

Prevalence of Upper Limb Disorders and Associated Factors with Psychosocial and Awkward Posture among Public University Workers in Malaysia

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Abstract: Musculoskeletal disorders of the upper limb are a most important cause of ill-health, incapacity and health care expenditure. The purpose of this study is to determine the prevalence of Upper Limb Disorders associated with awkward posture and psychosocial factors among Universiti Putra Malaysia (UPM) workers. Simple random sampling was used to draw 271 participants from six faculties of the university. The use of a structured question was employed for data collection. Results of the study showed that prevalence of ULDs among UPM workers was 67.2% in different body regions. Results showed that there is a significant association between ULDs and age, awkward posture, control at work, psychological demand, social support, and job satisfaction ($p < 0.05$). Multivariate logistic analysis showed that the workers who had medium and very high RULA risk level were 12.242 times more likely to complain about ULDs (OR=12.242, 95%CI: 3.617-41.435), compared to other workers who have low RULA risk level. In conclusion, it can be said from the result of the study that there is high prevalence of upper limb disorders among UPM workers which is significantly associated with age, awkward posture and all psychosocial factors. In order to minimize the prevalence rate of upper limb disorders, it is recommended that workers be educated on prevention strategies and an ergonomic program which emphasizes psycho-social risk factors and how to improve working conditions.

Keywords: Upper Limb Disorders, Psycho-social Factors, Prevalence, Public University Workers, Malaysia

I. Introduction

Upper limb disorders (ULDs) are a subgroup of musculoskeletal disorders and are ailments which have an effect on the neck, shoulders, elbows, hands, and arms [1]. Research conducted in different parts of the world has reported the problem of Upper Limb Disorder among various occupations [2], [4], [5]. Almost all activity related to occupation and daily life activity may result in incidences of upper limb disorders in different parts of the body [6], [7].

There are numerous names for the term WRULD such as; work related musculoskeletal disorder (WRMSD), Repetitive strain injury (RSI), cumulative trauma disorders (CTD), occupational overuse syndrome (OOS) [5]. Presently, these problems are somewhat common and there are chances that the problems will be even more common and prevalent in the future due to the rising level of computer usage in different occupations [8].

Universiti Putra Malaysia (UPM) which is located in central Peninsular is one of the largest state-owned research universities in Malaysia with a labour force of approximately 7,000 academic and non-academic staff belonging to different areas of specialization in different faculties and institutes [9]. These employees in their different areas of specialization may be exposed to a number of occupational, personal and psycho-social factors which may result in musculoskeletal disorders (MSDs).

Associations between awkward posture and ULDs among different occupational groups have constantly been revealed through a number of epidemiological studies [6], [7] also, work-related psychosocial factors such as high workload/demands, lack of job control, low social support, low job satisfaction, and monotonous work with MSDs, and the role of psycho-social factors and stress in these disorders have received increased attention [10], [11], [12], [6], [13].

In Malaysia, a study conducted among university staff by Siti, (2008) showed that the overall prevalence of MSDs among staff was high (80.4%) [14]. Also, similar results have been achieved in other

studies conducted in different countries. First of all, in Estonia, a study conducted among university office workers showed the prevalence of MSDs was 80.4% [15]. Moreover, a study which was carried out in Ghana among commercial minibus drivers also reported that prevalence of MSDs was 78.4% [16]. While a reasonable number of researches have revealed that there is an association between office work and university with MSD symptoms in developed countries, it can be said that there is still limited study with regard to the prevalence of MSDs among the university population in Malaysia, especially the association between psycho-social factors and ULDs, which has not been widely reported. Based on this fact, this study focused on Universiti Putra Malaysia workers with the main aim of determining the prevalence of upper limb disorders among the workers, and to determine if awkward posture and psycho-social factors contribute to the prevalence of ULDs problems.

II. Material And Methods

2.1 Study Location

The study was conducted in Universiti Putra Malaysia which is located in central Peninsular Malaysia, close to the capital city, Kuala Lumpur. This public university has 16 faculties, eight centres, six institutes, and two postgraduate schools [9].

