakit, gaya hidup, sejarah pekerjaan dan faktor ergonomik dalam kalangan pekerja di pasar raya besar di Lembah Klang.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Kajian ini sepenuhnya sukarela di mana responden boleh menarik diri pada bila-bila masa. Responden diminta untuk mengisi kesemua 6 bahagian di dalam borang kaji selidik ini iaitu ciri-ciri sosiodemografi dalam Bahagian A, sejarah kesihatan dalam Bahagian B, gaya hidup dalam Bahagian C, sejarah pekerjaan dalam bahagian D, *Nordic Musculoskeletal Questionnaire* (NMQ) dalam bahagian E dan faktor ergonomik dalam bahagian F. Soal selidik dianggarkan mengambil masa sekitar 20 hingga 30 minit.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Anda TIDAK boleh mengambil bahagian dalam kajian ini sekiranya anda:

a) Umur di bawah 18 atau di atas 55 tahun atau,

b) Mempunyai sejarah penyakit gangguan muskuloskeletal atau kemalangan jalan raya yang menyebabkan kecederaan dalam tempoh 12 bulan yang lepas, atau

c) Tidak mempunyai sekurang-kurangnya 1 tahun pengalaman sebagai pekerja di pasar raya besar

5. APAKAH FAEDAH MENYERTAI KAJIAN INI?

a)KEPADA ANDA SEBAGAI PESERTA?

Input daripada responden akan dapat membantu syarikat anda untuk mempraktikkan langkah ergonomik yang terbaik untuk anda sebagai pekerja bagi mengelakkan gangguan muskuloskeletal atau kecederaan pada masa hadapan.

Tidak akan ada pampasan atau ganjaran untuk penyertaan anda dalam penyelidikan ini. Walau bagaimanapun, hasil / ringkasan dari penyelidikan ini dapat diperoleh setelah selesai penyelidikan ini atas permintaan anda.

b) KEPADA PENYELIDIK?

Penyiasat akan mengenalpasti faktor yang berhubung kait dengan kes gangguan muskuloskeletal dalam kalangan pekerja di pasar raya besar di Lembah Klang. Data yang diperoleh boleh digunakan untuk kegunaan penyelidikan pada masa hadapan dan sebagai penambahbaikan untuk langkah pengawalan yang efektif.

6. ADAKAH IA BERISIKO?

Terdapat risiko minimum kerana penyelidikan ini tidak melibatkan spesimen biologi.

Sepanjang proses menjawab soal selidik, anda mungkin mengalami risiko psikososial yang minimum seperti kekeliruan ketika menghadapi kesukaran dalam memahami soalan dalam soal selidik menggunakan sebarang alat elektronik pilihan anda (iaitu: komputer, komputer riba, telefon, tablet, dll.).

Sekiranya anda mengalami simptom kemurungan, kegelisahan, dan tekanan, segera berhenti menjawab soal selidik. Anda digalakkan untuk mendapatkan pertolongan dari kaunselor atau mana-mana organisasi yang dapat memberikan sokongan mental.

7. ADAKAH MAKLUMAT DAN IDENTITI SAYA KEKAL RAHSIA?

Semua maklumat dan identiti yang diperoleh melalui penyelidikan ini akan dirahsiakan dan hanya digunakan untuk penyelidikan ini. Perisian pemprosesan data tidak akan mengandungi pengecam atau maklumat peribadi anda sementara soal selidik fizikal yang anda isi (sekiranya ada) akan dihancurkan oleh pencincang dan dibuang setelah semua data telah dipindahkan ke perisian pemprosesan data dalam 1 bulan.

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

Dr Ng Yee Guan
Professor Madya,
Jabatan Kesihatan Persekitaran dan Pekerjaan,
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Fakulti Perubatan dan Sains Kesihatan,
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E-mel: nurulkhaairinaa@gmail.com

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 * (~~ujian klinikal / ubat / rakaman video / kumpulan fokus / berdasarkan temu bual~~ / berdasarkan soal selidik)..

Saya telah dimaklumkan mengenai sifat penyelidikan dari segi metodologi, kemungkinan kesan buruk dan komplikasi (seperti yang ditulis dalam Lembaran Maklumat Responden).

Saya faham bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa tanpa memberikan alasan apa pun.

Saya juga memahami bahawa kajian ini adalah rahsia dan semua maklumat yang diberikan berkaitan dengan identiti saya akan dirahsiakan dan dirahsiakan.

Saya * ingin / tidak ingin mengetahui hasil yang berkaitan dengan penyertaan saya dalam penyelidikan ini

Saya setuju / tidak setuju bahawa gambar / gambar / rakaman video / rakaman suara yang berkaitan dengan saya boleh digunakan dalam bentuk penerbitan atau persembahan (jika berkenaan)

*potong yang tidak berkenaan

Tandatangan ……..…….....
...…….....
(Respondent)

Tandatangan.

