

## ORIGINAL ARTICLE

# MUSCULOSKELETAL SYMPTOMS AND ERGONOMIC HAZARDS AMONG ROOM ATTENDANTS IN HOTEL INDUSTRIES

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### ABSTRACT

Ergonomic hazards which contribute to Musculoskeletal Disorders (MSDs) among room attendants were considered as a problem or trouble since these ergonomic problems would affect their work performance for hotel industries. Data for MSDs prevalence among room attendants were collected using Nordic Musculoskeletal Questionnaire (NMQ) and direct observation via Washington Industrial Safety and Health Act (WISHA) Checklist for examining the ergonomic hazards at hotel industries. The highest body part trouble among room attendants in the last 12 months were low back pain (60%), followed by wrists/hands (41.5%), and knees (36.9%). WISHA Checklist results showed that most of room attendants were found in hazard level for risk factors involving awkward posture and highly repetitive motion. All the results obtained showed that the essential ergonomic interventions are needed to eliminate risk of exposures to MSDs among room attendants.

**Keywords:** *Musculoskeletal Symptom, Ergonomic Hazards, Room Attendants, Hotel Industries*

### INTRODUCTION

Major ergonomic hazards that may contribute to the development of Musculoskeletal Disorders (MSDs) are concerned with the postures adopted, the force and contact stress levels exerted, the rates of repetition required and working for long periods without a break. MSDs may occur if any of these ergonomic risk factors, either alone or in merger, overload the musculoskeletal system (EU-OSHA, 2016a). MSDs are disorders and injuries that affect the human body's movement or musculoskeletal system include muscles, tendons, ligaments, nerves, discs, and blood vessels (Middlesworth, 2015). Housekeepers had the highest overall injury rate and the highest rate of MSDs among hotel industries workers in United States (Buchanan et al. 2010). Regarding the cleaning job which involved in housekeeping tasks for room attendants, it is associated with a high prevalence of musculoskeletal disorders (MSD) involving in the back and upper extremities (Samani, 2012). Furthermore, workers in mould manufacturing process also have a prevalence of upper extremities due to uncomfortable work postures (Rahman et al. 2015). In addition, the construction industries that have been reported that statistically

significance for the wrist, shoulder and back regions were affecting the worker and lead to the development of pain or discomfort (Rahman et al. 2012). Low back pain is a widespread musculoskeletal injury that frequently occurs in the general active population including hotel room attendants (Fady et al. 2013).

Cleaning work for housekeeping task involves repetitive motion and awkward posture and this may lead to discomfort ergonomic situations, which in turn may contribute to MSDs (Olivia et al. 2016). In fact, generally room attendants experienced MSDs with neck and muscular pain (VIRWC, 2010) meanwhile most of the time they suffered from back pain after pushing or pulling a trolley or carts which carrying heavy loads (Oxenbridge & Moensted, 2011; Jorgensen et al. 2011). Housekeeping tasks among room attendants in hotel industries has repeatedly increase to the risk of MSDs especially for low back pain (Montross, 2011). Previous study shows that the room attendants' health conditions are worse than the national general community and majority room attendants have high injury rates related to the MSDs (Kensbock et al. 2016). Apart from housekeeping tasks, working in a car tyre service centre also acquired injuries from almost the same risk

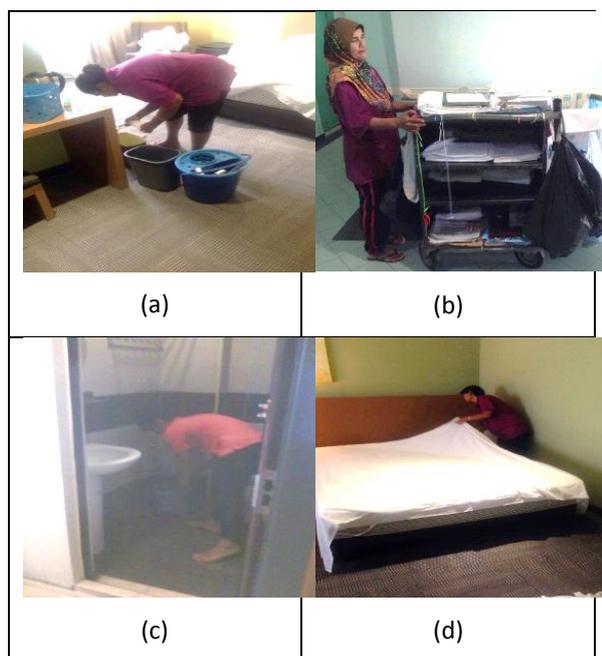
factors such as handling heavy or awkward objects, heavy lifting, and prolonged or sustained work in awkward postures (Rahman et al. 2010).