2.2 Study Design and Study Population

This study employed an analytic cross-sectional design that examined the prevalence of ULDs among UPM workers, from 20th May to 1st September 2014. Six faculties were selected using simple random sampling technique. In this study the inclusion criteria was all UPM workers, permanent and temporary contract workers (who have worked at least ≥ 12 months in UPM) and no history of upper limb disorders. Based on Lemeshow et al. (1990) [17] minimum calculated sample size was estimated at 112. After adjusting 20% for non-response and gender (multiplied by 2), the total sample size was 271 workers. The name list of the workers (academic and non-academic) was obtained from the respective faculty websites. Out of 350 self-administered questionnaires, which were distributed among UPM workers, 301 of them agreed to participate giving 86% respondent rate. Non-respondents were those who refused to have the researcher measure their height and weight (20 workers) and 29 workers who did not agree to fill up the questionnaire. At the end of the survey, only 271 questionnaires were analysed because 30 respondents were excluded from the analysis as they did not meet the inclusion criteria of at least 12 months on the job in UPM and they had a history of upper limb disorders due to injuries. The formula for the hypothesis testing of two groups that were compared was used (Lemeshow et al., 1990) [17].

$$n = \frac{\{Z1 - \alpha / 2 \sqrt{2\tilde{P}(1 - \tilde{P})} + Z1 - \beta \sqrt{P1(1 - P1) + P2(1 - P2)}\}^2}{(P1 - P2)^2}$$

$$\tilde{P} = P1 + P2 / 2$$

Minimum sample size: n=112

After performing proper calculation and adjusting for non-response with gender, the proper sample size for doing research was obtained as n = 270, six faculties on the basis of lottery technique were chosen through simple random sampling to select 270 workers from the name list provided.

2.3 Variables

Prevalence of upper limb disorders in this study was the dependent variable, which means the presence of pain or discomfort in any part of the upper limb region with neck, shoulders, arms, hands, and wrists. Socio-demographic characteristics (age, gender, ethnicity, level of education, type of job, income), with awkward posture and psycho-social factors (including control at work, psychological demand, social support, job satisfaction) are independent variables of this study.

2.4 Study Instrument and Data collection

The self-administered questionnaires were distributed from 20th May to early September 2014 for the purpose of data collection. The questionnaire comprises three sections containing different items. Section A: socio-demographic factors, which were used to collect detailed information on the history of all workers such as age, gender, ethnicity, level of education, type of job, and income. Section B: Upper Limb Disorders information, which assessed the musculoskeletal problems in some body regions (neck, shoulders, elbows, hands/ wrists). A modified validated and standardized Nordic questionnaire which was used by Kuorinka et al. (1987s) [18] was also used to examine the body parts with musculoskeletal disorders. Section C: Psycho-social factors were measured with the Job Content Questionnaire developed

by Karasek (1979) [19]. The reliability of the Job Content Questionnaire was evaluated by using Cronbach's alpha for estimating internal consistency for each of four scales and it was shown that Cronbach's alpha for control of work or job decision latitude was (0.703), psychological demand (0.713), social support (0.726), and job satisfaction (0.718). In general, the result displayed that internal consistency was acceptable.

For the investigation of awkward posture, Rapid Upper Limb Assessment (RULA) worksheet, designed and developed by McAtamney and Nigel Corlett (1993) [20] was used to measure workers' potential risk exposure by assessing the body posture force and muscle activities. Generally, RULA is used in sedentary task for rapid upper limb assessment on neck and upper limb loading. Based on this method, a score is calculated on a scale of 1-7, where 1 shows the most neutral posture, and 7 indicate the worst posture. The scores of this tool consist of two groups: Group A measures upper arms, lower arms, and wrists while Group B measures trunk and neck, and legs. Based on the RULA method, the group A and group B postures scores calculate with static muscle work and force scores after which Group A is combined with Group B to obtain score C, which is referred to as the grand score (ranging from 1-7). However, a low grand score of 1-2 is acceptable and indicates negligible risk and is referred to as action level 1, a grand score of 3-4 is low risk or action level 2, in which change may be required, a grand score of 5-6 (action level 3) is moderate risk, which requires more observation and change as soon as possible and if the score is greater than 6 (action level 4) and it means that the risk is very high and there is need for immediate change. The outcomes of posture, which is a single score, demonstrates the risk level of MSDs assessment as outlined in TABLE 2.1

