ERGONOMICS RISK ASSESSMENT IN MUSCULOSKELETAL DISORDERS AMONG PLANTATION WORKERS IN SELANGOR AGRICULTURAL DEVELOPMENT CORPORATION, SG TENGI SELATAN, KUALA KUBU BAHRU, SELANGOR, MALAYSIA

ABSTRACT

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A cross-sectional study evaluated repetitive motion on ergonomics working conditions and the occurrence of self-reported musculoskeletal symptoms among 50 plantation workers. A questionnaire, guided checklist from Department of Occupational Safety and Health Malaysia and Work-Ergonomics Risk Assessment (WERA) method were used. Descriptive statistics and multivariable analyses were used to characterize the data and identify factors associated with work-related musculoskeletal disorders. The results showed that a high prevalence of musculoskeletal symptoms, particularly neck, shoulder, and upper back were impacted by socio-demographics and job characteristics such as age, BMI, overall work experience, and normal working hours. Chi-square test indicated wrist, back and neck were frequently imposed repetitive motion yielding 9.78 (0.008), 22.68 (0.01), 6.70 (0.04), 6.09 (0.04) and 12.47 (0.002). These results emphasize the need for ergonomics intervention or measures aid to improve the working conditions of this population.

Keywords: agriculture, repetitive motion, musculoskeletal disorders, ergonomics

LIST OF ABBREVIATIONS

BMI	Body Mass Index
DOSH	Department of Safety and Health
ERA	Ergonomics Risk Assessment
FFB	Fresh Fruit Bunches
MSD	Musculoskeletal Disorders
OMD	Occupational Muscular Skeletal Disorder
SD	Standard Deviation
SNMQ	Standardized Nordic Musculoskeletal Questionnaire
SPSS	Statistical Package Social Sciences Statistic
WERA	Workplace Ergonomics Risk Assessment
WMSD	Work-Related Musculoskeletal Disorders

1.0 INTRODUCTION

Work-related musculoskeletal disorder (WMSD) is one of the most common issues in the working environment and a serious socioeconomic issue in modern society. Oil palm harvesting has been frequently linked with Musculoskeletal (MSD) and significant loss of production rate due to prolonged and intensive repeated task (repetitive movement) especially in the harvesting areas. Primarily, musculoskeletal disorders or complaints appear to be common among harvesters in oil palm plantation (OPP), (Ng, Tamrin, Yik, Yusoff, & Mori, 2013). The Occupational Safety and Health Administration (OSHA), in its programme against MSDs, makes a similar definition and states that they can be caused by sudden or sustained exposure to repetitive movements, force, vibration and awkward positions (NIOSH, 2017).

Agriculture is a demanding profession in which farmers suffer from numerous problems relating to work and health. In general, the incorrect routine of work and the prolonged repeated task can cause productivity loss and problems in occupational health. Manual handling and awkward posture were common in farms and has been associated with potential of injuring the lower back. Harvesting activities usually require harvester to bend excessively and perform repetitive actions. (Yusoff, Tamrin, & Said, 2014). In other studies conducted, the article reported, Repetitive work is also a main factor that contributes to high prevalence of WMSD among FFB harvesters while they are pulling and pushing the FFB. (Mokhtar, Dero, & Sukadarin, 2013). They are subjected to postural stress and may suffer from discomfort or pain in various parts of the body due to the standard routine of repetitively working in performing different post-harvesting tasks. Workers in these activities are engaged in repetitive tasks with high postural load due to work system constraints and the working conditions.

Ergonomic assessment comprises of two proactive and reactive methods. Proactive includes self-assessment by employee, walkthrough inspection and review of records. On the other hand, reactive approach used when there is an ergonomic related injury or MSDs complaint or requested by occupational health doctor. Therefore, in this study ergonomic assessment will be conducted in this study. Decreasing in safety injury can

be observed through the following figure while an increased cases of MSDs by year were reported.