The objectives of this study are to determine MSDs prevalence among room attendants in hotel industries using Nordic Musculoskeletal Disorder Questionnaire (NMQ) and to identify the level of ergonomic hazard using Washington Industrial Safety and Health Act (WISHA) Checklist.

## METHODOLOGY

### Subjects and Task Description

This research involved 39 male room attendants and 26 female room attendants who were randomly selected at 10 different hotels in Malaysia. The study is focused on the housekeeping tasks involving cleaning, vacuuming, scrubbing, mopping, and tidying that affect the musculoskeletal system among the selected subjects. Data collection among the room attendants took place in a four-month period beginning July 2016.



**Figure 1 (a) Cleaning room with back bent forward more than 30°, (b) Pushing trolley with high force, (c) Cleaning toilet with repetitive motion, (d) Making bed with improper body posture**

Figure above showed the sample of ergonomic evaluation process among room attendants. Figure 1(a) showed a female

room attendant was cleaning room with back bent forward more than 30° which involved awkward posture and this may cause low back trouble associated to MSDs. Figure 1(b) showed a female room attendant was pushing a trolley with high force which involved forceful exertion and this may cause severe hands and wrists pain. A male room attendant was cleaning toilet with repetitive motion involving scrubbing and polishing as shown in Figure 1(c). Scrubbing and polishing with same motion may cause pain or discomfort involving hands, shoulders and elbows. Figure 1(d) showed a female room attendant was making bed with improper body posture that would lead to bodily pain and could contribute to the development of MSDs.

### Nordic Musculoskeletal Questionnaire (NMQ)

The Nordic Musculoskeletal Questionnaire (NMQ) was developed from a project funded by the Nordic Council of Ministers in purpose for analysis of musculoskeletal symptoms (Kuorinka et al. 1987). The purpose was to evaluate and test a standardized questionnaire methodology allowing comparison of neck, low back, shoulder and general complaints for use in epidemiological studies.

NMQ consists of three parts which for Part A was about personal profile including the demographic variables regarding gender, age, height, weight, hand dominance, working experience, and hours of work per week. Part B was concerning the trouble with the locomotive organs, musculoskeletal symptoms frequency of pain and intensity of pain. The period prevalence for 12 months, point prevalence for 7 days and intensity of musculoskeletal troubles which include neck, shoulder, elbow, wrists or hands, upper back, low back, hips or thighs, knees, and ankles or feet are identified and questioned based on the questionnaire. Part C concentrated on major areas for which signs of the most common muscles and about the details for area of musculoskeletal symptoms including the lower back, neck and shoulder. This part would investigate further into their analysis on symptoms and signs of duration over past 12 months and 7 days in advance. Additionally there could be major expansion in this part which it analyses more thoroughly the severity of symptoms in terms of its impact based on activity at work.

## Washington Industrial Safety and Health Act (WISHA) Checklist

The Washington State Department of Labor and Industries (WISHA) Caution and Hazards Checklist provides thresholds of physical exposures across multiple body parts in order to assess a worker's daily exposure risk (McGaha et al. 2014). The tool was published in Washington State in the late 1990's as part of a regulatory effort in order to control exposures to musculoskeletal risks in the work place. WISHA checklist is one of the few measures which accounts for musculoskeletal hazards across all regions of the body. The caution and hazard levels are determined by the duration or period of time spent working at a defined intensity level, a caution rating needs exposure of two hours or more and hazardous rating needs exposures above four hours.

The risk factors based on WISHA checklist include awkward posture, high hand force, highly repetitive motion, repeated impact, duration and hand or arm vibration. Meanwhile the checklist is very useful for investigation of MSDs as it evaluates physical exposure to a combination of risk factors rather than each single risk factor separately and adds scores for each risk factor together to determine risk. Additionally the duration factor according to the checklist refers to the total amount of time per day an employee is exposed to the risk factor and not to duration an employee spends performing the work activity which includes the risk factor and potential for a MSDs hazard is analysed for each body part separately rather than by adding together scores from all different body parts. WISHA checklist involves the six physical risk factors including awkward posture, high hand force which involved pinch and grasp, highly repetitive motion, repeated impact, heavy, frequent or awkward lifting, and moderate to high hand-arm vibration.