Table 2.1 RULA Grand Score Analysis

Action level	Grand score	level of MSD risk
1	1 or 2	Negligible risk, no action required
2	3 or 4	Low risk, change may be needed
3	5 or 6	Medium risk, further investigation, change soon
4	7	Very high risk, implement change now

2.5 Ethical consideration

Ethics approval was obtained from the Ethics Committee for Research Involving Human Subjects of Universiti Putra Malaysia (JKEUPM), (Reff: UPM/TNCPIIRMC/J .4.18.1 (JKEVPM)/F2 dated 7 February 2014. Before collecting data, approval was also obtained from Deans of selected faculties and a written letter of consent was obtained from each participant. The respondents were informed about the purpose of the study and that participating in this study was voluntary. Furthermore, the participants were told that their answers would be kept confidential and would only be used for research purposes.

2.6 Data Analysis

The collected data were entered into an SPSS statistical package version 21.0. Descriptive statistics (univariate analysis) such as (frequency, percentage, median, and interquartile range) was used to summarize and explain characteristics of independent and dependent variables. Bivariate analysis (chi square test) was used to determine the relationship between categorical independent and dependent variables. Also, multiple logistic regressions were used to determine the predictors for Upper Limb Disorders. The results are shown by p value <0.05, which is considered significant association with an Odd ratio of 95% CI.

III. Results

3.1 Socio-demographic characteristics of UPM workers

The descriptive statistics for the socio-demographic factors of UPM workers are presented in TABLE 3.1, which, shows that the age distribution of the UPM workers is between 19 and 63 years and they are divided into two groups, with 50.9% in the younger group (≤37 years) and 49.1% in the older group (>37), with median of age at 37 years (IQR=10). The majority of UPM workers are female (72.7%), Malay (77.9%), and 38.4% of them hold doctorate degree and more than half (57.2%) are lecturers. The monthly income distribution ranges between RM700 and RM12000 and were categorized into two groups - the lower income class comprise 137 (50.6%) and high income class making up 134(49.4 %). with median of income RM 4000 (IQR= 5000).

Table 3.1 Distribution Of The Socio-Demographic Characteristics Of UPM Workers

Factors	Frequency	Percentage	Median (IQR)
Age groups (years)			37 (10)
≤37	138	50.9	
>37	133	49.1	
Gender			
Male	74	27.3	
Female	197	72.7	
Ethnicity			
Malay	211	77.9	
Chinese	19	7.0	
Indian	5	1.8	
Lain-lain	36	13.3	
Level of education			
Primary school	30	11	
Secondary school	36	13.3	
College diploma or equivalent	29	10.7	
Bachelor's degree	20	7.4	
Master degree	52	19.2	
Doctorate degree	104	38.4	
Type of job			
Lecturer	155	57.2	
Administrative staff	77	28.4	
Drivers	11	4.1	
Cleaners	28	10.3	
Income			4000 (5000)
≤ RM 4000	137	50.6	
> RM 4000	134	49.4	

3.2 Distribution of posture analysis (awkward posture) of UPM workers

Based on the results of RULA risk levels presented in TABLE 3.2, majority of UPM workers 122 (45%) were found to be in Medium risk level where further investigation and change will soon be required, 115 (42.4%) of the workers were in low risk level, where change may be needed. Only 34 (12.5%) workers were in the very high risk level, where change needs to be implemented now. Median RULA risk level score was 5 (IQR=2).

