
**CHANGES OF WORK CONDITION AND THE MC KENZIE
ERGONOMIC INTERVENTION COULD DECREASE OF
MUSCULOSKELETAL DISORDER AND WORK FATIGUE AMONG
“DODOL” INDUSTRY WORKERS WITH LOW BACK PAIN**

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ABSTRACT

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An unergonomical working condition could cause low back pain due to wrong position. For those condition affected to work production and the worsens is disability. This study aims to change of work condition by gave break time actively with the solution placed of water and all tools equipment distance, and prevention with McKenzie ergonomic intervention to decrease of musculoskeletal disorders among ‘dodol’ industry workers. This experimental study used treatment by subject design and there were 12 samples study. Period 1 of this study is working condition of process mixing “dodol” without any intervention given by researcher, meanwhile period 2 samples already work with changes strategy based on ergonomic and washing out period, also adaptation held in along period. Low Back pain was measured by Oswestry Disability Index (ODI) and productivity based on comparison product in a day, and score for low back pain measured per work time. Data was analysed with SPSS ver.16 and $\alpha=0,05$. Results of this research that there was significant difference statistically among variable, and difference of mean is 7,33 or there was decreased of

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musculoskeletal disorders 10% from 54,31±0,79 to 45,04±0,88. The conclusion of this study that changes of work condition with ergonomic basic could decrease musculoskeletal disorders among “dodol” industry workers with low back pain syndrome at Penglatan, Buleleng Regency.

KEYWORDS

Changing of work’s condition, Musculoskeletal Disorders, Low Back Pain



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INTRODUCTION

A famous “Dodol” home industry in Buleleng was at Desa Penglatan. Their product “dodol” had been exported to abroad and foreigner was like it. Process of make “dodol” still used traditional tools and equipment including fire, mixer that was called “suit” and they still used wooden either fuel. Process of making “dodol” divided to process of making flour, then coconut cream and all of those boiled along with brown sugar, sugar palm, mixing of glutinous rice flour, “injin” flour and coconut cream. Next process was mix of all those ingredients for 5 hours and that must continue by the workers, and they will do that in static position. There was “dodol” dough around 27 kg and all need to mix continuing. A worker usually did 6 times for dough with standing static position and used tool to mix it that size was not ergonomic, therefore worker do that in bad posture and affect to musculoskeletal disorders.

The problems from “dodol” industry, hot environment could reach 30 degrees Celsius, noise from flour maker and coconut cream maker reach 94,29 dB and attention to wooden on the fire settings. This situation if continue could affect mental health of worker, uncomfortable and musculoskeletal disorders among them. A recent study stated that worker dominant standing position and squatting static and while they standing there were flexion movement of cervical, rotate of shoulder, flexion lumbar and bending to lateral, twisting of spine and this movement was repetitive especially movement of elbow. If this position continuing, that will affected muscle strength of Upper extremity, overload of back and caused back muscle unstable and reduce muscle strength, and due to repetitive movement there will spasm around back muscle and caused low back pain. Based on Nordic Body Map (NBM) to measure musculoskeletal disorders in 7 samples, there are pain (21,4%). Another study stated that workers who pain at right shoulder (27%), low back (45%0, left shoulder (21%) and lower extremity (13%) and all workers in that study felt pain and had uncomfortable in extensor muscle and flexor lumbosacral.

Work condition which not find an ergonomic standard eventually will cause low back pain and could overcome with changing the condition in the form of arrange their break time between work hours, changing of water position and flour maker tools, also changing position of coconut cream maker distances 2 meters from them so they have walk little to have that. The prevention strategy was given them the Mckenzie ergonomic intervention. The principle of MzKenzie exercise was changing posture and decrease of hyper lordosis lumbar spine, improve strength muscle flexor and stretch of extensor group muscles that was stated at recent study by (Jumiati, 2015). This exercise was one of back exercise that effective to change the posture and reduce musculoskeletal disorders, also to increase mobility of spine. Effect of this exercise could decrease of work fatigue due to

blood circulation and it will affect to muscle cell healing optimal. In this study, all of intervention could affected work condition will give effective, comfort, safety, health and efficient that was decreasing indicator of musculoskeletal disorder among “dodol” industry at Penglatan, Buleleng Regency. This area study rarely to intervent, so this approach hopefully will help them. The observational study by researcher before found the problem among the workers and try to apply change work condition and use ergonomic exercise to decrease the symptoms.

RESEARCH METHOD

This study was experimental study with treatment by subject design conducted in another time period. Study was in “Dodol” home industry at Penglatan Village, Buleleng Regency and 8 weeks period study from December 2020 – March 2021. There were 12 samples chosen and given treatment by researcher. Low Back Pain was measured by Nordic Body Map (NBM) questionnaire. Analysis data used SPSS ver.16 with value $\alpha=0,05$.

RESULT AND DISCUSSION

Mean of age samples was $39\pm 7,786$. (table nya diisi karakteristik and Mean of work period samples was $9\pm 3,143$ with range in 5-15 years. Humidity at the working station is the highest number and as well as the temerpature. That show there were significant differences statistically after period 2 ($p<0,05$) (Showed in table 1.)