(Saksi)

Tarikh : ……...
:…….....

Name

No. K/P
:…….....

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

Date ……..…….....
….…….....

Signature

(Researcher)

APPENDIX 4

Table A.1: Ergonomics risk factors characteristics (N = 261)

Variables	Frequency (n)	%	Mean ± SD	Median (IQR)
Awkward posture				
Shoulders	64	24.5		
Head	45	17.3		
Back	41	15.7		
Hand / Elbow / Wrist	69	26.4		
Leg / Knees	22	8.4		
Static and sustained posture				
Prolonged standing more than 2 hours	104	39.8		
Seated position with minimal movement more than 30 minutes	164	62.8		
Manual handling				
Lifting and lowering loads				
Maximum weight of single object (in kg)				10.0 (35)
Average weight (in kg)				10.0 (45)
Number of objects lifted per day			85.92 ± 98.979	
Pushing and pulling objects				
Maximum weight of objects cumulatively (in kg)				20.0 (145)
Average weight of objects (in kg)				15.0 (74)
Number of trips for push/pull per day				10.0 (22)
Wheel conditions				
Poor/unacceptable	10	3.8		
Good/acceptable	43	16.5		
Maximum distance of push/pull (in meter)				10.0 (147)
Average distance of push/pull (in meter)				15.0 (97)
Carrying loads				
Floor surface during carrying loads				
Acceptable	21	8.0		
Unacceptable	43	16.5		
Maximum distance of carrying loads (in meter)				0.0 (0)

Variables	Frequency (n)	%	Mean ± SD	Median (IQR)
Obstacles en route				
Yes	28	10.7		
No	36	13.8		
Received proper manual handling				
Yes	31	11.9		
No	69	26.4		
Provided lift assisting devices for manual handling				
Yes	87	33.3		
No	13	5.0		
Lighting				
Inadequate				
Too bright or glaring	24	9.2		
Too dim or dark	31	11.9		
Temperature				
Uncomfortable				
Hot	35	35.4		
Warm	88	33.7		
Cold	46	17.6		
Noise				
Has loud noise	14	5.4		
Has irritating continuous sound/noise	45	17.2		

Table A.2: Distribution of frequency, severity, interference, and treatment for musculoskeletal disorders (MSDs) complaints in the pastweek among employees in hypermarkets (N = 261)

Body parts	Total 7 days	Frequency (7 days)			Uncomfortable (7 days)			Interference (7 days)			Treatment to relieve pain (7 days) (More than 1 option allowed)		
		1 – 2 times in the past week	3 – 4 times in the past	Every day in the past week	Slightly uncomfortable	Moderately uncomfortable	Substantially uncomfortable	Not interfere	Slightly interfere	Substantially interfere	Made me self-medicate/ treatment	Made me see a physician	Did not apply to me at all
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Neck	54 (20.7)	40 (15.3)	10 (3.8)	4 (1.5)	33 (12.6)	19 (7.3)	2 (0.8)	23 (8.8)	29 (11.1)	2 (0.8)	21 (8.0)	2 (0.8)	35 (13.4)
Shoulder (Right)	45 (17.2)	29 (11.1)	12 (4.6)	4 (1.5)	33 (12.6)	10 (3.8)	2 (0.8)	18 (6.9)	25 (9.6)	2 (0.8)	15 (5.7)	2 (0.8)	30 (11.5)
Shoulder (Left)	22 (8.4)	14 (5.4)	4 (1.5)	4 (1.5)	18 (6.9)	2 (0.8)	2 (0.8)	8 (3.1)	13 (5.0)	1 (0.4)	4 (1.5)	2 (0.8)	18 (6.9)
Upper Back	87 (33.3)	60 (23.0)	25 (9.6)	2 (0.8)	57 (21.8)	30 (11.5)	0 (0.0)	41 (15.7)	44 (16.9)	2 (0.8)	23 (8.8)	0 (0.0)	66 (25.3)
Upper Arm (Right)	12 (4.6)	8 (3.1)	2 (0.8)	2 (0.8)	4 (1.5)	6 (2.3)	2 (0.8)	4 (1.5)	8 (3.1)	0 (0.0)	4 (1.5)	0 (0.0)	8 (3.1)
Upper Arm (Left)	5 (1.9)	3 (1.1)	0 (0.0)	2 (0.8)	3 (1.1)	2 (0.8)	0 (0.0)	1 (0.4)	4 (1.5)	0 (0.0)	2 (0.8)	0 (0.0)	3 (1.1)
Lower Back	77 (29.5)	49 (18.8)	22 (8.4)	6 (2.3)	48 (18.4)	25 (9.6)	4 (1.5)	26 (10.0)	45 (17.2)	6 (2.3)	23 (8.8)	0 (0.0)	54 (20.7)

