

ORIGINAL ARTICLE**A CASE STUDY: RISK WORK PRACTICES WITH SLIPS AND FALLS POTENTIAL AMONG FOOD PRODUCTION WORKERS IN SME INDUSTRY**Sharifah Aznee SYED ALI^{1,2}, Seri Rahayu KAMAT², Kalthom Husin³¹*Department of Mechanical Engineering, Polytechnic of Port Dickson, KM14 Jalan Pantai, 71050 SiRusa, Negeri Sembilan, Malaysia.*²*Faculty of Manufacturing Engineering, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.*³*Faculty of Education, International Islamic University College, Bandar Seri Putra, 43000 Kajang, Selangor, Malaysia***ABSTRACT**

Food production workstation is one of the most risky areas and equipped with different tools and materials which potentially to slip and fall accidents. The aim of this study is to analyse the discomfort working body posture and activities in small medium enterprise (SME) food industry, which contributes to slip and fall accidents. Forty workers at least one-year experience working in food SME industry were involved. A quantitative and qualitative method using survey through questionnaire and observation were utilized to identify workers' experience in the food production workstation. RULA assessment was used to validate the instrument focusing on specific body discomfort or pain. The results indicated that seven critical activities of the food production workstation contributed to high RULA score of 7. The findings from this study yielded that minimizing the work shift was necessary to reduce the effect of prolonged standing. Workers who experienced prolonged standing would lead to fatigue and this condition triggered the potential to slip and fall hazard. Determining the best practices during work is useful for SME food industry in terms of limitation angle of the working posture, manual handling and suitable workstation. The outcome can be a guideline to the food service industries for precaution on the safety and health matters in the workstation.

Keywords: Posture, Standing, Food production, RULA Score, Slips and fall.

INTRODUCTION

Workers work almost 8 hours to 12 hours daily. This exposes them to some dangers at work. There are several cases of work processes performed in the food production workstation such as preparing raw materials, storing ingredients, processing, packaging, serving or distributing and washing. Food production workstation requires standing position for work-related purposes which, in turn, can contribute to slip and fall accidents. Accommodation and Food Services workers are exposed to static standing postures for a prolonged time (Choi et. al., 2007). Each employee will always move along the job as active passage and length will spread the slip and fall incidents (Barnett et. al., 2003; 2004; 2005). It is clear that the use of the same work path is very frequent. Floor surface roughness should be studied because if it is less than 10 μ m, it means that the floor is potentially for slipping and falling accidents (Marianne, 2007). Therefore, workers should be careful and according to the rules provided in the workplace.

Food production workers have to fulfil their job according to job schedules such as preparing raw materials, storing ingredients such as dry storage with room temperature or cold temperature, processing, packaging, serving or distributing to customers and washing. Food

production workstation is equipped with different types of food processing equipment and raw materials preparation. The comparison is made in terms of ergonomics and the numbers of hazards in food production workstation are higher than other high-risk rooms (Phelan et. al, 2009). An ergonomics study is a study on the relationship among human, equipment and the working environment for productive daily activities.

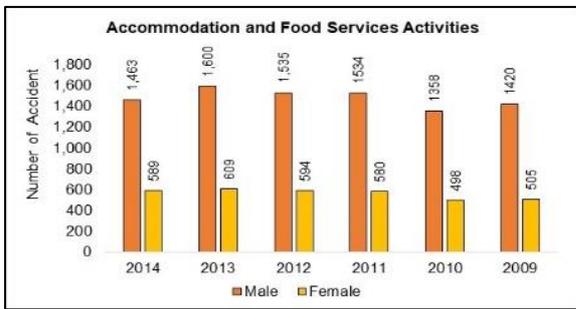
Table 1 demonstrates an interaction of insufficient posture and soreness due to needless force (Grandjean and Hunting, 1997). The risk of soreness in the legs is due to standing position. Different or similar soreness is caused by posture changes during work. Standing working position causes pain in the waist, knee, lower leg, and ankle. Standing posture contributes to fatigue (Mandy et. al., 2002).

