
ERGONOMIC ANALYSIS OF MUSCULOSKELETAL PROBLEM AND FATIGUE AMONG CATERING WORKERS

by

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Abstract

Musculoskeletal disorders (MSD) are condition including muscle which exaggerated by stress and repetitive or static position for a long time, meanwhile fatigue is body protection mechanism. Those two problems had been known as risk to workers and affected their productivity. An ergonomic analyzed included task, organization and environment needed to decrease and prevent of work musculoskeletal problem and fatigue among the workers, because those will affect their focus, productivity, worsen if there any injury and disability. This observational study aims to evaluate ergonomic analysis to musculoskeletal problem and fatigue to catering workers industry at Denpasar Bali. Samples of this study were catering workers, observes done by writer based on ergonomic analysis in aspect task, organization and environment. Musculoskeletal problem measured by Nordic Body Map (NBM) and fatigue assessed used questionnaire by Japan Association Industrial Health (JAIH). Data analysis used SPSS. Due to condition, in the catering industry their task divided good, but for the break time of workers too short and the environment not find ergonomic standard in the lighting, noise and safety equipment. Parametric and non-parametric test musculoskeletal problem and fatigue pre work and after work among the workers shown significant difference ($p < 0,05$). Therefore, ergonomic standard for the environment in the catering work industry need to improve for prevent of musculoskeletal problem and fatigue among catering workers.

Keywords: Musculoskeletal problem, Fatigue, Catering Worker, Ergonomic Analysis

INTRODUCTION

Musculoskeletal disorders (MSD) are condition including muscle which exaggerated by stress and repetitive or static position for a long time. There are work related musculoskeletal disorders (WRMSD) which are conditions affected muscle, ligaments or tendon caused by work, though often other activities (Rizka, 2012). Prevalence of MSD in Malaysia is high among worker and hence that will be the most important cases due to affected productivity, disabilities and economic (Tan, D 20120). MSD caused by muscle contraction and increase stress in muscle tissue affected obstruction blood vessel. Static position and long duration have known as risk factor of pathological of MSD and manifested as pain and fatigue (Daryono, 2016).

Fatigue is body protection mechanism

(Mulia, 2019). Fatigue is a condition or symptoms of lack of psycho-physiology as temporary such as sensory receptor, motor receptor and system. It caused by a stressor or workload for long time and/or had repetitive cycle. Another hypothesis about fatigue is the system had external stressor in few years without break or overcapacity (Adiputra, 1998). Work fatigue related to complex criterion of physical fatigue and physicist that affected reduction of physical capacity, depression, motivational degradation, and productivity. (Budiono dkk, 2003). Work fatigue suffered by the workers and it is depending on their workload which is an interaction the demands of tasks, working environment, skills, behaviour and perceptions of workers (Maharja, 2015). Combination of muscle problem and fatigue in workers had known will

affected productivity and health disorders which are cause the injury and disability. Those problems caused uncomfortable work that if continuing impact of decrease job performance and impacted to companies.

The catering industry is a business ruining in provide food to the customers to their home, party, meeting, canteen and cafeteria. The food given by the catering depending on customers order. In the catering business, there a chef who lead cooks and some workers help to preparation and assist to make the food. Based on surveys from various samples, prevalence of MSD among the chef and catering workers is high. They suffer from MSD for long time and have treatment (Tan D, 2020).

One of famous catering industry in Bali is home catering service at Denpasar is Ms. Warti Buleleng Catering. They located in JL. Ganetri, 4, Gatot Subroto Timur, Tonja, Kec. Denpasar Utara, Kota Denpasar, Bali 80235. This business ruined for around thirty-one years and they served various menu such as Balinese traditional food, National and international. This industry has more than 100 workers divided in 3 divisions, preparation include buying the ingredients, cooking and packaging. They also had division to decorate event that will help when the food served in party or event. Some workers had been suffered from MSD according interview with the owner. Based on the reasons, the analyzed of musculoskeletal problem and work fatigue in catering workers needed to observe the work environment based on ergonomic analytic.