Table 3.2 Distribution of RULA Score Among UPM Workers

Risk Level	Action level	Grand Score	Frequency	Percentage (%)
Low risk	2	3-4	115	42.4
Medium risk	3	5-6	122	45
Very high risk	4	7	34	12.5

3.3 Distribution of the psycho-social factors of UPM workers

TABLE 3.3 shows score ranges, median, and IQR scores for each scale and sub-scale. The researcher made a combination of sub-scales of skill discretion and decision-making authority to create the new scale (control at job). Scores for skill discretion among the workers are from 5 to 15 with median 10 (IQR=2). Score ranges for decision making authority are from 4 to 15 with median 11 (IQR=5). Control at work scores range from 12 to 29 and median 21 (IQR= 5). For psychological demand scores, the range is from 12 to 41 and median 27 and Inter-quartile range, IQR=10. Moreover, score ranges for co-worker support are from 4 to 20 with median 16 (IQR=3). Supervisor support scores are within 3-15 and the median is 12 (IQR=4). The score range for Social support is from 9 to 35 and median, 28 (IQR=8). Job satisfaction scores range from 15 to 75. In addition, median is 32 (IQR=9).

Table 3.3 Distribution of the Psycho-social Factors of UPM Workers

Psychological factors	Median (IQR)	Range
Skill discretion	10(2)	5-15
Decision-making authority	11(5)	4-15
Control at work	21(5)	12-29
Psychological demand	27(10)	12-41
Co-worker support	16(3)	4-20
Supervisor support	12(4)	3-15
Social support	28(8)	9-35
Job satisfaction	32(9)	15-75

TABLE 3.4 shows that the scores of control at work, psychological demand, social support and job satisfaction are dichotomized into two groups to make two level variables (low and high). Based on the cut-off-median point, the majority of UPM workers (154 or 57%) experience low job control while 117 (43%) of them have high control of job, 119 (44%) of the workers have low psychological demand and 152 (56%) of them have high psychological demand. Also, 151 (55.7%) of the UPM workers experience and low social support while 120 (44.3%) had high social support. 151 (55.7%) of them experienced low job satisfaction while 120 (44.3%) have high job satisfaction.

Table 3.4 Distribution of the Psycho-social Factors of UPM Workers

Psychological factors	Low N (%)	High N (%)	Total
Control at work	154 (57)	117 (43)	271
Psychological demand	119 (44)	152 (56)	271
Social support	151 (55.7)	120 (44.3)	271
Job satisfaction	151 (55.7)	120 (44.3)	271

3.4 Prevalence of Upper Limb Disorders

Based on TABLE 3.5 the overall self-reported 12-month prevalence of ULDs among UPM workers, is 182 (67.2%), and 89 (32.8%) UPM workers do not complain of having any upper limb disorders.

Table 3.5 Prevalence of General Upper Limb Disorders of UPM Workers (N=271)

Upper Limb Disorders	Frequency	Percentage (%)
Yes	182	67.2
No	89	32.8
Total	271	100

3.5 Prevalence of Upper Limb Disorders according to type of Job

TABLE 3.6 shows the prevalence of ULDs among different respondent groups, and the highest prevalence of ULDs is shown to be among cleaners (78.6%), followed by lecturers (70%), drivers (63.6%) and administration staff (58%).

Table 3.6 Prevalence of Upper Limb Disorders According to Type of Job

Job title	Upper Limb Disorders		Total
	No	Yes	
lecturer	47(30%)	108(70%)	155(100%)
Administration staff	32(42%)	45(58%)	77(100%)
Drivers	4(36.4%)	7(63.6%)	11(100%)
Cleaners	6(21.4%)	22(78.6%)	28(100%)
Total	89(32.8%)	182(67.2%)	271(100%)

3.6 Prevalence of ULDs in different body regions

TABLE 3.7 presents the prevalence of ULDs in different upper body regions; neck showing the highest prevalence of upper limb disorders (54.2%) for the last 12 months among UPM workers, followed respectively by shoulders (47.2%), wrists/hands (28.1%) and elbows (13%). Further analysis also shows that neck has the highest prevalence of upper limb disorders for the last 12 months that prevented workers from doing their normal work (31%), followed respectively by shoulders (29.9%), wrists/hands (20.3%), and elbows (10%). Finally, analysis regarding the question "having trouble at any time during past 7 days", the highest rate is for neck pain (17.3%), shoulder pain (16.2%), hand/wrist pain (13.7%) while elbow pain has the lowest rate of having trouble at 7 days, with only (5.9%).

