

# RISK OF MUSCULOSCELETAL DISORDERS (MSDS) ON TRADITIONAL JEWELRY CREAMERS

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## Abstract

The risk of Musculoskeletal Disorders (MSDs) can occur in a variety of occupations including in traditional jewelers. The complaint is caused by an awkward position during work activities. The study aims to identify complaints of Musculoskeletal Disorders (MSDs). This study used qualitative approach through in-depth interviews on 5 key informants and 2 key expert informants and ergonomic risk determination referring to the BRIEF method. The results showed that all informants experienced complaints of the upper neck, lower neck, right shoulder, back, right elbow, right upper arm, and right forearm. Measurements through the BRIEF sheet show that complaints on the left and right elbows, left and right shoulders, neck, and back include high category ergonomic hazards while complaints on the hands and wrists of the right include moderate category ergonomic hazards. High risk of Musculoskeletal Disorders (MSDs) is found at all stages of work (smelting, grinding, posturing, jewelry formation, and gilding). Therefore, workers are recommended to perform muscle relaxation for (8-12 seconds) every half hour.

**Key Words:** Musculoskeletal Disorders (MSDs); risk; traditional jewelry creamers

## 1. Introduction

International Labor Organization data in 2014 recorded an informal sector workforce in Indonesia of 53.6%, the workers did not get guaranteed safety and accidents (ILO, 2014). Occupational Safety Law No.1/1970 states that every worker is entitled to protection for his/ her safety in doing the work (Yusida et al., 2017). The informal industry in Indonesia itself is still not concerned about the potential dangers posed by the ergonomic aspects stored in each part operated in the industry (Tarwaka et al., 2010).

In doing the work, workers with the wrong work posture for a long period of time are at risk of experiencing some musculoskeletal disorders (MSDs) muscle disorders and other disorders that can make the process of production is not optimal (Andrian, 2013). MSDs are one of the diseases resulting from the wrong working posture with symptoms of attacking muscles, nerves, tendons, ligaments, joints, cartilage, and spinal cord. Symptoms of the disease are not the result of instant or direct work and not also acute events (falling, slipping, slipping, or falling) but rather caused by events or work carried out continuously.

The National Health Interview Study (NHS) (2008) reported that complaints of musculoskeletal disorders are the cause of 50% of occupational illnesses. The Bureau of Labor Statistics (BLS)

reported that in 2011 complaints of musculoskeletal disorders accounted for 33% of all occupational injuries and occupational illnesses with 387,820 cases (Proyojani, 2016). The Philippines has a very high risk of musculoskeletal disorders and occurs in all traditional jewelry manufacturing processes; it requires improved work posture and redesign of the workplace to reduce the risk of MSDs (Caparas, 2020).

Data from the Central Bureau of Statistics (BPS) of South Sumatra in 2017 stated that 57.31% of people worked in the informal sector. As many as 30% of the people of Tanjung Batu, Ogan Ilir Regency, South Sumatra Province work as jewelry craftsmen. In the manufacture of jewelry crafts, every work activity of its workers is filled to suffer the occurrence of complaints of MSDs related to ergonomic problems. Based on the statement, research was conducted to assess the danger of ergonomics to jewelry workers in Tanjung Batu Village, Ogan Ilir.

## 2. Method

This research uses qualitative research, which is research that uses special techniques to obtain in-depth information or answers about a person's perceptions, opinions, and feelings. This research is descriptive, describing a comprehensive and detailed picture of events. Descriptive data in the form of written or spoken words of people and observable behaviors, using phenomenological approaches in which researchers interpret, interpret the results of their studies. Research is observational through cross sectional approach. The data was collected based on

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**Table 1.** Distribution of Musculoskeletal Disorders (MSDs) Complaints to Jewelry Making Workers in Tanjung Batu Village

Complaints	Number	Percentage (%)
Low (1-28)	0	0
Medium (29-56)	0	0
Severe (57-84)	2	40
Very Severe (85-112)	3	60
<b>Total</b>	<b>5</b>	<b>100</b>



**Figure 1.** Smelting Work Posture and Ergonomic Measurement Angle

interview guidelines (modified from Nanda research, 2019), BRIEF survey sheet, and Nordic Body Map questionnaire (Inc, 1995). Sample determination techniques are done purposive random sampling. The source of information is 2 people as a key informant and 5 people as informants. The level of ergonomic hazards in 9 parts of the worker's body is determined based on the BRIEF method

### 3. Results And Discussion

#### Overview

Based on data from the Central Bureau of Statistics Ogan Ilir in 2018, the population of Tanjung Batu consists of 3,568 people, about 30% of the people work as jewelers. Making jewelry is an informal job of the community itself or that works for others. The number of jewelries making businesses that have a permanent building in the Village Tanjung Batu as many as 238 locations, at each business location there are 4-10 workers.