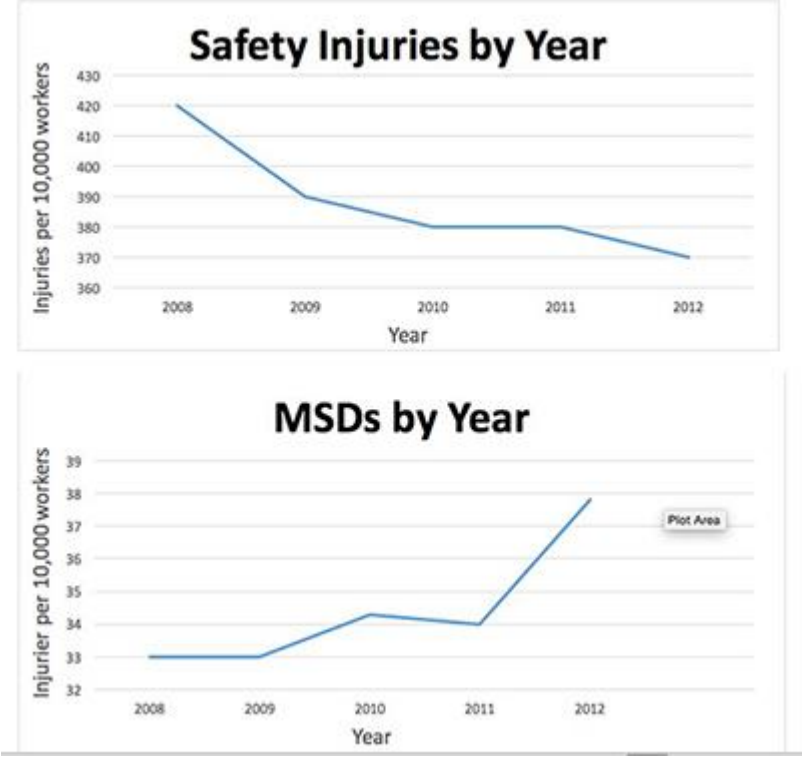

Figure 1: Trend of recorded musculoskeletal disorders and Safety Injuries recorded from 2008-2012.

Most studies conducted on work-related musculoskeletal disorder (WMSD) in oil palm plantation proved of using Rapid Entire Body Assessment (REBA), Rapid Upper Limb Assessment (RULA), and Ovako Working posture Assessment System (OWAS) follow standardized tables in which combination of head's, back's, arms' and legs' position identifies a postural score and suggests level of risk involved in the task However, there is limited studies that used WERA to evaluate MSDS risks access to studies on Ergonomic Risk Assessment (ERA) after Guidelines on Ergonomic Risk Assessment at Workplace 2017 was established. Thus, this study there is lack of information of initial ergonomic risk assessment in oil-palm plantation. The purpose of this study is to investigate an ergonomic risk among oil palm plantation workers using an Ergonomic Risk Assessment (ERA). Moreover, this study helps to fill the research gaps and help the researchers to explore the critical areas of reducing the MSDs among agriculture sector and new theory on health and safety in agriculture sector can be identified precisely.

2.0 METHODS

2.1 Study Background

This study was a cross-sectional study conducted among agriculture plantation workers who worked in Selangor Agricultural Development Corporation (ADC) in Sungai Tengi Selatan, Kuala Kubu Bharu, Selangor, Malaysia during harvesting stage, collection stage, unloading into truck and maintenance of crop-care stage. The workers were recruited by approaching through the agriculture plantation manager to provide in- formation of this study. All participants read and signed an informed consent prior to the data collection. The total population in Sungai Tengi Selatan plantations is 50 workers who are categorized into two crops include oil palm and commercial fruits such as coconut, jackfruit, mangosteen *rambutan,* and *pulasan.*

The sample size was calculated by using using Krejcie and Morgan (1970) table. According to the table, with total population size is 50 individuals, the sample representatives will be 44 individuals with the margin of error 0.05. However, according to (Razak et al., 2014), the sample representatives can total up to 50 individuals by addition of 10% of sample size to prevent low response rate with absence of the respondents. Thus, the total sample size in this study is 50 individuals which are total population of Sungai Tengi Selatan plantation workers. Selection of respondents were conducted by using purposive sampling with inclusion and exclusion criteria. The inclusion criteria were full time workers aged between 20 and 50 years who are using a chisel, metal poke or hook and wheelbarrow for tasks. The exclusion criteria are part timer, complaint for any musculoskeletal diseases and injury during past years and any history of recent injury or accident or any other surgery in any part of the body

2.2 Study instruments

In this study scheduled interviews, questionnaires and non-participant observation were used. There are three instruments used in data collection.