Table 3.7 Prevalence of ULDs in Different Body Regions (N= 271)

Body regions	Any trouble last 12 months	Prevented from doing normal work	Trouble last 7 days
	No. (%)	No. (%)	No. (%)
Neck	147 (54.2)	84 (31)	47 (17.3)
Shoulders	128 (47.2)	81 (29.9)	44 (16.2)
Elbows	35 (13)	27 (10)	16 (5.9)
Wrists/ Hands	76 (28.1)	55 (20.3)	37 (13.7)

3.7 Association of Upper Limb Disorders and Socio-Demographic Characteristics

TABLE 3.8 shows that there are significant associations between age and upper limb disorders ($\chi^2=25.925$, $df=1$, $p< 0.001$). However, there are no significant associations shown by chi square (p value) between ULDs with gender ($\chi^2=2.736$, $df=1$, $p=0.098$), ethnicity ($\chi^2=1.401$, $df=3$, $p=0.705$), level

of education ($\chi^2=6.196$, $df=5$, $p=0.288$), and type of job ($\chi^2=4.814$, $df=3$, $p=0.186$) and income ($\chi^2=0.270$, $df=1$, $p=0.604$).

Table 3.8 Association of Upper Limb Disorders and Socio-Demographic Factors

Factors	ULDs		df	χ^2	p-value
	Yes	No			
Age					
≤ 37	73	65	1	25.925	<0.001*
> 37	109	24			
Gender			1	2.736	0.098
Male	44	30			
Female	138	59			
Ethnicity			3	1.401	0.705
Malay	144	67			
Chinese	11	8			
Indian	4	1			
Others	23	13			
Level of education			5	6.196	0.288
Primary school	23	7			
Secondary school	23	13			
College diploma or equivalent	19	10			
Bachelor's degree	9	11			
Master degree	36	16			
Doctorate degree	72	32			
Type of job			3	4.814	0.186
Lecturer	108	47			
Administrative staff	45	32			
Driver	7	4			
Cleaner	22	6			
Income			1	0.270	0.604
≤ RM 4000	90	47			
> RM 4000	92	42			

*Significance at $p<0.05$

3.8 Association between RULA risk level and ULDs

As for the RULA risk assessment for awkward posture, TABLE 3.9, shows that the UPM workers who they have medium and very high RULA risk were more likely to have ULDs (88.5%), whereas ULDs for the workers in the low RULA risk level were 38.3%. Also, statistical analysis showed that there was significant association between awkward posture and the resultant ULDs ($\chi^2=75.640$, $df=1$, $p<0.001$).

Table 3.9 Association of Upper Limb Disorders and RULA Risk Level

Variable	Action level	ULDs		df	χ^2	p-value
		Yes (%)	No (%)			
RULA risk level				1	75.640	<0.001*
Low risk	2	44 (38.3)	71 (61.7)			
Medium & Very high risk	3-4	138 (88.5)	18 (11.5)			

*Significance at $p<0.05$

3.9 Association of upper limb disorders and psychosocial factors

TABLE 3.10 shows that there is significant association between all psychosocial factors (control at work and ULDs ($\chi^2=34.775$, $df=1$, $p<0.001$), psychological demand and ULDs ($\chi^2=64.938$, $df=1$, $p<0.001$), social support and ULDs ($\chi^2=37.736$, $df=1$, $p<0.001$) and significant association between job satisfaction and ULDs ($\chi^2=95.817$, $df=1$, $p<0.001$).

