

ORIGINAL ARTICLE

WORK-RELATED MUSCULOSKELETAL PROBLEMS AND THE ASSOCIATED RISK FACTORS AMONG RUBBER TAPPERS: A CASE STUDY AT A VILLAGE IN NORTHERN PENINSULAR MALAYSIA.

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ABSTRACT

Rubber tapping involves repetitive and high paced work, static muscle loading, non-neutral body postures, forceful physical exertion, and many other potential risk factors for development of work-related musculoskeletal problems (WRMP). In this research, a cross-sectional study was carried out to identify the prevalence of WRMP among rubber tappers, to determine the psychosocial factors that contribute to WRMP, and to explore the relationship between psychosocial factors and physical factors among rubber tappers. Data collection was done using three instruments, namely Nordic Musculoskeletal Questionnaire (NMQ), Job Content Questionnaire (JCQ) and Rapid Upper Limb Assessment Tools (RULA). In total, 70 rubber tappers participated in this study. Results obtained in study revealed that majority of the rubber tappers suffering from lower back pain whereas in terms of psychosocial factors they have low social support and high job and physical demand. WRMP among rubber tappers are cannot be doubttable, however the risk can be reduced if the management of occupational safety and health risk is managed properly.

Keywords: WRMPs, NMQ, RULA, JCQ

INTRODUCTION

Work-related musculoskeletal problems (WRMP) are refer to conditions where the workers have experienced discomfort in one or multiple body parts such as neck, shoulder, back, elbow, hand, hip, and knee. The agriculture sector is a physically demanding occupation in which the work tasks may cause WRMP and also work disability (Park et al., 2010). It is commonly reported that rubber tappers received massive amounts of physical and mental workload which caused them to develop WRMP. Exposure to one ergonomic risk factor may not be enough to cause the WRMP, but there is some evidence showed that when there is the combination of few risk factor (i.e. forceful exertions, repetition, and awkward posture) occurring at high levels the WRMP likely to occur (Shan et al., 2011; Sukadarin et al., 2016a). For example, rubber tapper that performing the tapping task involves repetitive trunk bending and twisting with considerable arm extension at the same time.

Other ergonomic risk factors that present in the rubber tapping activity includes an age of the trees, height of tapping areas, the numbers of an area being tapped, uneven ground and the techniques used to perform the tapping process (Reddy, 2012; Shan et al., 2011; Asyraf et al., 2007). Incorrect postural practices at work such

as tapping the rubber trees at a low level, tapping rubber tree above head level due to the condition of the tree working with the hand above the shoulder height among women farmers (Shan et al., 2011).

In 2012, Meksawi et al. had conducted a research in Southern Thailand among 427 respondents, and the result showed that the low back area is the most prevalent with 52.9% of body region for WRMP development followed by legs (14.8%), upper arms (18.9%), neck (3.0%), wrists (2.3%) and lower arms (2.1%). Same finding was also found in a study by Shan et al. (2011) which conducted among 419 rubber tappers in Malaysia, had shown the results of 12 months the symptoms of Musculoskeletal Diseases (MSDs) prevalence was commonly reported at the neck area (59.9%) followed by lower back (56.3%), shoulders (54.9%), knee (45.8%), ankles/feet (34.4%), elbow (33.2%), upper back (30.8%), wrists (30.1%), and hip/thighs (15.3%). Reddy et al., (2012) and Nair et al., (2015) also conducted among 343 and 154 of rubber tappers respectively in India and found that the results of 12 months the symptoms of MSDs prevalence also found higher at the neck (72.2%), followed by lower back (66.2%), shoulder(44.9%), knee (55.8%), ankles/feet (34.4%), elbow (33.2%), upper back (30.8%), wrists(50.1%), and hip/thighs(15.3%).