2.2.1 Nordic musculoskeletal disorder questionnaire

It presents 28 multiple-choice questions, sometimes negative, structured in two well-differentiated parts. The first part, the general one, refers to symptoms in 9 parts of the body (neck, shoulders, elbows, wrists/hands, upper back, lower back, hip/thighs, knees, and ankles/feet) during the last 12 months/7 days. The second part, the specific one, refers to symptoms in three parts of the body (neck, shoulders, and lower back) throughout the subject's working life/7 days beforehand. In both cases, complementary information (qualitative variables, sex, age, nationality) (López-Aragón et al., 2017).

2.2.2 Workplace Ergonomic Risk Assessment (WERA) form.

The WERA assessment form consists of six physical risk factors including posture, repetition, forceful, vibration, contact stress and task duration and its involve the five main body regions which were shoulder, wrist, back, neck and leg. It has a scoring system and actions level that provide a guide to the level of risk and need for action to conduct more detailed assessment. The steps in conducting WERA assessment include 1) Observe the task 2) Select the task or job for assessment 3) Score the task or job 4) Calculate the exposure scores 5) Consideration of action level. (refer to table 1)

• Low Level	a score of 18 to 27 indicates the task is accepted
• Medium Level	a score 28 to 44 is indicates the task is needed to further investigate and require change
• High Level	a score of 45 to 54 indicates the task is not accepted and should change immediately

Table 1: Workplace Ergonomics Risk Assessment (WERA) Form Score Sheet

<table>
<tr><td colspan="3">1ST PHASE</td></tr>
<tr><td rowspan="3">PREPARATION</td><td colspan="2">Recruitment of 50 agriculture plantation workers</td></tr>
<tr><td>Oil palm plantation</td><td>Fruits farming</td></tr>
<tr><td>- Harvesters
- Collector
- Maintenance
- Driver</td><td>- Harvesters
- Collector
- Maintenance
- Driver</td></tr>
<tr><td colspan="3">2ND PHASE</td></tr>
<tr><td rowspan="4">DATA COLLECTION</td><td colspan="2">Malay version of standardized Nordic Questionnaire were distributed to participants</td></tr>
<tr><td colspan="2">Video-recorded workers’ bodies during work activities</td></tr>
<tr><td colspan="2">Initial checklist is ticked based on field observation and recorded video.</td></tr>
<tr><td colspan="2">Workplace Ergonomics Risk Assessment (WERA) is calculated and given final score.</td></tr>
<tr><td colspan="3">3RD PHASE</td></tr>
<tr><td>ANALYSIS</td><td colspan="2">Data Interpretation and Analysis</td></tr>
</table>

Table 2: The methodology flow in assessing forceful exertion on musculoskeletal disorders on agriculture plantation workers started with the preparation, data collection and analysis phase.

2.3 Data analysis

Data collected were analyzed through by Statistical Packages for the Social Science (SPSS) software for Windows version19. Descriptive statistics such as mean, standard deviation, percentages, and frequencies used to describe the study variables. The MSD among agriculture plantation workers majorly varied with the age and job task. All the data and information from Nordic questionnaire survey was analyzed to evaluate the MSD problems based on working factors (posture, load, frequency, duration and repetition), the risk of MSD problems and distribution of worker factors (age, height, weight and duration of the work). Chi-square test was applied on contingency tables for hypothesis testing to determine an association between prevalence of musculoskeletal disorder and WERA score among oil palm plantation workers. Any variables with a p-value < 0.1 from the chi- square test were included in the multivariate logistic regression analysis. A p-value < 0.05 were considered as significant.