Table 3.10 Association of Upper Limb Disorders and Psycho-social Factors

Psychosocial Factors	ULDs		df	χ^2	p-value
	Yes	No			
Control at work or Job decision latitude			1	34.775	<0.001*
Low	126	28			
High	56	61			
Psychological demand			1	64.938	<0.001*
Low	49	70			
High	133	19			
Social support			1	37.736	<0.001*
Low	125	26			
High	63	57			
Job satisfaction			1	95.817	<0.001*
Low	139	12			
High	43	77			

*Significance at $p < 0.05$ **3.10 Multivariate logistics**

Based on TABLE 3.11 Multivariate logistic regression is used to determine to what extent independent variables affect upper limb disorders, and the process includes completely independent variables which were earlier shown to be significant in chi square test ($p < 0.05$). From the result of Hosmer-Lemeshow test we can see that the goodness of fitness is satisfactory ($\chi^2 = 15.143$, $df = 8$, $p = 0.05$). The results show that the workers who had medium and very high RULA risk level were 12.242 times more likely to complain about ULDs (OR=12.242, 95%CI: 3.617-41.435), compared to other workers who have low RULA risk level.

$$\text{Log}Y = -4.682 + 2.505 (X_1) + \varepsilon$$

where: Y = ULD symptom, X_1 = medium and very high RULA risk level, ε = Error

The Nagelkerke R^2 showed that about 82.5% of the variation of ULD was explained by the predictor variables entered into the regression model.

Table 3.11 Multiple Logistic Regressions of Predictors of Upper Limb Disorders

Variables	B	S.E	Sig.	Adjusted OR	95% CI
Age					
≤ 37	-	-	-	1	-
> 37	0.469	0.655	0.474	1.599	0.443, 5.776
RULA risk level					
Low risk	-	-	-	1	-
Medium risk & very high risk	2.505	0.622	<0.001*	12.242	3.617, 41.435
Control at job					
Low	0.426	0.590	0.470	1.532	0.482, 4.868
High	-	-	-	1	-
Psychological demand					
Low	-	-	-	1	-
High	-0.217	0.669	0.746	0.805	0.217, 2.990
Social support					
Low	0.375	0.591	0.526	1.455	0.457, 4.637
High	-	-	-	1	-
Job satisfaction					
Low	1.186	.659	0.072	3.275	0.900, 11.911
High	-	-	-	1	-
Constant	-4.682	1.069	0.001	0.009	

S.E= standard error, *Significant at $p < 0.05$, OR= Odd ratio, CI= Confidence Interval**IV. Discussion**

This study reveals that the prevalence of ULDs is 67.2% among UPM workers. The findings of this study also show that the prevalence of ULDs among UPM workers is close to that of other previous findings which reported 65%, [21] but also a bit higher compared to other study findings, which reported 55%, [22] and lower compared to other study findings on a similar population [7], [15], [16]. Age is seen to have an association with ULDs. The results of this study are consistent with most of the previous researches done [10], [23], [24], [25], [26]. Moreover, this study shows that the prevalence of ULDs

is(82%) and much higher among the older group workers when compared to younger age group workers (53%). A number of factors may account for the increase in ULD prevalence among older group workers compared to the younger group. Some of these factors may be biological in nature due to the ageing process such as, degenerative changes that occur in muscles, tendons, ligaments, nerves, and joints. Therefore, the best approach to preventing and reducing the risk of ULDs among ageing workers is to organize programs that promote exercising and training in ergonomics.

Even though the findings of the study show that there is no association between gender and ULDs, the prevalence of ULDs is higher among female workers than male workers (70.1 % vs 59.5% respectively). This study result concurs with previous research findings [3], [10], [27]. This prevalence in women can be explained by the fact that employed women are being exposed to different cumulative risk factors at work and at home due to the nature of domestic chores performed by women [29]. Another possible reason why women are more prone to ULDs could be the sex-linked biological features such as anatomy, physiology or even hormones which are different from those of men. In a case where this assumption happens to be true, the same workloads experienced by both genders can result in much biophysical strain more among women than their male counterparts. Another factor which may be responsible for the prevalence of ULDs in women could be the level of sensitivity to pain [30]. More so, other factors which could cause the prevalence of ULDs among women could be psycho-social factors such as lack of social support, job dissatisfaction, and family issues.