Table 1: Postures and pains connection

Postures at the workplace	Risk of pains in
Standing	Feet and legs
Sitting without back support	Extensor muscles of the back
Seat too high	Knees, lower legs and feet
Seat too low	Shoulders and neck

Extended Arm	Shoulders and upper arms
Inadequate grips on tools	Lower arms

Figure 1 delineates the quantity of accident in Accommodation and Food Services Activities in Malaysia. Around 12285 cases were accounted for to SOCSO from the year 2009 to 2014 (SOCSO, 2009-2014). The quantities of the accident for the male were higher than female specialists. Altogether, 8910 cases were accounted for among the male contrasted and the cases in the female which were 3375 cases. Consequently, the Accommodation and Food Services Activities accident had a uniform increment from the year 2009 to 2014. A normal of 2048 cases happen every year in



Accommodation and Food Services Activities in Malaysia.

Figure 1 Quantities of Accidents as indicated by the Accommodation and Food Services Activities

Figure 2 demonstrates the Benefits Paid by Accommodation and Food Services Activities in Malaysia (SOCSO, 2009-2014). The higher the benefit paid is for temporary disablement and the lower is for dependant benefit.

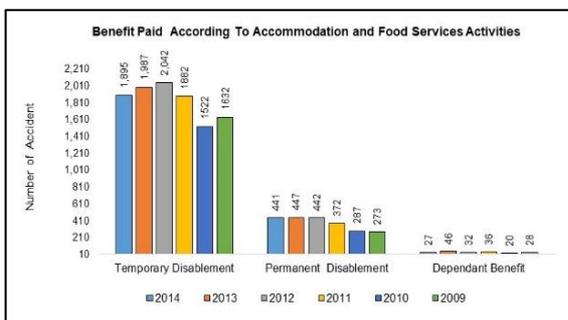


Figure 2 Benefit Paid According Accommodation and Food Services

Source SOCSO: Annual Report 2014-2009 [Online]

Available: <https://www.perkeso.gov.my/index.php/ms/laporan/laporan-tahunan>

Yearly Report of SOCSO obviously demonstrates that Accommodation and Food Services working environment adds to high potential and danger of dangerous mishaps, making hurt representatives. In the event that workers are being reckless or self-smug on the security rules or appropriate wellbeing

mechanical assembly, they may be the casualties of slip and fall accidents.

A decent workplace is characterized as a physical arrangement of particular areas on the floor and is equipped with machines, apparatus materials which are the basic choice in office arrangement (Roslin et. al., 2008). In selecting the facilities at a workplace, design an appropriate infrastructure in the food production workstation are needed to build a safety and proper food production workstation for workers (Afrooz et. al., 2013). However, there are very limited studies conducted on SME industry especially on Accommodation and Food Services but the numbers of accidents in this industry are quite high based on SOCSO reports. Thus, this study aimed to analyse the discomfort working body posture and analyse body angle and physiology experience among workers that contribute to slip and fall accidents during manual lifting activity at food SME industry. Other hazardous elements for slip and fall accidents found in past reviews incorporate layout factors, for example, tools, job task, footwear, lifting and management factors such as the arrangement of jobs, workstation, safety environment, job practical and safety act (Bentley, 2009; Bentley and Haslam, 2001).

Most slipping accidents contribute to 40-85% of fall-related working injuries (Kemmlert and Lundholm, 2001). However not all slipping accidents end in the fall, but rather it can be present as an outcome in a harm from pulling an object or from a muscle strain (Manning and Shannon, 1981).