Psychosocial factor

Working in the agriculture sector is known to be a physically and mentally demanding job. Psychosocial factors are identified to be one of the risk factors for developing WRMP (Eatough et al., 2012; Fernandes et al., 2010; Hansson et al., 2010; Meksawi et al., 2012; Shan et al., 2011). The research by Meksawi et al., (2012) found that fatigue was shown to increase the risk of WRMP with one-half of participants had a high level of perceived fatigue due to the high physical load of performing the tapping task. The factors that may contribute to the fatigue are inadequate time for rest, low level of social support, and inadequate income due to the rubber market prices fall down.

Psychosocial factors such as high job strain, high job dissatisfaction and feeling less enthusiasm about work which can lead to sickness absence (Choobineh et al., 2013). Psychosocial factors cannot be seen as risk factor just by themselves but however, when it combined with the physical risk factor, they can raise up the risk of injuries (Nunes & Bush, 2011). An excess of long hours working not only as a stressor or psychosocial problems but it also can lead to fatal accident, depending on the type of work (García-di, 2015). Therefore, in helping to ease their considerable WRMP burden, a greater focus will need to be placed on job satisfaction; job security, occupational stress, as well as the hazard drop strategies should be implemented on the manual tools, handling work tasks and other.

High mental demands also increased the risk of WRMP (Smith et al., 2006), especially when paired with low rewards (Simon et al., 2008). Due to economic unstable, it also lowered the income level of rubber growers and latex harvesting workers. In addition, as can be seen in the study of Stain et al., (2008) weather conditions can differ considerably, that may also affect workers' emotion and contributing towards work-related stress symptoms. Besides, Irwin & Poots,(2015) had revealed that lone working is associated with several risks including the possibility of assault, accident or injury, and the higher workload when it compared with working with a partner. In addition, working with partner(s) will make workers somehow less stress by making friends with others.

In view of limited study on the prevalence of WRMP among rubber tappers in Malaysia, this study is attempted to determine the prevalence of WRMP psychosocial risk factors. Therefore, the objectives of this study are 1) to determine the prevalence of WRMP among rubber tappers; 2) to determine the psychosocial risk factor that can contribute to

WRMP; 3) to assess postural problem among rubber tappers.

METHODS

Participants

A cross-sectional study is conducted among seventy (n=70) rubber tappers of different age, gender, height, weight, education level, underlying disease, smoking habit, working hours per day, length of working, trees tapped per day and level of tapping. The respondents were randomly selected to participate in this study. Previous studies showed that cross-sectional study is commonly used, where researchers focused on normal ergonomics problems occurrences in real-time (Sukadarin et al., 2016b).

Subjective Assessment on Musculoskeletal Complaint

Musculoskeletal Complaints (MSCs) were collected using the Nordic Musculoskeletal Questionnaire (NMQ) (Kuorinka et al., 1987). Previous researchers found that, even though NMQ was not developed as a clinical tool to diagnose MSDs problems, it can be used to identify body musculoskeletal problems similar to periodic check-ups (Sukadarin et al., 2016b).

Assessment of Psychosocial Factors.

The assessment of psychosocial factors is conducted using the Malay version of Karasek's Job Content Questionnaire (JCQ). The JCQ contains 4 main psychosocial factors. There are job control, psychological job demand, social support, and physical demands. A Likert-scale of 1 to 5 was used (1=strongly disagree, 2=disagree, 3= Neutral 4= agree and 5= strongly agree) to measure all items that related to psychosocial risk factors.

Assessment of Physical Factors

RULA method by McAtamney and Corlett (1993) has been used to evaluate the level of ergonomic risk by observation of the posture of the respondent while they were tapping the rubber trees at their plantations.

RESULTS

In total, there are 70 respondents that involved in this study. Table 1 shows the demographic data of respondents. Of all respondents, 55.7% of them are male. Most of the respondents have BMI in the normal range (50%). However, only 35.7% of them are smoking. In terms of educational level, 32.9% had no official education history, other 32.9% obtained SPM (Secondary Education in Malaysia) level. Most of the participants had in the range of 6-10 years' experience in rubber tapping.