#### Musculoskeletal Disorders Complaints (MSDs)

The results showed that the most complaints were felt by workers by 100% on the upper neck, lower neck, right shoulder, back, right elbow, right upper arm, and right forearm. For complaints of 80% occur in the left shoulder, waist, left elbow, right wrist, right hand, right thigh, and right ankle, and the rest complain on other parts of the body. Most workers experience complaints of Musculoskeletal Disorders (MSDs) every day after work. Distribution of Musculoskeletal Disorders (MSDs) Complaints can be

seen in **Table 1.**

#### Ergonomic Hazard Assessment

##### a. Assessment of Smelting Work Posture

The stages of smelting work have a high level of ergonomic danger are on the right elbow, right shoulder, and neck with a final score of 3. The right elbow position is extended by 135° to 20 seconds with a frequency of 3 times per minute including a high level of ergonomic hazard. Based on Pramestari (2017) research, 67% of production workers complain of pain in the right elbow due to the activity of wrapping the product retaining the elbow in an extended position of 135°. The right shoulder position is in the Arm Behind Body state for 20 seconds with a frequency of 3 times per minute including a high level of ergonomic hazard. According to Nopiyanti (2017), muscles that experience fatigue or tension due to excessive activity in the shoulders, if left unchecked and lasting can cause inflammation of the tendons. Work posture can be seen in **Figure 1.**

##### b. Assessment of Grinding Work Posture

The stages of grinding work have a high degree of ergonomic hazards are on the right elbow, right shoulder, neck, and back. The right elbow position is extended by 150° to 15 seconds with a frequency of 4 times per minute including a high level of ergonomic hazard. Complaints on the elbow can be caused because the craftsman performs continuous movements at the time of cutting wood (Wiratma et al., 2015). The right shoulder position in the Arm



**Figure 2.** Polishing Working Posture and Ergonomic Measurement Angle



**Figure 3.** Ergonomic Posturing and Measuring Angle



**Figure 4.** Working Posture of Jewelry Formation and Ergonomic Measurement Angle

Behind Body is 15 seconds long with a frequency of 4 times per minute including a high level of ergonomic hazard. Malaysia has a lot of work that requires the shoulders to bend next to the body and arms behind the body which is done continuously resulting in 53% of workers experiencing shoulder pain (Zein et al., 2015). The position of the neck flexion  $45^\circ$  duration of 30 seconds with a frequency of 2 times in 1-minute causes complaints of pain in the neck. Bent posture causes neck flexion then to risk of having MSDs. The  $40^\circ$  flexible back position of 30 seconds for 2 times per minute is included in the high ergonomic level. According to Pheasant and Haslegrave theory estimates that approximately 30% of skeletal muscle injuries, especially the waist and back, are caused by bending work attitudes. Grinding work posture can be seen in **Figure 2**.

#### c. Assessment of Posturing

Stages of occupational work that have a high degree of ergonomic hazard are on the left elbow, left shoulder, and neck. The position of the left elbow rotated fore-arm is 30 seconds long with a frequency of 2 times in one minute including a high level of risk. Elbows in a twisting state cause imperfect oxygen flow causing more blood circulation throughout the body and venous return of blood to the heart for longer thus spurring faster heart work causing workers to feel tired faster (Sundari, 2011). Arm Behind Body's left

shoulder position is 20 seconds long with a frequency of 3 times per minute including a high level of ergonomic hazard. As many as 60% of workers complain of shoulder pain and this leads to a 15-20% decrease in work effectiveness. The position of the neck flexible  $70^\circ$  duration of 20 seconds with a frequency of 3 times per minute including a high level of risk. The higher the angle of flexion, the higher the complaint of neck pain felt (Situmorang et al., 2020). Flexible posture causes increased moments of gravitational load on the spine of the neck that trigger tension in the neck muscles. Posturing can be seen in **Figure 3**.