3.0 RESULTS

3.1 Socio-demographic background

A total of 50 respondents were interviewed during this research. The average age of the respondents were 26 to 36 years (average 32.1 years old). 66% of the respondent population were married and half of the total respondent (50%) had no formal education. Majority of the respondent were not local. The BMI mean of 23.2 kg/m^2 (SD = 3.5kg/m^2, range = 18.25 kg/m^2).

The average of work experience was 9.1 years (SD = 7.2). 50% of the participants had been working from 5 to 15 years followed by 36% and 18% working less than 5 years and more than 16 years respectively. The average daily working time of the subjects was 7.7 hours (SD = 0.725) which accounted of 42 workers in the study were working for ≥ 6 hours daily. More than half of participants (68%) had been doing jobs in a team of 6 to 10 persons which later taking an hour break for 45 minutes each session.

Table 3 shows that the 50 respondent were classified according to their job task such as harvester (n=14), collector (n=12), maintenance (n=13) and driver (n=4) respectively. The study combined both the oil palm workers and commercial fruits workers as one sample population of 50 respondents. High number of workers had the experience working at the field about 5-15 years which were 25 workers. The largest team according to job task is the maintenance which was 20 workers since the farm is large in area which require ongoing maintenance routinely. Despite being that the majority of the workers worked more than eight hours a day, 28 workers were recorded with only one time break everyday which sums up to 90-minute break. Refer Table 3

Table 3. Socio-demographic and work related details of plantation workers (n=50)

Variables		**Males**	**Females**	**Total**
Age	Mean (SD)	32(86.0%)	32(14%)	32.1(100.0%)
	Range	26-35	26-35	26-35
Body mass	Mean (SD)	23.1(86.0%)	24(14.0%)	23.3(100.0%)
index	Range	18-25	18-25	18.25
Marital	Single	15(88.2%)	2(11.8%)	17(100.0%)
status	Married	28(84.8%)	5(15.2%)	33(100.0%)
Educational	No formal	25(100.0%)	0(0.0)	25(100.0%)
level	education			
	Primary	5(50.0%)	5(50.0%)	5(100.0%)
	education			
	Secondary	12(85.7%)	2(14.3%)	14(100.0%)
	education			
	Tertiary	1(100.0%)	0(0.0%)	1(100.0%)
	education			
Job task	Harvester	14(100.0%)	0(0.0%)	14(100.0%)
	Collector	12(100.0%)	0(0.0%)	12(100.0%)
	Maintenance	13(65.0%)	7(35.0%)	20(100.0%)
	Driver	4(100.0%)	0(0.0%)	4(100.0%)
Work	<5	16(88.9%)	2(11.1%)	18(100.0%)
experience	5-15	20(80.0%)	5(20.0%)	25(100.0%)

	>16	7(100.0%)	0(0.0%)	7(100.0%)
Daily working hours	<8	8(100.0%)	0(0.0%)	8(100.0%)
	≥8	45(83.3%)	7(16.7%)	42(100.0%)
Work breaks	Once	21(75.0%)	7(25.0%)	28(100.0%)
	Twice	6(100.0%)	0(0.0%)	6(100.0%)
	Thrice	16(100.0%)	0(0.0%)	16(100.0%)
Team members	1 person	4(100.0%)	0(0.0%)	4(100.0%)
	6-10 person	28(82.4%)	6(17.6%)	34(100.0%)
	>10 person	11(91.7%)	1(18.3%)	12(100.0%)

3.2 Prevalence of work-related musculoskeletal disorders among plantation workers

Table 4 shows several body part of WMSDs affected by the workers. Neck, shoulder and upper back shows the highest three number of prevalence which were 15, 12 and 10 respectively. According to the previous study, lower back pain was the most commonly self-reported symptoms followed by knee, neck and shoulder for fresh fruit bunch (FFB) cutters and collectors. (Guan, 2014). Based on that statements, the results were concrete supporting evidence that relates the factors.

