

Risk Analysis of Musculoskeletal Disorders (MSDs) Complaints on Batik Crafters Under The Assistance of Ademos Indonesia

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Abstract

Introduction: Batik is one of Indonesia's original works of art that is continuously preserved in several regions in Indonesia. Several people working as batik crafters in Bojonegoro, East Java, Indonesia are under the assistance of Ademo. Based on the preliminary study conducted, most batik crafters had started to complain of pain in several parts of their body, which was considered due to work postures and non-ergonomic work stations. Thus, this study was conducted to analyze the risk of Musculoskeletal Disorders using RULA and NBM.

Materials and Methods: It was an observational study with cross sectional design. Data collection was conducted by conducted observation using RULA (Rapid Upper Limb Assessment), NBM (Nordic Body Map) and interviews with batik crafters in home industry. The population in this study was 42 batik crafters in a batik industry under the assistance of Ademos Bojonegoro. This study utilized total sampling technique by which the whole population were taken as the sample.

Results: The results showed that 76.2% of batik crafters had a very high risk of MSDs on the right side of the body and on the left side of the body; 50% of batik crafters had a high risk of MSDs; and 50% had a very high risk of MSDs. The results of observations using NBM showed that 42.85% had a high risk of MSDs.

Conclusion: This study concludes that all the batik crafters are in an emergency circumstance experiencing musculoskeletal disorders and need an ergonomic work station as soon as possible.

Key words: batik crafters, ergonomic, RULA, NBM, MSDs

Introduction

Batik is one of the works of art from Indonesia which has now penetrated the international market ⁽¹⁾. Along with the development of batik, every region in Indonesia has begun to produce batik with its respective regional characteristics, including Bojonegoro Regency, East Java, Indonesia.

Several traditional batik crafters in Bojonegoro Regency are under the assistance of Ademos, an organization that focuses on the empowerment of rural communities by synergizing with government, private sector, and non-governmental organizations. High market demand for batik fabric makes an occupation as a batik crafter as one of the main sources of income for some people.

Batik fabric is usually produced in a wholesale system. It causes the batik crafters to work overtime in one time working on a batik making project for one client which is certainly full of pressure since there is a target that they must be able to complete a number

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of fabrics agreed upon at the beginning within a certain period of time. Based on a preliminary study that has been done, the process of making batik is still done in the traditional way. The crafters can work more than 8 hours per day. During the batik making process, they can work in a sitting position and bend over for hours. This static work posture for a long time was evident during the initial interview that some batik crafters had started to feel some health impacts, one of which was frequent pain in the lower back. Lower back pain occurs since the load on the vertebrae is tripled in the sitting position compared to the standing position (2). Accordingly, batik crafters have musculoskeletal disorders.

Musculoskeletal Disorders (MSDs) are complaints of aches, pains, and so on in the muscular system such as tendons, blood vessels, joints, bones, nerves, and others caused by work activities (3). Musculoskeletal complaints are complaints of the skeletal muscles felt by a person ranging from very mild to very painful complaints (4). Muscles that receive static loads repeatedly and for a long time can cause complaints in the form of damage to joints, ligaments and tendons.

Furthermore, the results of the preliminary study also showed that most of the batik crafters under the assistance of Ademos Bojonegoro were female. Based on a study conducted by Wijnhoven, the prevalence rate of musculoskeletal pain was higher in women than men. For musculoskeletal pain at any location, the prevalence rate of symptoms among women was 50% higher than men (5). Another complaint that many batik crafters felt was cramps due to work posture which tended to be static for a long time and required a high enough concentration. Batik crafters were required to do a work posture that lead to awkward position since they did not have knowledge to make work stations more comfortable and ergonomic for their work. Additionally, they also did not understand that working posture with awkward position can have a negative impact on their health. If not handled properly, these complaints can affect the productivity of their work, in this case, the batik fabric target that they have to complete every day. Low back pain has a significant impact on the productivity of batik crafters. Referring to a study conducted in 2003, workers with low back pain will experience a decrease in work productivity by up to 60% (6).

This study conducted a risk analysis using RULA considering that RULA can assess the burden on posture that is not ergonomic more than some other risk assessment methods (7). Thus, the researcher intended to conduct a risk analysis of Musculoskeletal Disorders on batik crafters working under the assistance of Ademos Bojonegoro using the RULA method.

Materials and Methods

This research is a descriptive study. Based on the type of research, it is an observational research. Besides, based on its location, it is a research conducted in the field using a cross-sectional design since the observations were conducted at a certain time or period. This study was conducted in Bojonegoro Regency with batik crafters in several districts under the assistance of Ademos as the target respondents with a total population of 42 batik crafters, all of which were used as research samples. The variables studied were the level of risk from ergonomics as seen from posture, type of work, age, working hours, and exercise habits as independent variables. Importantly, the dependent variable of this study included complaints of musculoskeletal disorders. The instrument used was a Nordic Body Map questionnaire to obtain data related to musculoskeletal complaints felt by respondents. The level of ergonomic risk was calculated using the RULA observation sheet.