### Data Collection

Data for musculoskeletal symptoms have been acquired by an interview using NMQ. The selected subjects were being asked about their profile regarding the demographic items such as gender, age, height, weight, hand dominance, years of working, and hours of work per week. They were being questioned about the musculoskeletal trouble involving pain or discomfort that they had over the last 12 months in order to mark them on the body discomfort chart. Questions regarding the

perceived job demands such as making beds, tidying rooms, cleaning and polishing toilets, taps, sinks, bathtubs, and mirrors, washing floors, removing stains and vacuuming were involved throughout the interview.

Ergonomic hazards were assessed through direct observation of room attendants' working performance involving the housekeeping tasks using WISHA Checklist to determine their exposure risk level. The risk factors according to WISHA checklist are awkward posture, high hand force, highly repetitive motion, repeated impact, duration and hand or arm vibration. There are two conditions presented in the WISHA Checklist which include the indicators for "Caution" for a lower level of risk and "Hazard" for a higher level of risk. Time taken during data collection for each participant was 2 to 3 hours which included both NMQ and WISHA Checklist.

### Data Analysis

Data was analysed using Statistical Package for the Social Science (SPSS) Software Version 22.0. Descriptive statistics such as numbers, percentages, mean and standard deviation from the collected data were analysed for NMQ results involving demographic variables among room attendants. NMQ results regarding the musculoskeletal trouble by body parts in the last 12 months were analysed as numbers and percentage. WISHA Checklist results were analysed as numbers and percentages which involved the exposure risk level of ergonomic hazards.

## RESULTS

### Demographic Variables

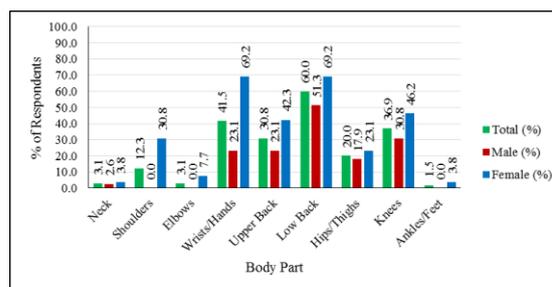
Based on analysis for demographic variables as shown in Table 1, there were more male room attendants with a percentage of 60% compared to female room attendants with a percentage of 40%. Their total years of working experience percentage were 93.8% for range between 1 to 5 years while 6.2% for more than 6 years. The total mean for years of working among room attendants was 2.4 (SD=2.5). 100% of the room attendants work for range between 40 to 50 hours a week with a total mean of 46.5 (SD=3.1). 80% of room attendants were age between 21 to 40 years old while the total mean for their ages was 29.9 (SD=8.4). Majority of room attendants with a percentage of 81.5% were right handed.

**Table 1 Demographic Variables (n=65)**

Characteristic	N	%	Mean	SD
<b>Gender</b>				
Male	39	60.0	-	-
Female	26	40.0	-	-
<b>Age</b>				
≤20	3	4.6		
21-40	52	80.0	29.9	8.4
≥41	10	15.4		
<b>Working Experience (Year)</b>				
1-5	61	93.8	2.4	2.5
≥6	4	6.2		
<b>Weekly Working Time (Hours)</b>				
40-50	65	100.0	46.5	3.1
≥51				
<b>Body Mass Index (BMI)</b>				
Underweight	2	3.1		
Normal Weight	47	72.3	23.5	2.8
Overweight	14	21.5		
Obesity	2	3.1		
<b>Hand Dominance</b>				
Right-handed	53	81.5	-	-
Left-handed	12	18.5	-	-

**Number of Self-Reported Symptoms**

Figure 2 showed the number of self-reported symptoms occurring in the last 12 months which the highest MSDs experienced among male room attendants was lower back with a percentage of 51.3% while the lowest prevalence involving shoulders and ankles/feet with a percentage of 0% for both. Meanwhile the highest musculoskeletal trouble among female room attendants involving wrists/hands and low back with a percentage of 69.2% for both while the lowest prevalence among them were neck and ankles/feet with a percentage of 3.8% for both. The highest prevalence among room attendants both male and female was low back region with a percentage of 60% while the lowest prevalence was ankles/feet with a percentage of 1.5%.