Table 1. Comparability test work condition

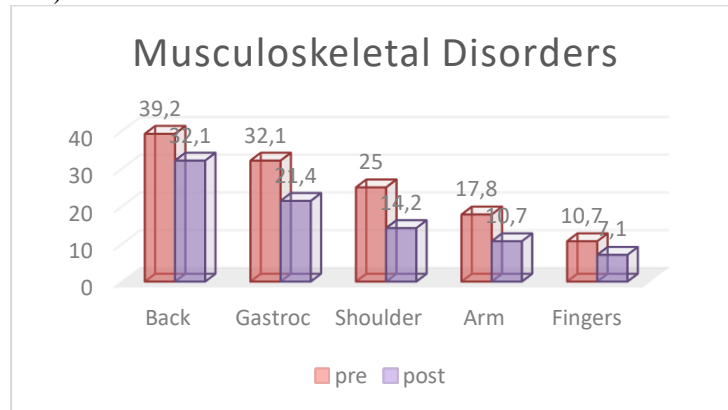
Variable	D	Period 1	Period 2	P value
		Mean±S	Mean±SD	
Temperature (°C)	,85	29,35±0	28,92±0,73	0,078
Humidity (%)	,87	70,00±7	71,57±7,64	0,079
Light Intensity (lux)	59,50	298,92±	292,14±66,	0,593
Noise (dBA)	,05	75,78±4	77,79±6,10	0,203

Analysis data musculoskeletal period 1 and period 2 found significant difference statistically with p value $< 0,05$ in post data, and difference of mean was 7,33 or decreasing musculoskeletal disorders around 10%.

Table 2 Analysis Data Musculoskeletal Disorders

	Pre	Post	P value
Period 1	35,46±1,72	54,31±0,79	0,002*
Period 2	35,13±0,79	45,04±0,88	0,000*
P value	0,390**	0,002**	

There was Decreased of musculoskeletal disorders prof on the picture and shown on the chart that period 2, area back, gastrocnemius or lower extremity, shoulder, arms and fingers. MzKenzie exercise and changing work condition gave relaxation effect due to stretching of antagonist muscles, and caused isometric along autogenic inhibition (GTO). After changing of work condition, there was decreased of blood circulation and help cell muscle to healing therefore, there was decreased of accumulation fatigue and musculoskeletal disorders among “dodol” workers with low back pain condition. (Showed at picture 1)



Picture 1. Chart of musculoskeletal disorders

Workers who age 20-50 years had physical ability stronger and they had good productivity, meanwhile workers who age more that 50 years had weak physically and impacted to their productivity. That mean, as older there was bone degeneration and necrosis of tissue, it will made scar tissue and decrease of stability and elasticity of bone and muscle (Hadyan, 2015). Work period was risk factor that affected of risk worker to have musculoskeletal disorder especially them who work with strength (Rivai, 2014). Environmental condition was another risk that could effect on musculoskeletal disorder among workers. Based on Sedarmayanti (2009) stated that risk factor from physical work were humidity, air circulation, lighting, noise and mechanical vibration. Data from Menaker (2018) work condition in all period in this study was showed ideal condition that need to applied by this industry.

Musculoskeletal disorders were caused by muscle contraction that effected of increasing load in muscle therefore there were obstruction in blood circulation in blood vessels. Decreasing of blood circulation had risk to static contraction. Muscle energy could made mitosis cell and there was ion calcium accumulation could necrosis of cells. This static contraction which long period based on Daryono (2016) could affected of pathology process resulting pain.

Workers who had in static position in long period and with those work environment was not health and not meet ergonomic standard. This condition will cause of problem and longtime standing static position made them to balance their body which caused work load static among lower extremity muscles and caused blood clot there with risk kyphosis of spine and low back pain.

This work methods that caused work position uncomforted and happened in long period with those mixing movement and repetitive could cause problem in musculoskeletal. While work, as human being will be found position and adapt with system. Those condition caused musculoskeletal disorders especially low back pain symptoms. To solve that problem, we need to know what is criteria for work ideally; (1) muscle contraction static less, (2) static position relax always better (Sutajaya, 2018).

McKenzie exercise was one of back exercises proven could changing posture and decrease of musculoskeletal disorders, also increasing mobility of spine while work. Meanwhile, operationally, aims of give this exercise were to stretch back muscle (extensor muscle) and this exercise prioritize extension movement to have strength and stretch muscle along extensor and lumbosacral joint, resulting reduce of pain (Moldovan, 2012). Stretching muscle to resting length and had circulation optimal to the brain made this condition decrease of work fatigue. This intervention to change work condition including the break time active and McKenzie exercise will the best ergonomic solution that change of layout, exercise and stretching effected to relaxation spasm muscle, stretching of antagonist muscles. Stretching of antagonist muscle had from isometric contraction of muscle and change in work condition with addition McKenzie exercise. Those could increase relaxation and decrease pain along spasm.

Based on stated McKenzie (2000), McKenzie aims to decrease of pain and functional activity to mobile maximal from lower back, or maximal movement of the body. Besides that, stretching of muscles to resting length condition could gave blood circulation maximal to brain and help reduce of work fatigue also increasing of focus (Ganong (2008). McKenzie effected to relaxation spasm muscle due to of stretching antagonist muscles and gave isometric contraction resulting of decreasing the pain. McKenzie ergonomic intervention and work condition changes within took break time active while working and distances 2m of water position and the flour and coconut cream maker made workers had been better. This changes use ergonomic approach with total decrease of musculoskeletal around 5,24% among craftsman at Kediri, Tabanan Adiatmika (2007). Therefore, this intervention had been known good to ergonomic and work condition changes proven could decrease musculoskeletal disorders.

CONCLUSION

Based on the analysis and discussion it can be concluded that changing of work condition within ergonomic could decrease of musculoskeletal disorders in “dodol” workers industry with low back pain at home industry Penglatan Village, Buleleng regency around 10%.

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