Data of distribution of pain in different body regions according to age, BMI, job experience, job tasks, and daily working hours were presented in Table 3. Among all nine body regions, the neck was most reported WMSD with the increase of age (34 ± 10.0), BMI (24.2 ± 3.9), total work experience (11.0 ± 7.0), job task (4.0 ± 2.0), and daily working hour (7.0 ± 1.0). The association between demographics factors and the prevalence of WMDSs is shown in Table 4. From the results of the association, it can be concluded there were significant differences between the prevalence of WMSD

symptoms and demographic variables. The demographic factors were significant higher in age 45 ± 13.0 ($p=0.01$) BMI 23.6 ± 3.2 ($p<0.01$) and 23.6 ± 3.2 ($p<0.05$), total work experience 9.0 ± 0 ($p<0.05$), job ask 4.0 ± 1.0 ($p<0.01$), 2.0 ± 1.0 ($p<0.05$) and daily working hour 7.0 ± 1.0 ($p<0.05$)

Table 4: Prevalence of work related musculoskeletal symptoms among workers

Body regions	Harvesters	Collectors	Maintenance	Drivers	Total
Neck*	2 (13.3%)	2 (13.3%)	8 (53.3%)	3 (20.0%)	15 (100.0%)
Shoulder	3 (25.0%)	3 (25.0%)	6 (50.0%)	0 (0.0%)	12 (100.0%)
Upper back	2 (20.0%)	3 (30.0%)	5 (50.0%)	0 (0.0%)	10 (100.0%)
Elbow	5 (62.5%)	1 (12.5%)	2 (25.0%)	0 (0.0%)	8 (100.0%)
Wrist/hand	0 (0.0%)	0 (0.0%)	2 (66.7%)	1 (33.3%)	3 (100.0%)
Lower back	1 (33.3%)	0 (0.0%)	2 (66.7%)	0 (0.0%)	3 (100.0%)
Knee	2 (22.2%)	5 (55.6%)	2 (22.2%)	0 (0.0%)	9 (100.0%)
Ankles/feet	3(50.0%)	1(16.7%)	2(33.3%)	0(0.0%)	6(100.0%)

Table 5: Distribution of pain the highest prevalence body region (neck) according to age, BMI, job experience, job tasks, and daily working hour.

Demographic factors	Neck Mean ± SD
Age (year)	34 ± 10.0
BMI (kg/m^2)	24.2 ± 3.9
Total work experience (years)	11.0 ± 7.0
Job tasks	4.0 ± 2.0
Daily working hour	7.0 ± 1.0

Table 6: Association between demographics factors and prevalence of WMDSs.

Demographics Factors	Shoulder	Wrists / hands	Lower back	Knees	Ankles/ feet
	$\chi 2$ (p)	$\chi 2$ (p)	$\chi 2$ (p)	$\chi 2$ (p)	$\chi 2$ (p)
Age	2.78 (0.43)	7.64 (0.06)	10.60 (0.01)*	5.01 (0.17)	4.20 (0.24)
BMI (kg/m^2)	11.34 (0.003)**	5.16 (0.08)	0.65 (0.72)	6.80(0.03)*	2.15 (0.34)
Total work experience (years)	3.70 (0.16)	6.42(0.04)*	1.98 (0.37)	2.96 (0.23)	1.49 (0.48)
Job task	17.70 (0.007)**	11.58(0.07)	4.80 (0.57)	13.25(0.04)	17.74 (0.07)
Daily working hour (hour)	4.90 (0.03)*	1.00 (0.32)	1.0 (0.32)	1.80 (0.18)	1.110.30)

*Significant at ($p < 0.05$) level, ** Significant at ($p<0,01$) level ,(n=50)

3.3 Ergonomic Risk Assessment on Repetitive Motion towards WMSDs.

Table 5 indicated that the highest total number of workers that exposed to the risk based on repetitive motion checklists was led by the body region or working involving repetitive shoulder / arm movement with some pauses which was 40 persons in total. to be specific, the harvesters (14 workers) then followed by collectors (12 workers), maintenance (10 workers) and all four drivers (4 workers) accordingly. This scenario poses serious threat to health of workers in long term time frame. As stated in a study by (Guan, 2014), repetitive motion and several others factors can cause MSDs.