**Figure 2 Percentages of Nordic Questionnaire Respondents with Body Part Trouble in Last 12 Months**

**Reported Lower Back, Neck and Shoulder Trouble**

According to Table 2, during the past 12 months, none of room attendants sought a professional for any musculoskeletal trouble, meanwhile there was 1 (1.5%) room attendant had been hospitalized due to lower back problem which lead to change in job or duty. The highest body part trouble experienced by room attendants was lower back (60%) followed by shoulder (12.3%) while the least body part trouble experienced by them was neck (3.1%). Most of room attendants (32.3%) suffered lower back trouble for about 8 to 30 days, followed by 24.6% for more than 30 days total in the last 12 months. There were also 3.1% of room attendants who suffered lower back trouble for about 1 to 7 days in the last 12 months. Lower back symptom severe enough and resulted to reduce room attendants' leisure activity with a percentage of 7.7% and work activity with a percentage of 1.5%. However, 9.2% of room attendants reported that they were prevented from work for about 8 to 30 days while 4.6% of them were prevented from work for about 1 to 7 days in the last 12 months due to lower back trouble. Besides, there were 3.1% of room attendants who experienced neck trouble and 10.8% of them had shoulder trouble for about 8 to 30 days in the last 12 months. Not to mention that there was 1 (1.5%) room attendant reported had shoulder trouble for about 1 to 7 days in the last 12 months.

**Table 2 The Prevalence of Musculoskeletal Symptoms by Body Parts among Room Attendants (n=65)**

Symptoms	Lower		
	Back, % (n)	Neck, % (n)	Shoulder, % (n)
Any trouble ever	60.0 (39)	3.1 (2)	12.3 (8)
Ever had in accident	0 (0)	0 (0)	0 (0)
Change job or duty	1.5 (1)	0 (0)	0 (0)
Total time with trouble last 12 months			
0 days	0 (0)	0 (0)	0 (0)
	3.1		
1-7 days	(2)	0 (0)	1.5 (1)
	32.3	3.1	
8-30 days	(21)	(2)	10.8 (7)
More than 30 days, but not every day	24.6 (16)	0 (0)	0 (0)
Every day	0 (0)	0 (0)	0 (0)
Reduce of work activity last 12 months			
	1.5 (1)	0 (0)	0 (0)
Reduce of leisure activity last 12 months			
	7.7 (5)	0 (0)	0 (0)
Total time prevented work last 12 months			
	4.6 (3)	0 (0)	0 (0)
1-7 days			
	9.2 (6)	0 (0)	0 (0)
8-30 days			
More than 30 days	0 (0)	0 (0)	0 (0)
Sought a professional			
	0 (0)	0 (0)	0 (0)
	1.5		
Hospitalized	(1)	0 (0)	0 (0)

Room attendants also had high prevalence of musculoskeletal symptoms which prevented them from doing their normal work and some of them had certain body parts trouble in last 7 days. Table 3 is presented 12-month prevalence of musculoskeletal symptoms and work interference by anatomical region. For the body parts' trouble in last 12 months had been discussed as shown in Figure 1.

Based on Table 3, the highest prevalence of musculoskeletal symptoms among room attendants which prevented them from doing normal work involving lower back (13.9%)

followed by upper back (6.2%) and the least prevalence among them were knees and hands/wrists which both at 1.5%. Some of room attendants had high prevalence of musculoskeletal symptoms in the last 7 days which involved lower back (20%) and upper back (3.08%) while the least prevalence among them were hands/wrists and hips/thighs which both at 1.5%.