Table 1

Variable	N (%)
Age (Years)	
20-29	8(11.4)
30-39	20(28.6)
40-49	16(22.9)
50-59	12(17.1)
60 and above	15(20)
BMI (Body Mass Index)	
Underweight (BMI less than 18.5)	6(8.6)
Normal (BMI 18.5 to 24.9)	35(50)
Overweight(BMI 25 to 29.9)	20(28.6)
Obese(BMI 30 or greater)	9(12.9)
Years of Working	
< 5 Years	18(25.7)
6-10 Years	20(28.6)
11-15 Years	9(12.9)
16-20 Years	8(11.4)
>21 Years	15(21.4)
Sex	
Male	39(55.7)
Female	31(44.3)
Education Level	
No education	23(32.9)
Primary School	14(20)
Secondary School	34(48.6)
Current Smoker	
Yes	25(35.7)
No	45(64.3)

Based on observation, it was found that 44.3% of the respondents were tapped the rubber trees at the level of waist to eyes. While, 30% of the respondents were tapped the rubber tree awkwardly with both hands are most of the time at above eyes level. This is due to most of the rubber trees are old and tall. Time required to tap a matured rubber tree increased as they need to conduct the tapping process either above their head or below their waist. The older the trees, time that required were more as they need to conduct the rubber tapping process above their head or some maybe below their waist. The times that they used to work per day are 3-4 hours daily with

Table 2

Variable	N (%)
Working hours per day	
1-2 Hr/Day	9(12.9)
3-4 Hr/ Day	50(71.4)
5-6 Hr/Day	10(14.3)
7-10 Hr/ Day	1(1.4)
Number of trees tapped per day	
< 200	5(7.1)
200-399	24(34.3)
400-599	20(28.6)
>600	21(30.0)
Current common level of tapping	
Below waist	9(12.9)
Waist to Eyes	31(44.3)
Above Eyes	9(12.9)
Mixed Level	21(30.0)

the highest number of tapped trees at 200-399 trees each person everyday (Table 2).

MSCs (Musculoskeletal Complaints) among rubber tappers

Table 3 shows the distribution of MSCs on various parts of the body among respondents. Low back pain is the most common MSCs (64.3%), followed by knees (62.9%), neck (55.7%), wrists / hand (55.7%), shoulder (45.7%), ankles / feet (32.9%), elbows (28.6%), hips / thighs (22.9%), and upper back (15.7%).

Table 3

Body Region	N (%)
Neck	39 (55.7)
Shoulders	32 (45.7)
Elbows	20 (28.6)
Wrists/Hands	39 (55.7)
Upper Back	11 (15.7)
Lower Back	45 (64.3)
Hips/Thighs	16 (22.9)
Knees	44 (62.9)
Ankles/Feet	23 (32.9)

Postural Analysis among Rubber Tappers

Table 4 shows the RULA score for rubber tappers activities. For tapping 65.7% of the respondents had a total score 3 which indicate that the process is needed further investigation and changes to avoid serious harm. Furthermore, 28.6% of respondents is required further investigation and changes soon the work practices to avoid serious physical damage.

Table 4

RULA Score	Level of Action	Action required	(N)(%)
3-4	2	Further investigation and changes needed	46(65.7)
5-6	3	Further investigation and changes soon	20(28.6)
7	4	Investigate and change immediately	4(5.7)

Psychosocial Risk Factors Analysis of Rubber Tappers

Job control

For the job control demand scale, 81.4% of the respondents agreed that their job requires them to learn new things. Based on the face to face interview, the respondents also said that when there is a mistake while do the tapping; they need to fix it as soon as possible. This situation somehow is challenging to them. Because of that also, the result shows, in total, 60.0% of them agree that they must be creative to do the tapping. 84.3% of respondents were agreed that their job requires a lot of repetitive work. Most of them (64.3%) also agreed that their job requires them to make their own decisions. From the face to face interview, respondents revealed that they have to make their own decisions for collect the latex and decide the timing to sell the latex. 47.1% of respondents agreed that in order to have a good tapping skill they need a lot of practice. While, 34.3% of respondents disagreed that their work required them to do various work in the same time. This is because of normally the workers will do the tapping activity for a minimum a week before they do the latex collection in the next following week.