#### d. Assessment of The Working Posture of Jewelry Formation

The stages of jewelry formation that have a high degree of ergonomic hazard are on the right shoulder, neck and back. The position of the right shoulder in a state of lifting  $45^\circ$  for 15 seconds is repeated 4 times per minute including a high level of ergonomic hazard. Elevated shoulder position causes neck pain. The  $45^\circ$  flexible neck of 30 seconds is repeated twice per minute causing neck pain. The movement of the flexible neck causes fatigue and increases pressure on the nerves. The back position is in a flexible position with a  $45^\circ$  angle of 30 seconds with repeated twice in one minute which includes a high level of risk. Jobs with a bent work attitude were 0.5 times more

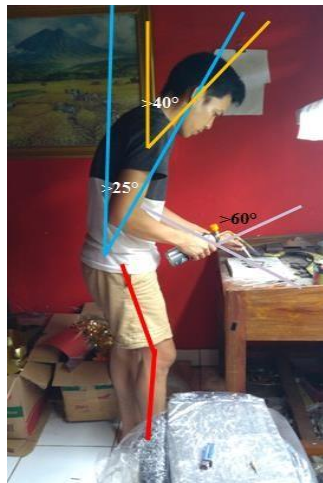


Figure 5. Gilding Working Posture and Ergonomic Measurement Angle

Table 2. Ergonomic Hazard Level Assessment Results with BRIEF Survey

	Hand & Wrist		Elbow		Shoulder		Neck	Spine	Leg
	Left	Right	Left	Right	Left	Right			
Smelting	1	2	2	3	0	3	3	1	0
Grinding	1	2	2	3	0	3	3	3	0
Posturing	0	2	3	0	3	0	3	2	0
Jewelry Formation	1	2	2	0	2	3	3	3	0
Gilding	2	1	0	0	0	2	3	3	0

likely to experience back pain complaints than workers whose work attitudes were not bent (Erna, 2015). The working posture can be seen in Figure 4.

#### e. Assessment of Gilding Work Posture

In jewelry gilding activities, parts of the body that have a high level of ergonomic risk are on the neck and back. The 15-second 40° flexible neck position is repeated 4 times a minute including a high level of risk. This result is in line with research in Celuk Village, silversmiths working in a state of ducking or flexion with an angle of 40° for more than 4 hours per day experiencing complaints of neck pain Padmiswari, 2017). The 15-second 25° flexion position is repeated 4 times a minute including a high level of risk. Bending positions have a 0.5 times greater risk of experiencing back pain complaints compared to workers who are less bent. Ergonomic Hazard Level Assessment Results with BRIEF Survey can be seen in Table 2. Gilding working posture can be seen in Figure 5.

Based on the six activities in jewelry making on table 2 obtained body parts of jewelry workers who have a high level of ergonomic hazards with a final score of 3, occur in the smelting activity on the right elbow, right shoulder, and neck. High levels of ergonomic hazards also occur in the grinding activity of the right elbow, right shoulder, neck, and back. In the activity of insertion on the left elbow, left shoulder, and neck. The activity of jewelry formation occurs on the right shoulder, neck, and back, and the gilding stage is on the neck and back. The body parts that are at risk of musculoskeletal disorders (MSDs) complaints

are on the left and right elbows, left and right shoulders, neck, and back.

#### 4. Conclusion

Based on BRIEF survey method there are 5 stages that are at risk of musculoskeletal disorders (MSDs) complaints, namely smelting, grinding, cloning, jewelry formation, and gilding. Through the BRIEF Survey method with a final score of 3 (high), at the smelting stage there are complaints on the right elbow, right shoulder, and neck. At the stage of grinding there are complaints on the right elbow, right shoulder, neck, and back. Next, at the stage of insertion there are complaints on the left elbow, left shoulder, and neck. At the stage of jewelry formation in the form of complaints on the right shoulder, neck, and back. As for the stage of gilding in the form of complaints on the neck and back. Based on the Nordic Body Map questionnaire showed 100% (5 informants) experienced complaints on the upper neck, lower neck, right shoulder, back, right elbow, right upper arm, and right forearm. As well as 80% (4 informants) experienced complaints on the left shoulder, waist, left elbow, right wrist, right hand, right thigh, and right ankle.

#### 5. Suggestion

There are several recommendations that researchers can provide based on the findings in this study:

1. For jewelry making workers, workers need to take time to stretch muscles during work, have sufficient hours of sleep at night (7-8 hours) in the correct position.

2. For jewelry business owners, improving their understanding of ergonomic risks in workers, reminding workers to relax or stretch muscles in between working hours.

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