**Table 3 Twelve-month Prevalence of Musculoskeletal Symptoms and Work Interference by Body Region (n=65)**

Anatomical Region	Any trouble last 12 months, % (n)	Prevented from normal work, % (n)	Trouble last 7 days, % (n)
<b>Upper Extremity</b>			
Shoulders	12.3 (8)	0 (0)	0 (0)
Elbows	3.1 (2)	0 (0)	0 (0)
Hands/Wrists	41.5 (27)	1.5 (1)	1.5 (1)
<b>Lower Extremity</b>			
	20.0		
Hips/Thighs	(13)	0 (0)	1.5 (1)
	36.9		
Knees	(24)	1.5 (1)	0 (0)
Ankles/Feet	1.5 (1)	0 (0)	0 (0)
<b>Axial Skeleton</b>			
Neck	3.1 (2)	0 (0)	0 (0)
	30.8		
Upper back	(20)	6.2 (4)	3.1 (2)
	60.0		20.0
Lower back	(39)	13.9 (9)	(13)

**Risk Level of Awkward Posture**

According to Table 4, ergonomic risk factor for awkward posture involving shoulder without repetitive, squatting and kneeling among all room attendants (100%) were in caution level. These results showed that the risks are present but immediate action is not recommended (Washington State Department of Labor and Industries, 2000). However according to the checklist result, all room attendants (100%) were in hazard risk level for back awkward posture which working with back bent forward more than 45° with duration more than 2 hours total per day. Based on Washington State Department of Labor and Industries (2000), if there is one or more "Hazard" boxes are checked, a Musculoskeletal Disorders (MSDs) exists, and further action is recommended.

**Table 4 Risk Level of Awkward Posture (n=65)**

Awkward Posture	Risk Level			
	Caution <sup>h</sup>		Hazard <sup>i</sup>	
	N	%	N	%
Shoulder <sup>a</sup>	65	100.0	-	-
Shoulder <sup>b</sup>	-	-	-	-
Neck <sup>c</sup>	-	-	-	-
Back <sup>d</sup>	-	-	-	-
Back <sup>e (h)</sup>	N/A	N/A	65	100.0
Knees <sup>f</sup>	65	100.0	-	-
Knees <sup>g</sup>	65	100.0	-	-

Notes: - Non-applicable (N/A), (a) Working with the hand(s) above the head or the elbow(s) above shoulder(s), (b) Repetitively raising the hand(s) above the head or the elbow(s) above the shoulder(s) more than once/minute, (c) Working with the neck bent more than 45° (without support or the ability to vary posture), (d) Working with the back bend forward more than 30° (without support or the ability to vary posture), (e) Working with the back bent forward more than 45° (without support or the ability to vary posture), (f) squatting, (g) kneeling, (h) Duration-more than 2 hours total/day, (i) Duration-more than 4 hours total/day

**Risk Level of High Hand Force**

Table 5 is presented risk level of high hand force for pinch and grasp which involved arms, wrists and hands. According to the result obtained, most of room attendants (95.4%) were in caution risk level for pinching and grasping an unsupported object with duration more than 2 hours total per day with no other risk. Meanwhile there were 3 room attendants (4.62%) in hazard risk level for pinching and grasping an unsupported object with duration more than 3 hours total per day which involved wrists bent in flexion or in extension or in ulnar deviation for 30° or more.

**Table 5 Risk Level of High Hand Force - Pinch & Grasp (arms, wrists & hands) (n=65)**

High Hand Force	Risk Level							
	Hazard <sup>c</sup>		Hazard <sup>d</sup>		Caution <sup>e</sup>		Hazard <sup>e</sup>	
	N	%	N	%	N	%	N	%
Pinch <sup>a</sup>	-	-	3	4.6	6	95.4	-	-
Grasp <sup>b</sup>	-	-	3	4.6	6	95.4	-	-

Notes: - (a) Pinching an unsupported object(s) weighing 2 or more pounds/hand, or pinching with a force of 4 or more pounds/hand (comparable to pinching half a ream of paper), (b) Gripping an unsupported object(s) or with a force weighing 10 pounds or more pounds/hand (comparable to clamping light duty automotive jumper cables onto a battery), (c) Highly repetitive motion (more than 3 hours total/day), (d) Wrists bent in flexion 30° or more, or in extension 45° or more, or in ulnar deviation 30° or more (more than 3 hours total/day), (e) No other risk (caution - more than 2 hours total/day, hazard - more than 4 hours total/day)

**Risk Level of Highly Repetitive Motion**

Table 6 is presented risk level of highly repetitive motion which involved neck, shoulders, elbows, wrists and hands. 51 room attendants (78.5%) met hazard risk level since they were using the same motion with little or variation for every few seconds with wrists bent 30° or more and forceful exertions with hands for more than 2 hours total per day. There were 14 room attendants (21.5%) found in caution risk level which they were using same motion with little or variation for every few seconds for more than 2 hours total per day with no other risk factor.