LITERATURE REVIEW

Ergonomic, from Greek was Ergon (work) and Nomos (norm or law). Ergonomic is a applied science concerned in work laws and focused to knowledge, technology and art (Manuaba, 2005). Ergonomic helps the industry to combine technology and health to increase the productivity. Tools and work environment are the most important that effect workers. Those could reduce or increase the productivity

or the negative impact was work related disorder disease (WSD) (Manuaba, 1992).

Regarding to Humantech, 1995 musculoskeletal disorders (MSDs) is a trauma cumulative. Musculoskeletal disorders were pathological symptoms affected muscle tissue, ligament, tendon and nerve. In general, these symptoms divided as reversible and persistent. Musculoskeletal disorders caused by over stress load in tissue and repetitive movement or can caused by failed of healing progress. This symptom representative by pain, cramps, tight or fatigue.

Fatigue is a signal or mechanism of body. Work related fatigue problems were criteria complex in the body including physiological and the body. Fatigue in the muscle caused by static position that affect to muscle contraction and metabolism (Guyton dan Hall, 1997; Grandjean, 2000). Work related fatigue caused work productivity and affected focus, if that worsen will effect to mental health (Grandjean, 2000).

METHODS

This Observational study was conducted in one day (Tuesday, 25 Februari 2020 at 10.00 WITA - 17.00 WITA). Identification of problem assessed, observed and documentation of process the catering industry. Population of this study is all workers of Ms. Warti Buleleng Catering industry, but the workers who are eligible to be samples in study are 10 due to permission by the owner and due to pandemic, there are workers that is not on duty. Identification problem of work environments conditions, equipment, and health condition workers there. Collection data by the interview and measurement of Lighting used lux meter, room temperature used thermohydrometer, noising measured by sound meter. All of that could downloaded at apple store or play store. Measurement of MSD used Nordic Body Map (NBM) that contain 30 items of rating scale, and for fatigue data samples used questionnaire by Japan Association

Industrial Health (JAIH) that contain 30 items too.

MEASUREMENTS

Musculoskeletal disorders assed by Nordic Body Map (NBM) which contain 30 items likert scale related to pain or symptoms in their extremity. 1= no pain, 2= less pain, 3= pain and 4 = significant pain. Total score will show in table below.

Table 1. NBM Score

Scale Likert	Total Score	Risk	Intervention
1	28 – 49	Low	No intervention needed.
2	50 – 70	moderate	Maybe need some intervention in the next days.
3	71 – 91	High	Need the intervention soon.
4	92 – 112	Very high	Compex intervention needed as soon as possible.

Fatigue was measued using questionnaire by Japan Association Industrial Health (JAIH) contain 30 items related in work fatigue. 30 items divided as 1-10 activities fatigue, 11-20 items about motivational and las 21-30 about physical fatigue.

DATA ANALYSIS

Analyzed data used SPSS by test of comparability MSD and fatigue with p significancy at <0,05, analyzed of ergonomic based on interview, documentation and observation.

RESULT AND DISCUSSION

Ergonomic Analytic including observation of Task, Organization and Environment. Task in catering workers divided to 3 divisions are national, traditional and

international. Their tasks were in each division; preparing of ingredients, storage, compounding of ingredients, cooking, packaging and distribution, serving (if needed). In each division, catering worker had different work position. There are standing, sitting, even squatting and all of them did in almost eight hours in a day. For cooking team, they did repetitive movement for cutting, mixing and also squishing the ingredients with their hands. Organization analyzed in work environment were operational hours started at 07.00 WITA to 19.00 WITA, there are 7 officers beside catering worker in the kitchen. The owner gave them facilitate such as dorm for 80 workers include meal for them. Time break of workers was not organized well, sometimes they did not had time to had break due to order reach 10.000 pack of foods. Their salary given as junior and senior, plus bonus amount Rp. 5.000 for one food in a month. They covered by health and worker insurance. For the work environment, overall condition was good. Temperature range 30 degree – 80 degrees Celsius, noise in 74Db and light measurement was 135. In addition, they do not have information display about safety in the kitchen and the workers did not wear safety apron and gloves while cooking.