Body parts	Total 7 days	Frequency (7 days)			Uncomfortable (7 days)			Interference (7 days)			Treatment to relieve pain (7 days) (More than 1 option allowed)		
		1 – 2 times in the past week	3 – 4 times in the past	Every day in the past week	Slightly uncomfortable	Moderately uncomfortable	Substantially uncomfortable	Not interfere	Slightly interfere	Substantially interfere	Made me self-medicate/ treatment	Made me see a physician	Did not apply to me at all
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Forearm (Right)	5 (1.9)	3 (1.1)	0 (0.0)	2 (0.8)	2 (0.8)	1 (0.4)	2 (0.8)	2 (0.8)	1 (0.4)	2 (0.8)	0 (0.0)	2 (0.8)	3 (1.1)
Forearm (Left)	4 (1.5)	2 (0.8)	2 (0.8)	0 (0.0)	2 (0.8)	2 (0.8)	0 (0.0)	2 (0.8)	2 (0.8)	0 (0.0)	2 (0.8)	0 (0.0)	2 (0.8)
Wrist (Right)	22 (8.4)	16 (6.1)	4 (1.5)	2 (0.8)	14 (5.4)	8 (3.1)	0 (0.0)	5 (1.9)	17 (6.5)	0 (0.0)	10 (3.8)	0 (0.0)	12 (4.6)
Wrist (Left)	6 (2.3)	6 (2.3)	0 (0.0)	0 (0.0)	5 (1.9)	1 (0.4)	0 (0.0)	4 (1.5)	2 (0.8)	0 (0.0)	4 (1.5)	0 (0.0)	2 (0.8)
Hand (Right)	18 (6.9)	12 (4.6)	4 (1.5)	2 (0.8)	8 (3.1)	8 (3.1)	2 (0.8)	6 (2.3)	10 (3.8)	2 (0.8)	2 (0.8)	0 (0.0)	16 (6.1)
Hand (Left)	13 (5.0)	8 (3.1)	3 (1.1)	2 (0.8)	5 (1.9)	7 (2.7)	1 (0.4)	3 (1.1)	10 (3.8)	0 (0.0)	3 (1.1)	2 (0.8)	8 (3.1)
Hips/ buttocks	31 (11.9)	18 (6.9)	7 (2.7)	6 (2.3)	23 (8.8)	8 (3.1)	0 (0.0)	21 (8.0)	10 (3.8)	0 (0.0)	2 (0.8)	0 (0.0)	29 (11.1)
Thigh (Right)	5 (1.9)	5 (1.9)	0 (0.0)	0 (0.0)	1 (0.4)	4 (1.5)	0 (0.0)	1 (0.4)	4 (1.5)	0 (0.0)	2 (0.8)	0 (0.0)	3 (1.1)

Body parts	Total 7 days	Frequency (7 days)			Uncomfortable (7 days)			Interference (7 days)			Treatment to relieve pain (7 days) (More than 1 option allowed)		
		1 – 2 times in the past week	3 – 4 times in the past	Every day in the past week	Slightly uncomfortable	Moderately uncomfortable	Substantially uncomfortable	Not interfere	Slightly interfere	Substantially interfere	Made me self-medicate/ treatment	Made me see a physician	Did not apply to me at all
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Thigh (Left)	5 (6.9)	6 (2.3)	0 (0.0)	0 (0.0)	2 (0.8)	4 (1.5)	0 (0.0)	2 (0.8)	4 (1.5)	0 (0.0)	2 (0.8)	0 (0.0)	4 (1.5)
Knee (Right)	10 (3.8)	6 (2.3)	4 (1.5)	0 (0.0)	3 (1.1)	5 (1.9)	2 (0.8)	6 (2.3)	4 (1.5)	0 (0.0)	2 (0.8	0 (0.0)	8 (3.1)
Knee (Left)	5 (1.9)	3 (1.1)	0 (0.0)	2 (0.8)	5 (1.9)	0 (0.0)	0 (0.0)	1 (0.4)	4 (1.5)	0 (0.0)	2 (0.8)	0 (0.0)	3 (1.1)
Lower Leg (Right)	20 (7.7)	14 (5.4)	6 (2.3)	0 (0.0)	17 (6.5)	3 (1.1)	0 (0.0)	13 (5.0)	7 (2.7)	0 (0.0)	7 (2.7)	0 (0.0)	15 (5.7)
Lower Leg (Left)	13 (5.0)	9 (3.4)	4 (1.5)	0 (0.0)	10 (3.8)	3 (1.1)	0 (0.0)	8 (3.1)	5 (1.9)	0 (0.0)	4 (1.5)	0 (0.0)	9 (3.4)
Ankle/Feet	55 (21.1)	27 (10.3)	26 (10.0)	2 (0.8)	27 (10.3)	26 (10.0)	2 (0.8)	21 (8.0)	34 (13.0)	0 (0.0)	18 (6.9)	0 (0.0)	39 (14.9)