**Table 6 Risk Level of Highly Repetitive Motion - Neck, shoulders, elbows, wrists, & hands (n=65)**

Physical Risk Factor	Risk Level			
	Caution		Hazard	
	N	%	N	%
Using same motion with little or variation every few seconds <sup>a</sup>	14	21.5	-	-
Using same motion with little or variation every few seconds <sup>b</sup>	N/A	N/A	51	78.5
Intensive keying <sup>c</sup>	N/A	N/A	-	-
Intensive keying <sup>d</sup>	-	-	-	-

Notes: - Non-applicable (N/A), (a) No other risk factor (Caution - more than 2 hours/day & Hazard - more than 6 hours/day), (b) Wrists bent 30°/45° or more, AND high, forceful exertions with hand(s) (more than 2 hours/day), (c) Awkward posture including wrists bent 30°/45° or more, or in ulnar deviation 30° or more (more than 4 hours/day), (d) No other risk factor (Caution - more than 4 hours/day & Hazard - more than 7 hours/day)

### Risk Level of Repeated Impact

Table 7 showed result of repeated impact for more than 2 hours total per day which involved hands and knees. According to analysis, 30 room attendants (46.2%) were in caution risk level for using hands as a hammer for more than 10 times per hour. Meanwhile all room attendants (100%) were found in caution risk level for using knees as a hammer for more than 10 times per hour.

**Table 7 Risk Level of Repeated Impact for more than 2 hours total per day (n=65)**

Body Part	Risk Level			
	Caution <sup>c</sup>		Hazard <sup>d</sup>	
	N	%	N	%
Hands <sup>a</sup>	30	46.2	-	-
Knees <sup>b</sup>	65	100.0	-	-

Notes: - (a) Using the hand (heel/base of palm) as a hammer, (b) Using the knee as a hammer, (c) more than 10 times/hour, (d) more than 60 times/hour

### Risk Level of Moderate to High Hand Arm Vibration

Table 8 is presented high hand or arm vibration which involved hands, wrists and elbows for caution risk level. Based on the result obtained through the research, all room attendants (100%) were found using hand tools that typically have moderate vibration level for more than 2 hours total per day.

**Table 8 Risk Level of Moderate to High Hand-Arm Vibration - Hands, wrists & elbows (n=65)**

Physical Risk Factor	Risk Level - Caution	
	N	%
Using hand tools that typically have high vibration levels <sup>a</sup>	-	-
Using hand tools that typically have moderate vibration level <sup>b</sup>	65	100.0

Notes: - (a) more than 30 minutes total/day, (b) more than 2 hours total/day

### DISCUSSIONS

Low back and wrists/hands pain are widespread problems among hotel room attendants in this study. The majority of selected subjects also reported several

ergonomic problems involving awkward posture and highly repetitive motion due to their housekeeping tasks such as cleaning room, mopping and polishing toilet. Besides that, workers involving heavy lifting usually associated with low back pain especially in manufacturing industry (Kadikon & Rahman, 2016).

According to previous study, the highest prevalence of musculoskeletal disorders among hotel room attendants was low back (52.7%), followed by wrists/hands (46.5%) and the least prevalence was elbow region (27.3%) (Jong-Yu et al. 2004). These results strongly supported by previous research which found that symptoms in the lower back were most prevalent (49%) followed by the wrists/hands (43%), ankles/feet (35%), and shoulders (25%) (Kirtigandha et al. 2011). Furthermore low back pains are a common complaint among room attendants due to their bad working posture for housekeeping tasks (Andrews, 2009). Additionally, the highest prevalence among hotel room attendants in Las Vegas was reported for very severe pain in the lower back with a percentage of 40% and upper back with a percentage of 38% (Krause et al. 2005).

There were 205 workers in housekeeping service which more than 24% of them experienced workplace musculoskeletal injuries involving back injuries which caused by overexertion (Cheng & Chan, 2009). However, heavy workloads are correlated with musculoskeletal symptoms such as low back pain, shoulder injuries, bursitis of the knee, neck and wrist pain (Liladrie, 2010). Based on previous research, most of room attendants have taken sick leave due to the MSDs which experienced by them while performing housekeeping tasks (Swedish Hotel and Restaurant Union, 2014). The sick leaves were nearly three times more frequent at housekeeping departments in hotel industries which have turned up the pace in recent years (Swedish Hotel and Restaurant Union, 2014).