Picture 1. Catering worker sitting in non ergonomic position with unconditional environment.



Picture 2. Lighting in the work station (kitchen).

Sample of this study were 7 from around 100 workers there, due to pandemic and conditions by the owner there are 7 workers as to sample. Characteristic of sample in this study shown below in table 2.

Table 2. Data Characteristic Samples

Variable	n	Mean \pm SD	Percentage
Age (year)	7	38 \pm 4.61	-
Male	2	-	28.6%
Female	5	-	71.4%
Fatigue Pre-Work	7	44.80 \pm 10.74	100%
Fatigue Post-Work	7	62.5 \pm 7.13	100%
Musculoskeletal Problem Pre-work	7	47.8 \pm 5.5	100%
Musculoskeletal Problem Post-Work	7	57.7 \pm 5.3	100%

Category of age among samples in this study had mean 38 year and this was similar with a recent study that used samples in mean age 39 years. In this age, people reach productivity level to work and had high risk get musculoskeletal problems and fatigue due to work (Tan, D, 2020). Among the catering workers there, dominant female workers than male workers, especially in the kitchen. Male workers had been in the event to prepare ingredients and stainless tools which that was heavy.

All data fatigue of workers and musculoskeletal problem analyzed to normality

test used Shapiro-Wilk Test and p value = 0,05. Normality test for the Fatigue (Table 2.) shown data pre and post work had normal with p value > 0,05. Meanwhile, normality test data Musculoskeletal (Table 3.) problem pre and post work not normal because of p value < 0,05. Analysis of comparability test data work fatigue (Table 4.) among catering worker used parametric test, paired t test and resulted there was significant difference statistically with p value 0,03 (p < 0,05) pre and post worker. That mean samples in this study had fatigue after work. Similar data for musculoskeletal problem used Wilcoxon-test shown significant difference statistically at p value < 0,05 (p=0,014). As the result, known the musculoskeletal problem among catering workers there in high risk.

A recent study from Tan, D stated that work musculoskeletal problem among restaurant chefs in Malaysia caused their work posture. Their musculoskeletal problem the highest prevalence were feet, lower back, and shoulders (Tan D, 2020). Consider with study from Guo Y L et al., had result samples with high prevalence musculoskeletal problem among catering workers in Tainan were pain over the shoulder/neck, low back, elbow and wrist, and areas numbness over the hands. (Guo Y et al., 2021). Musculoskeletal Problem had known caused by overstress in the body while working, repetitive movement, bad posture while sitting, standing and work (not ergonomically position), and poor posture in lifting weight (Leah, 2011). Based on Tarwaka, 2014 and Suma;mur 2009, Fatigue divided as 2 are general fatigue and musculoskeletal fatigue and those caused productivity among workers especially field workers like catering workers.

Table 3. Normality Test Work Fatigue

Variable	Mean	Standard deviation	P value
Pre-work	44.8	10.7	0.68
Post-work	62.5	7.1	0.43

Table 4. Normality Test Musculoskeletal Problem

Variable	Mean	Standard deviation	P value
Pre-Work	47.8	5.5	0.014
Post-work	57,7	5,3	0.014

Table 5. Comparability test on work fatigue

Variable	Mean	Standard deviation	Range	P value
Pre-Work	44.8	10.7	33-67	0.03
Post-Work	62.5	7.1	53-71	

Table 6. Comparability Test Musculoskeletal Problem

Variable	Mean	Standard deviation	Range	P value
Pre-Work	47.8	5.5	42-59	0.014
Post-Work	57.7	5.3	52-69	

CONCLUSION

Ergonomic analytic in workers a Catering industry especially at kitchen was not in standard ergonomic quality including work position, environment, lighting and the temperature there. The workers did not wear standard uniform and also did not properly wearing mask, hand gloves etc. The high risk of

MSD and fatigue among the workers related to ergonomic position and work environment.

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