As stated in the table 6, three highlighted significant values were recorded. Working involving repetitive sequence of movement more than twice per minute with upper back pain with significant value of 4.86(0.03). Followed by the second significant relation between working involving repetitive shoulder / arm movement with some pauses and lower back which valued at 4.34(0.04). The third significant link between work using the heel / base of palm as a hammer with the body part of wrists/ hand posed a significant value of 4.34(0.04). There are no accessible data that showed the associations between these variable. However, on strong evidence based of data interpretation from this study, it is proven that the pain of the mentioned body parts were strongly associated with the ergonomic risk factor of repetitive motion that reflected upon the prevalence number of the WMSDs reported by the workers.

Table 7. Ergonomic Risk Factors based on repetitive motion checklist by different job tasks.

Body regions	Harvester	Collector	Maintenance	Drivers	Total
Working involving repetitive sequence of movement more than twice per minute	14(38.9%)	12(33.3%)	10(27.8%)	0(0.0%)	36(100.0%)
Working involving repetitive shoulder / arm movement with some pauses	14(35.0%)	12(30.0%)	10(25.0%)	4(10.0%)	40(100.0%)
Work using the heel / base of palm as a hammer	0(0.0%)	0(0.0%)	8(80.0%)	2(20.0%)	10(100.0%)
Work using the knee as a hammer	0(0.0%)	0(0.0%)	6(100.0%)	0(0.0%)	6(100.0%)

Table 8. Association between ergonomic risk factor (repetition) and prevalence of WMSDs.

Ergonomic Risk Factor (Repetition)	Neck	Shoulder	Upper back	elbows	Wrists/ hand	Lower back	Knees	Ankles/ feet
	χ^2(p)	χ^2(p)	χ^2(p)	χ^2(p)	χ^2(p)	χ^2(p)	χ^2(p)	χ^2(p)
Working involving repetitive sequence of movement more than twice per minute	6.28 (0.01)*	0.07 (0.79)	4.86 (0.03)*	1.14 (0.29)	2.37 (0.12)	2.3 (0.12)	1.55 (0.21)	0.01 (0.76)
Working involving repetitive shoulder / arm movement with some pauses	2.38 (0.12)	0.25 (0.62)	3.13 (0.08)	0.15 (0.70)	0.80 (0.38)	4.34 (0.04)*	0.54 (0.46)	0.76 (0.38)
Work using the heel / base of palm as a hammer	2.53 (0.11)	2.53 (0.25)	0.78 (0.38)	0.34 (0.56)	4.34 (0.04)*	0.80 (0.37)	2.74 (0.10)	1.71 (0.34)
Work using the knee as a hammer	1.10 (0.25)	2.53 (0.11)	0.76 (0.38)	0.01 (0.96)	1.38 (0.24)	0.44 (0.51)	1.50 (0.22)	0.93 (0.34)

*Significant at ($p < 0.05$) level, ** Significant at ($p<0,01$) level,(n=50)

3.4 Association between Prevalence of WMSD and repetitive motion.

Table 9 showed the risk factor versus the reported pain by the workers interviewed. Three (3) highlighted risk factor were wrist, back and neck. However, there were some reported pain by the workers that does not match the risk factor. By looking at the risk factor exposed to the worker's risk, the data showed that the pain reported by the workers that have significant value were the neck 9.78(0.008), shoulder 22.68(0.01) and ankles/ feet 6.70(0.04). but throughout the research conducted, we managed to identify that the landscape of the working environment forces them to working in an extended period of time that caused such pain reported such as uneven terrain which affects their ankles and feet, having to look up or down extensively during work process due to the unmatched height between workers and trees and such. The risk factor exposed towards the neck where related significantly with shoulder as the repetitive motion of work process prolonged with time forces strain and tension onto the worker's shoulders. The table also indicated that back pain was occurred by the risk exposed towards the back area which can be concluded by the tension on their knees while bending to maintain their back strength while working long hours.