METHODS

Questionnaires were developed to be distributed among forty workers aged 19 to 25 years old with at least 1-year experience in food production activities. There were three parts in the questionnaires. Part A and Part B referred to respondents' personal details and working environment whereas Part C focused on workplace experience or physiology experience among workers. The workers were well prepared because they had a minimum of 1-year experience in food production activities. Furthermore, they spent more than 6 working hours during the observation. The Workstation was divided into six main departments namely preparing raw materials, storing ingredients, processing, packaging, serving or distributing and washing.

Six root causes could influence the slip and fall accidents at food production workstation. It comes from floors, dirt, working stances, manual dealing with, personal protective

equipment (PPE), and experience.

To analyse working postures, observations during work activities from different departments were recorded using a camera. Each repeated activity was recorded for 20-30 minutes. The data were analyzed using Rapid Upper Limb Assessment, RULA (Lynn and Corlett, 1993).



Figure 3 Working posture

Table 2 Comfort level of RULA analysis

Score	Level of MSD Risk
1-2	Negligible risk, no action required
3-4	Low risk, change may be needed
5-6	Medium risk, further investigation, change soon
6+	Very high risk, implement change now

Table 2 shows the comfort level of RULA analysis. The analysis helped in to justify the level of MSD risk (Meksawi and Virasakdi, 2012).

RESULTS AND DISCUSSION

This study was conducted to observe the critical activities of postures among workers in food production workstation. This study found six factors which lead to discomfort and unsatisfactory working posture during work. From the findings, the factors were working postures, experience, flooring condition, contaminant, manual handling and personal protective equipment (PPE).

Table 3 Factor of working posture

standing	62%
run	8%
twist	10%
walking	20%

Table 3 shows the findings of the first factor, working posture. Working posture could be ordered into four primary positions; standing, twist, walking and running. Most employees guaranteed 62% standing is the principle position for sustenance generation exercises from 8 am to 5 pm. Right around 20% of employees expressed that walking was their working stance. Despite this, 10% stated that twisting was utilized for their working posture contrasted and running as it were. About 8% advocated that this position was utilized amid work exercises. From the information, employees needed to stand, walk, twist and now and again hurried to satisfy their job task which took over 6 hours to finish their undertakings with various sorts of working postures. Figure 3 demonstrates the standing, twist and walking of working posture in performing production job.

Table 4 Experience during working factor

During the period of work, have workstation give impact on the safety and health		Body Part effect from working positions	
Yes	80%	Back pain	14%
		shoulder	7%
		waist	14%
No	20%	Hand	14%
		Leg	50%

Table 4 displays the workers' experience factor and pain in certain parts of the human body during work. 80% workers agreed that with long working hour, their working postures had bad impacts on their safety and health. About 50% of them agreed that leg was the most affected body part. Besides, 14% claimed their job task disturb their body parts such as back, waist and hand. Only 7% complained painful at shoulder also due to their work activity. As their work walks and stands between 6 to 8 hours causing 50% pain in the legs. Sometimes workers used combination all of the working position mention above during working. Working hastily will contribute to slip and fall accidents (Derosier et. al., 2008).

Table 5 Floor and Contaminant condition Factors

Are the floor mat is available for you to be standing for a long time		Are the floor surface at your path is slippery and greasy	
Yes	20%	Yes	72%
No	80%	No	28%

Table 5 shows the third and fourth factors. 80% of the respondents concurred that floor mat was not given on the floor surface in the workplace. It particularly demonstrated that workstation was a high hazard region and could caused slip and fall accidents, 72% of the answerer concurred that the floor at their pathway was elusive and due to the fact that food production workstation is often filled with cooking crude material, for example, oil, water and cleanser. These are the main contaminants that build and develop slip and fall accidents in the food production workstation area. Figure 4 shows the exact floor state at food production workstation. Greasy and slippery floors stem

from oil spills or water. In any case, if there is a spill of oily substances, after some time the floor will not dry itself and it will lead to mossy surface and this condition might cause harm for everyone who walks through such area. The conditions are worsened by the footwear of workers which tend to spread water and oil everywhere. Figure 4 marked in red is a dangerous area that needs to be removed to avoid the slip and fall accidents.