Job demands

Result showed that 47.1% of respondents agreed that they need to work fast to ensure all trees are tapped on time. This is because of some of the respondents need to tap two to three plantations in a same day to have extra income to support their living expenses. Majority of the respondents started their work early in the morning. The reason is that, some of the rubber trees are old, and the old rubber trees will yield less latex when afternoon. 71.4% agreed that they need to work very hard. This is due to the rubber market prices nowadays are unstable. So, they need to have to work extra times and efforts to gain extra income. Might be due to that, half of respondents (50%) agreed that the job is very hectic.

Social support

In terms of social support, it can be concluded that, most of them had low social support but they are still thankful to have very supportive family at their sides. This result is in line with the study conducted by Meksawi et al., (2012). The reasons for them to have low levels of social support because most of them work alone and they have their own rubber plantations. In terms of superior control, 74.3% and 91.4% of the respondents strongly disagreed that their supervisor is are paying attention for what they do and they need and

helping them to get the job done respectively. In addition, 44.3% of respondents agreed that their colleagues are very skilful in doing their work without the help of others. Besides that, they (45.7%) also agreed that the people they work with are friendly. Mostly the pair workers who work together are normally husband and wife, or son or daughter with their parents and they are helpful in getting the job done.

Physical demand

This part focuses on the physical demand that the rubber tappers or respondents face in their daily work routine. Their jobs always require a lot of physical effort when they did the tapping process (87.1%). Moreover, their job also need them to move or lifted a heavy load such as lifting any scrap rubber that more than 8 kg per time. 77.1% of respondents said they only lift heavy object sometimes and for some rubber tappers they will employed other people such as aborigines' people or young people in the village to collect the scrap rubber. 72.9% of respondents agreed that they need to lift and lower scrub rubbers to and from the ground floor. While 57.1% of respondents said that they also lift the scrap rubber with their shoulder. Part of it, 70.0% of the respondents also agreed that sometime when they do the scrap rubber collecting they will push or pull the heavy load if they cannot lift with their shoulder and mostly female rubber tappers did this because they do not have enough energy as a man. This issue reflects to the study of Zautra et al. (2007), which stated that high frequency of weight lifting (lifting any object more than 8 kg per time) is associated with affecting low back pain. This study found that the occurrence of LBP in this group of rubber tappers was high (64.31%). The factors that showed significant associations with LBP was level of tapping above the head and below the waist. This study is in line with the study reported by Meksawi et al., (2012). According to Hoogendorn et al., (2000), working above head level and below knee level require a certain degree of trunk flexion which stimulate the back muscle to work continuously and together with repetitive trunk flexion found among rubber tappers, this occupational factor could be a potential risk to LBP (Udom et al., 2016). The 57.1% of the respondents stated that sometimes they need to do the physical activity rapidly because they are rushing to finish tap work before afternoon. More than half of the respondents (65.7%) agreed that their job always involve with awkward body posture and awkward arms position. 72.9% agree that they always bend and twist the waist while doing the tapping process. Furthermore, 80.0% of respondents agreed that their tapping work requires a lot of repetitive movement of hand or wrists as well as they body which always need to bend and

twist. At least 70% of respondents agreed that sometimes their job required them to stand up in the same position for a long time.

CONCLUSION

This study shows that WRMP is a significant problem among rubber tappers and low back pain is found has highest prevalence if compared to other body regions. Education on back care and the appropriate working posture are needed among rubber tappers to prevent low back pain and get rest break while working to reduce the repetitive of movements. For psychosocial factors hazard, it can be reduced using the administrative control (for example). Where the rubber tappers can reduce their working hours by divide their work time into 2 times per days. Further studies should be carried out which may include anthropometry measurement and biomechanics in order to comprehensively understand the mechanism of WRMP and for developing new tools for rubber tapping.

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COMPETING INTERESTS

There is no conflict of interest.

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