In one questionnaire study based on Work Environment Authority, it is proven that during the period of 1997 to 2001 about 46% of room attendants had trouble in the upper back, 43 % had pain every week in their hip, leg, knee and ankle. 39 % had pain and discomfort in the lower back(Swedish Work Environment Authority, 2005). Meanwhile according to previous study of 941 Las Vegas housekeepers, 83% of them were taking pain

medication for musculoskeletal discomfort due to work and 62% were forced to visit a doctor and prevented from normal work due to MSDs (Catherine, 2007).

In term of ergonomic hazards which involved in housekeeping tasks, most of the time room attendants experienced awkward postures such as bending over or kneeling or reaching overhead for a long time while making beds or cleaning tasks (The Work Comp Experts, 2012). Cumulative injuries of body parts most affected due to awkward posture for room attendants were back (40%), hands/wrists (22%), shoulder (13%) and other (25%) (SRI-Ergonomics, 2016).

For high hand force which experienced by hotel room attendants, in order to generate a specific force, a pinch grip requires a specific greater muscle exertion than a power grip which the pinch grip has a greater likelihood of causing injury (Ergoweb, 2016). According to Stetson et al (1991) based on their observation analysis of the hand and wrist, hand exertions correlated with ergonomic risk factors of high force, pinch grip, wrist flexion/extension/ulnar deviation, and use of hand to strike object.

In this study, most of room attendants were found in hazard risk level for highly repetitive motion of ergonomic factor as Canadian Centre for Occupational Health and Safety (CCOHS, 2016) stated that major risk factors for repetitive motion injuries which associated in housekeeping tasks are excessive bodily motions and heavy physical workload which are high risk for back trouble while forceful upper limb motions in awkward positions could be a high risk for neck or shoulder and arm troubles. Room attendants are more likely than other hotel workers to suffer repetitive motion injuries and are susceptible to an assortment of musculoskeletal injuries (Yu-Chin et al. 2014).

For repeated impact of ergonomic hazards, it is reported that certain tasks that would trigger knee pain among hotel housekeepers are they have to go on their knees in every room to look under bed and doing that repeatedly from room to room (Liladrie, 2008). Majority of room attendants in hotel industries reported that they were using their knees to push beds out from the wall during work for housekeeping (Montross, 2016) and these are supported by other study which

found that most of room attendants suffered knee pain due to constant bending and kneeling (Liladrie, 2008).

In this study, it was found that all respondents were using vibration tool such as vacuum cleaner for housekeeping tasks involving room cleaning. European Agency for Safety and Health at Work (EU-OSHA, 2016b) claimed that while using work equipment, such as floor buffers and vacuum cleaners, which are often used by room attendants for housekeeping job, the main issues of concern for users were found to be vibration from the machines. Additionally, vibration from the work equipment or machines can contribute to hand-arm vibration syndrome, tingling, numbness or white fingers from reduced blood flow (EU-OSHA, 2016b). Based on a OSH Academy (2013), vibration is one of the risk factors which contribute to the development of MSDs because while handling vibrating tools for a prolonged period of time, vascular insufficiency in the hand and fingers can result in interruption with sensory receptor feedback. If a room attendant cannot feel the grip well, he or she would apply more force than is necessary in order to hold or handle the object and the vibration involved has also been linked to Carpal Tunnel Syndrome (CTS) (OSH Academy, 2013).

## CONCLUSION

In conclusion, majority room attendants have high prevalence involving low back, wrists/hands and knees. Female room attendants were likely easier to get injury due to housekeeping tasks since they had the highest prevalence for all body part trouble compared to male room attendants. Most of room attendants were in hazard level for awkward posture and highly repetitive motion risk level regarding the housekeeping tasks at workplace. Further investigation and ergonomic working practices should be implemented to reduce the musculoskeletal trouble for housekeeping services.

## Acknowledgement

The authors express sincere gratitude to all hotel industries respondents who had given a great cooperation throughout the data collection for the study. Appreciation also goes to everyone who involved directly or indirectly towards the completion of this research.

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