This study comprised found that 211(77.9%) of the respondents were Malay. However, results of chi square test (p value) showed that there is no significant association between ULDs with ethnicity ($p > 0.05$). This finding supports a study conducted among office workers, nurses and caregivers in Estonia, by Merisalu et al. (2011) that reported no correlation between ethnicity and ULDs [31], while, findings of other researchers showed significant association between ethnicity and ULDs. [32], [33].

The result showed that the majority of the UPM workers are, Masters and Doctorate degree holders (57.6%). However, there is no significant association found between ULDs and level of education. This finding conforms with the findings of a study conducted by Siti(2008) among UPM staff which indicated that there is no significant association between MSDs and level of education of the workers[14]. Also, a study carried out among newspaper office workers showed that there was no significant association between MSDs and level of education [34]. In contrast to the finding of this study, some previous studies showed that there is a significant association between ULDs and level of education [35], [36], [37], [26], [28], [38].

Findings of this study also revealed that more than half of the UPM workers (57.2%) are lecturers. The highest prevalence of ULDs is among cleaners (78.6%), followed by lecturers (70%), drivers (63.6%) and administrative staff (58%). However, chi square statistical analysis (p value) showed that there is no significant association between ULDs and type of job ($p > 0.05$). In contrast to this finding, some researchers showed that there is significant association between ULDs and type of job[39], [40]. This may be explained by the fact that cleaners might not pay much attention to the discomfort of their body parts, have little information on how to protect themselves and also the fact that they do more manual work with little or no comfort at awkward positions which may increase their risk of having ULDs in the long term.

This study found that 50.6 % of the respondents had income \leq RM 4000, and 49.4% of respondent's monthly income was $>$ RM 4000. The findings of this study showed that there were not significant associations between ULDs and income. Similar findings have been demonstrated by Darwish and Al-Zuhair (2013) reported that there was no significant association between monthly income and MSDs among female secondary school teachers in Saudi Arabia [41]. On the other hand, some studies found that there were significant association between income and MSDs. One such study was conducted by Kortt and Baldry (2002) among the Australian population and reported that there was significant association between MSDs and income [40]. More so, Siti (2008) conducted a study among hospital nurses in Malaysia and found a significant association exists between MSDs in shoulders and monthly income [14].

Assessment of the rapid upper limb is used to assess the risk of posture and shows the risk level of MSDs, revealing that about 45% of the UPM workers are in medium risk level (action level 3). Meanwhile, none of the workers have acceptable posture (action level one). Chi square test (p value) indicates significant association between RULA risk level and the resultant ULDs obtained from SNQ ($\chi^2 = 75.640$, $df = 1$, $p < 0.001$). The prevalence of ULDs among workers who are in a low RULA risk level is 38.3%, whereas ULDs among the workers in medium and very high RULA risk are at 88.5%. The result of this study is similar to previous research findings, which found that none of the workstations in negligible risk (action level 1) and they reported significant association between MSDs and RULA risk level[36][42] [43]. A possible explanation may be due to the fact that, muscles do not work well when placed in awkward postures. Working with various parts of the body (e.g., joints, limbs, back) in bent, extended or

flexed positions rather than in a straight or neutral position involves awkward positions that increase the exertion and muscle force which an employee needs to apply in order to complete a task. When the muscles are stressed it leads to compression of tendons, nerves and blood vessels, therefore, reducing the supply of blood to the muscles tendons and then causing ULDs.

This study result reveals that based on the median score as cut-off point, the majority of UPM workers 154 (57 %) experience low job control. Control at work is significantly associated with ULDs, and similar findings have been demonstrated in previous studies [10], [6], [44],[30]. In contrast, Kim et al. (2013), conducted a study among male fire-fighters in Korea. They reported that there was no significant association between MSDs and insufficient job control [45].