Table 9. Chi-square statistical analysis (χ2-test) of the WERA physical risk factors and the prevalence of reported pain ache or discomfort among plantation workers.

WERA Physical Risk Factor	Neck	Shoulder	Elbows	Knees	Ankles/ feet
	χ2 (p-value)	**χ2 (p)**	**χ2 (p)**	**χ2 (p)**	**χ2 (p)**
Wrist repetition	9.78 (0.008)*	22.68 (0.01)*	1.35 (0.51)	3.30 (0.19)	6.70 (0.04)*
Back repetition	0.46 (0.80)	2.33 (0.31)	1.55 (0.46)	6.09 (0.04)*	3.21 (0.20)
Neck repetition	1.86 (0.40)	4.27 (0.11)	12.47 (0.002)*	0.80 (0.67)	1.11 (0.57)

*Significant at ($p < 0.05$) level , **Significant at ($p < 0.01$) level , (n=50)

4.0 DISCUSSION

4.1 Introduction

Statistically, the data shown in the tables previously have shown that there is a link between the mentioned factors. As previous study shown, harvesting activities usually require harvester to bend excessively and perform repetitive actions. (Yusoff, Tamrin, & Said, 2014). In this study however, the factors were pinpoint based on several parts of bodies and working tasks. To meet the aim of this study which were the main four objectives, several data were obtained throughout the research. These data were stated as the respondent background data, the prevalence of WMSD, the link between the socio-demographics and working risk factors with the prevalence of WMSD and a few other details.

4.2 Respondent background

Forty-three (43) men and seven (7) women participated in this study. The age of workers ranged from 26 to 36 years. Majority of participants were married and had no formal education. The respondent came in variety of races and nationalities such as Malaysian, Indonesian and others. All the workers that participated in this study were working full-time job in the industries and their working experience in the average of 9.1 years of service overall. This background data is important for researches to grasp the potential overview of a result and to test the hypothesis of this study.

4.3 Prevalence of work-related musculoskeletal disorder

This research recorded that 15 workers out of the 50 respondent were affected by neck problems. From the total 15 workers, the task of maintenance team recorded the highest number of workers affected by neck problems which was eight (8) workers in total. this was in line in a study that stated Musculoskeletal disorders (MSDs) usually affect the back, neck, shoulders and upper extremities, although they can also affect the lower extremities (Guan-Ng et al., 2013).

4.3.1 Job tasks

Shoulder was the highest number recorder of WMSD prevalence against job task which was (0.007) which dropped below the significant value of (<0.05, <0.01). This shows that the shoulder affected workers were greatly affected by WMSD because of the job task they received. Some of the job task required prolonged repetitive movement for the workers to

complete the task. Oil palm harvesting has been frequently linked with Musculoskeletal (MSD) and significant loss of production rate due to prolonged and intensive repeated task (repetitive movement) especially in the harvesting areas. Primarily; musculoskeletal disorders or complaints appear to be common among harvesters in oil palm plantation (OPP), (Ng, Tamrin, Yik, Yusoff, & Mori, 2013).

4.3.2 Body mass index (BMI)

Body mass index is one of the normal factor that will affect any physical activities particularly in the agricultural field where physical repetition movement is a must. Higher BMI normally caused more difficulties and side effects towards the individuals that conducted routine physical activities. This statements were enforced by the result that can be concluded for the research done. Knee pain were reported associated with the workers with higher BMI apart for shoulder pain. This may be due to the factor of long working hours that caused them to walk or stand for a long period of time which caused the pain reported.

4.3.3 Total work experience

Veteran workers tend to have multiple body pain or no pain at all. This due to the accumulation of time spent working for all those years. It could also be no pain felt because of the "normal" activities for the workers as they have done the task for years and numb to the pain present. However, the main body part where they used mostly in the working process involving high frequency of repetitive motion which was the wrist/ hands were significantly affected among the workers.