Figure 4 Greasy and smooth route

Table 6 Factor of carrying the load

<i>Do you need to move things or objects in close proximity</i>		<i>Do the management give the training to operate manual handling or lifting objects during working</i>	
Yes	69%	Yes	65%
No	31%	No	35%

Table 6 shows the factor of carrying the load. About 69% of the respondents agreed that they faced difficulties in moving things to a close proximity area. The management provides training on how to manage manual handling or for lifting objects during work. Figure 5 shows food production workstations storing different types and sizes of cooking utensils. The combination of equipment weight with the working way of producing static or dynamic posture motion. Workers whose tasks require prolonged standing might feel discomfort which in turn creates imbalance problems.



Figure 5 Cooking utensils

Table 7 illustrates which the sixth factor is Personal Protective Equipment Factor. Almost 81% of the employees stated that PPE was given, the rest 19% responded otherwise. Footwear or safety boot is one of the personal protective equipment provided to be worn in food production workstation. The flooring factor in the food production working area is

exposed to slippery and greasy hazards which have the potential to cause slip and fall accidents and create harm among employees. To counteract or lessen the dangers, footwear (Figure 6) ought to be in great conditions for employees to perform well. Personal Protective Equipment is crucial to employees, particularly when working with various posture and carrying with various kinds of loads.

Table 7 Personal Protective Equipment (PPE) Factor

<i>Is the personal protective Equipment is provided</i>	
Yes	81%
No	19%



Figure 6 Footwear

A merging of the factors mentioned above was leading higher rate of slip and fall accidents especially when employees do not take safety matters into account seriously during working hours. Working with prolonged standing position will create an onset of fatigue to employees. Stress and fatigue, in turn, can create safety hazards in the workplace and body imbalance like concentration in working and pains in certain parts of the body. Performing such a production operation is unhealthy. Performing the same job under the greasy and smooth flooring condition create a high risk for the occurrence of slip and fall accidents. Carrying load is required especially the cookware has different sizes of different types. When employees are walking while carrying heavy items, it is likely that they will quickly get tired especially on certain parts and this situation is especially dangerous if they do not use the appropriate PPE equipment. Thus, the use of proper PPE helps to reduce the pain especially in working with unhealthy postures and uncomfortable especially for a long time. Example of PPE lumbar with alterable support for back, knee, ankle, elbow which are used in lifting cookware and suitable for food production workstation environment. Remaining with unhealthy working postures in prolonged period cause hurt to workers' physical toughness. At all movement whether standing and walking for prolonged time affects the muscle-skeletal system (J. Swann, 2009). This framework may meddle with step and stability, putting people at a greater hazard of slip and fall accidents.

Details	Grilled meat	Peeling onions	Cut of meat	Cooking Black paper sauce	Frying	Dishcloth	Wash utensils
Upper Arm	4	4	4	3	4	4	4
Forearm	3	3	2	3	3	3	3
Wrist	4	4	4	4	4	4	4
Wrist Twist	2	2	2	2	2	2	2
Posture A	6	6	5	5	6	6	6
Muscle	1	1	1	1	1	1	1
Force/Load	0	0	0	0	0	0	1
Wrist And Arm	7	7	6	6	7	7	8
Neck	4	4	4	4	4	4	4
Trunk	4	4	4	3	4	4	4
Leg	1	1	1	1	1	1	1
Posture B	7	7	7	6	7	7	7
Neck, Trunk and Leg	8	8	8	7	8	8	9
Final Score	7	7	7	7	7	7	7