The current study also revealed that most of the UPM workers have high psychological demand (152 or 56%). The result of this study shows that a significant association exists between ULDs and psychological demand. Corroborating earlier results, those workers with high psychological demand are at higher risk of MSDs and probably suffer multiple site pains [46], [10], [45], [30]. In addition, this study reveals that the majority of the UPM workers (151 or 55.7%) experience low social support. The study result shows that by p value < 0.05 the level is significant, and there is a significant association between ULDs and social support. This finding is consistent with previous research results [6], [57].

The findings of this study show that 151 or 55.7% of UPM workers experience low job satisfaction. Chi square test (p value) proved that there is a significant association between ULDs and job satisfaction. The results of this study corroborate the previous findings by Woods (2005) [13] while conversely, studies conducted by El-Bestar et al. (2011), Sim et al. (2006) found that there is no significant association between job satisfaction and ULDs (p value > 0.05). [48], [6]. Possible clarification for this could be the fact that psycho-social factors related to work can lead to stress. Stress may increase the tone in muscles causing them to become fatigued, or it may increase the period of muscle activity and decrease the chance for recovery. When workers are stressed, they experience more muscle contractions than normal and therefore the muscles cannot relax completely. Also, stress may increase the perception of pain, or undermine the mechanisms used to cope with pain. Seen from a more pathophysiological perspective, stress may, apart from increasing muscle activity, impair circulation and the supply of oxygen to tissues as a result of hyperventilation. Moreover, prolonged stress may degrade tissue quality and the ability of tissues to recover due to hormonal processes [49].

V. Conclusion

Upper limb disorders (ULDs) were found to be prevalent among university workers; neck and shoulders have the highest prevalence rate among the body parts covered by the study. Among factors covered by the study, there is no association between gender, ethnicity, level of education, type of job, income and ULDs. Furthermore, chi square test (p value) shows that there is significant association between age, awkward posture and all psycho-social factors (control at work, psychological demand, social support, and job satisfaction) and ULDs among UPM workers. In the same vein, this study reveals that the majority of the workers have medium and very high RULA risk levels that are significantly associated with ULDs. Multiple logistic regressions show that RULA risk level is the main risk factors responsible for ULDs among UPM workers.

5.1 Limitations

A number of limitations were encountered in this study. Self-reporting questionnaire to collect data and recall bias can be considered as limitations. Also, the information collected from this study merely depended on the questionnaire and observational method without any use of medical diagnosis, so workers' responses may be biased as a result of social desirability to provide sociably favoured answers rather than the real experience.

5.2 Recommendations

According to the results of this study, psychosocial factors such as decision making, feelings of alienation and job dissatisfaction have a tangible effect on ULDs. Thus, there is need for an awareness to be created among workers through several strategic prevention programs and campaigns focused on psycho-social risk factors and improvements of work conditions targeted at minimizing the risk of ULDs complaints among workers. Social support should be improved through activities such as team building, recreational activities, peer group activities and other activities. Additionally, the following engineering and administrative improvements are needed to reduce the risk of ULDs among UPM workers:

These include:

1. Engineering improvement

- (a) For cleaners, the cleaning equipment should have an acceptable weight, a suitable height and should be easy to use by cleaners (may be moving cleaning tools and products by using carts from one place to another) in order to reduce the musculoskeletal load.
- (b) Provide appropriate workstations, which should be designed to fit different workers, because every worker's body type varies. Therefore, ergonomic workstations should be designed for workers to ensure that they enjoy the best working positions and environment. Additionally, an ergonomic workstation should be designed in such a way that it allows the user to have a neutral position on their shoulder or upper limbs. Different workstations should also be made to fit different types of jobs according to the need so as to promote occupational safety and health.

2. Administrative improvements

- (a) Training courses on the Proper usage of VDU, proper work posture and information about risks to psychological health during work period should be provided.
- (b) Suitable work schedules that provide the workers a proper time to rest should be provided.
- (c) Provide and maintain high work conditions for workers so that they feel comfortable (faraway from fear of making mistakes, ability to make decisions, how to perform their work, not do extra work).

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