4.4 Assessment of different body part repetitive motion with prevalence of work related musculoskeletal disorder.

Repetitive work is also a main factor that contributes to high prevalence of WMSD among FFB harvesters while they are pulling and pushing the FFB. (Mokhtar, Dero, & Sukadarin, 2013). The article posted by Dero et al can be proven in this study since the repetitive motion used during working process produced negative effects towards the workers in different body parts. Based on the table of association between ergonomic risk factor (repetition) and prevalence of WMSD, three (3) significant values were identified. 3 body parts were affected were the upper back, lower back and wrists / hands. These body parts were affected due to the repetitive movements more than twice per minute, repetitive shoulder and arm movement with some pauses, and working using the heel / base of palm as a hammer respectively. Manual handling and awkward posture were common in farms and has been associated with potential

of injuring the lower back. Harvesting activities usually require harvester to bend excessively and perform repetitive actions. (Yusoff, Tamrin, & Said, 2014).

4.5 Association between repetitive motion on manual handling activities and WERA scores.

Repetitive work is also a main factor that contributes to high prevalence of WMSD among FFB harvesters while they are pulling and pushing the FFB. (Mokhtar, Dero, & Sukadarin, 2013). According to the recorded WERA score during this research, three (3) body parts involving repetitive motion on manual handling which were the wrist, back and neck that have significant association with reported physical risk factors were several other body parts namely neck, shoulder elbows, knees and ankles/ feet. The WERA score recorded that wrist repetitive motion of the workers has caused pain to their shoulder and neck. During the observation, this were most probably caused by terrain of the working site which required them to look down or up for extended period of time. The same case regarding the ankle pain reported. The terrain forced them to maintain their ground in such non comfort stepping which caused the reported pain.

5.0 CONCLUSION

After this research was completed, there are several facts that can be concluded. The objectives were achieved and can be represented as follows. The prevalence of work related Musculoskeletal Disorder among participant was determined that neck pain was the highest prevalence of WMDSs cases among the workers with a total of 15 workers affected followed by shoulder pain with the prevalence value of 12 cases reported and upper back pain cases of 10.

Repetitive motion was assessed using an Ergonomic Risk Assessment Checklist contribute to work related Musculoskeletal Disorders and the result showed that the workers who worked involving repetitive shoulder or arm movement with some pauses posed the highest risk with total number of 40 workers that were affected by WMSDs throughout their career.

Again in the table 5 which showed the calculation risk of Musculoskeletal Disorder by using Workplace Ergonomic Risk Assessment (WERA) stated the fact as workers of the oil palm and commercial fruit field, they are highly likely to be affected by the risk imposed mainly the wrist risk factor that met the link towards the neck pain, shoulder pain and also ankles / feet pain reported by the workers. This result may be affected by several others socio-demographic factors but ultimately a risk it is.

Definite association between prevalence of work related Musculoskeletal Disorder and Workplace Ergonomic Risk Assessment (WERA) score can be concluded based on multiple numbers of significant values between the three (3) mentioned body parts that were is risk namely wrist, back and neck in table 5.

6.0 LIMITATIONS

As the research was conducted, there were a few limitations that occurred along the way. One of them are the language barriers. Since the respondents were originally not a native speaker of English language nor Bahasa, difficulties to understand the questionnaire as a whole happened. Body languages and alteration of vocabulary were used to encounter this problem to achieve their understanding to the best of their abilities. Secondly, the presence of their local supervisor affected their natural working environment as the workers tends to be more rule-abiding under the supervision of their supervisor. This prevented the natural daily working routine scenario to be captured, recorded and analysed for assessing their potential working hazards relating WMSD. Further into the research process, the working schedule of the

workers were not fixed as their schedule depended on demands. For us, to be able to keep up with their schedule of working were an obstacle for us because of the time difference in our routine with the workers. This caused some of the routine of working process were missed out from our evaluation and observation during the research.

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8.0 REFERENCES

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