Wounds caused by the redundant development of various human body parts are known as Repetitive Strain Injuries (Jaita, 2012). Continuous Strain Injuries, for the most part, are classified into four primary bodies, for example, a) hand-wrist b) arm-elbow c) bear neck and d) leg-foot. At kitchen working environment, dull developments may happen, particularly twisting while at the same time taking utensils or fixing from various statures, lifting and manual dealing with while conveying overwhelming burdens, for example, cookware and raw material. The major issues arise from Repetitive Strain Injuries are posture inconvenience and cumulative trauma disorder. Information from the survey demonstrates four working stances were delivering outrageous torment in a human body part, for example, back, bear, abdomen issue, and furthermore leg. These torments restrict their capacities due to weakness and will add to the loss of stability, creating slip and fall accidents. Food production workstation flooring creates danger and injury to employees, hence, installed mats will ensure them throughout working hours and lessen the slips and falls incident. The management should provide mats to secure against various movements. Surface mats and sprinters should have an inclined edge, boundary stage or another handling of to help diminish the probability of stumbling at the boundary. This case study results showed some similarities to other studies in literature in which most working postures were dominated activities like bending, followed by standing and repetitive work, and working in awkward postures resulted from those activities (Deros et. al., 2010).

After analyzing the data from the questionnaire, data of observation were analyzed using RULA Employee Assessment Worksheet to determine RULA score for critical activity posture.

Table 8 demonstrates the detail some portions of the body poses that are delivered in high hazard working stance. Based on the results, each part of the body discomfort led to bad posture.

Table 8: RULA Employee Assessment Worksheet for critical Posture Activity

Three different departments such as processing, serving or distributing and washing produced very high hazard with a result of >6+ on Wrist and Arm, Neck, Trunk and Leg. Changing the stance quickly is required for that working stance. Then again, task at production, for example, Cutting meat and Cooking Black paper scored 6 on Wrist and Arm and scored >6+ on Neck, Trunk and Leg. Subsequently, when the level of MSD score was 6 which was delegated medium hazard and required further examination and needed to change soon, it ought to be considered to conceivably deliver high take a huge risk, Trunk and Leg the MSD score expanded to >6+.

Therefore, this study showed that 7 critical activities in the food production workstation came from three different departments namely processing for activities: grilling meat, peeling onions, cutting meat, cooking black pepper sauce and frying, serving, distributing department for dish clothing activities and finally washing department for washing utensils activities which produced RULA score of 7. When the score was more than 6, the activity was considered very high risk and the posture should implement immediate change. These activities produce different extreme awkward postures especially in completing daily work. The repeating through unsuitable posture will result in strain and eventually cause to fatigue. Musculoskeletal claims among catering workers were high especially during heavy lifting and prolonged awkward posture (Salleh et. al., 2017).

Therefore, asserted, standing is the most working position used during work, followed by walking, bending and running in food production activities. Working with the extended standing position is reflect unhealthy posture for the human physical structure. Everyone with their own and distinctive capacities and impediments, when the representative had an accomplished with mischance or wellbeing condition issue will effortlessly add to unbalance issue. The relationship of those factors listed perhaps produce a slip and fall accident. Finally resulted in temporary and fixed injuries until prompting fatalities. At the point when our body stances are used effectively, low energy is utilized and exhaustion can be reduced. The best postures give equalization of the muscle to serve and give backing for the specific

organs, it is critical for staff to take care of their own stance to keep away from the advancement of issues in later life. Rebuild and limiting the work move was important to decrease the impact of long period standing.

CONCLUSION

In conclusion, there are six factors exist in the case study such as working stances, involvement, flooring condition, contaminant, lifting load and personal protective equipment(PPE). The combination of these factors might create a hazard and produce slip and fall accidents among food production workers. The findings from this study yielded that minimizing the work shift was necessary to reduce the effect of prolonged standing. Workers who experienced prolonged standing would lead to fatigue and this condition triggered potential slip and fall hazard. This study can be a guideline to hotels, restaurants and food service industries for solving the slip and fall incidents and a precaution on the safety and health matters in the workstation.

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COMPETING INTERESTS

There is no conflict of interest.

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