Characteristics of Batik Crafters	Group	Distribution	
		N	%
Gender	Male	7	16.7
	Female	35	83.3
Age	12-16 years	9	21.4
	17-25 years	6	14.3
	26-35 years	13	31.0
	36-45 years	10	23.8
	46-55 years	3	7.1
	56-65 years	1	2.4
Period of Service (Years)	1-3 years	7	16.7
	> 3 years	35	83.3

Results

Characteristics of Respondents (Batik Crafters) Under the Assistance of Ademos Indonesia

Tabel 1. Distribution Table of Characteristics of Batik Crafter under The Assistance of Ademos Indonesia

The distribution of characteristics of respondents (Batik Crafters) under the assistance of Ademos Bojonegoro includes gender, age, period of service (years). For the gender category, most of the workers with a total of 35 batik crafters (83.3%) were females, while the rest with a total of 7 batik crafters (16.7%) were males. For the age category, most of them with a total of 13 batik crafters (31.0%) were aged 26-35 years. In addition, for period of service, most of them with a total of 35 batik crafters (83.3%) had been working for >3 years.

Complaint Levels of Musculoskeletal Disorders (MSDs) Based on Rapid Upper Limb Assessment (RULA)

Table 2. Frequency Distribution of RULA Final Score for the Right Side of the Body of the Batik Crafters Under the Assistance of Ademos Indonesia

Risk Categories	Frequency	Percentage (%)
Low	0	0
Moderate	0	0
High	10	23.80
Very High	32	76.2
Total	42	100.0

Based on the Rapid Upper Limb Assessment (RULA) method, 10 respondents (23.8%) of the 42 respondents (batik crafters) under the assistance of Ademos were at high risk of experiencing Musculoskeletal Disorders (MSDs), indicating immediate corrective action on work posture was needed in the near future. Moreover, 32 respondents (76.26%) are at very high risk so that corrective action on work posture was needed at the moment.

Table 3. Frequency Distribution of RULA Final Score for the Left Side of the Body of the Batik Crafters Under the Assistance of Ademos Indonesia

Risk Categories	Frequency	Percentage (%)
Low	0	0
Moderate	0	0
High	21	50
Very High	21	50
Total	42	100.0

Based on the Rapid Upper Limb Assessment (RULA) method, 21 respondents (50 %) of the 42 respondents (batik crafters) under the assistance of Ademos were at high risk of experiencing Musculoskeletal Disorders (MSDs), indicating immediate corrective action on work posture was needed in the near future. Moreover, 21 respondents (76.26%) were at very high risk so that corrective action on work posture was needed at the moment.

Complaint Levels of Musculoskeletal Disorders (MSDs) Based on Nordic Body Map (NBM) Method

Based on the results of observations and interviews with 42 respondents using the NBM checklist sheet regarding the severity of MSDs, the following data were obtained:

Table 4. Frequency Distribution of Nordic Body Map (NBM) Final Score of batik Crafters under The Assistance of Ademos Indonesia

Risk Categories	Frequency	Percentage (%)
Low	6	14.28
Moderate	16	38.10
High	18	42.85
Very High	2	4.28
Total	42	100

By using the Nordic Body Map (NBM) method to assess the complaint levels of Musculoskeletal Disorders

on 42 respondents, it was found that 6 respondents (14.28%) had a low risk, 16 respondents (38.1%) had moderate risk, 18 respondents (42.85%) had a high risk and, 2 respondents (4.28%) had a very high risk.

Discussion

Characteristics of Batik Crafters under the Assistance of Ademos

Most of the batik crafters under the assistance of Ademos were dominated by females or housewives who initially just filled their spare time by making batik which then continued to make batik activity their permanent job. All batik crafters, both males and females, experienced a high and very high risk of musculoskeletal disorders complaints. Based on the physiological aspect, males have stronger muscle abilities than females. Thus, it is natural for women to experience complaints or pain in their body more easily when doing risky work⁽⁸⁾. This is in line with a study conducted by researchers that there is a significant relationship between gender and complaints of Musculoskeletal Disorders⁽⁵⁾. In relation to this study, although both males and females were in the same risk category for MSDs, it was found that the number of women was higher. Theoretically, females' muscle capacity is not as strong as males', so immediate prevention efforts need to be done in order to prevent females from experiencing unwanted events that can affect their quality of life and productivity.

More importantly, results showed that most of the batik crafters under the assistance of Ademos were in the productive age range of workers (26-45 years). However, based on the results of RULA calculations and observations using NBM, all batik crafters were in the category of experiencing a high and very high risk of musculoskeletal disorders. This is because the older a person is, the less muscle strength he/she has, so the risk of these workers experiencing complaints of musculoskeletal disorders also increases⁽⁹⁾. Besides, at the age of 30 years and over, degeneration occurs in the form of scar tissue damage and reduced fluid in the bones and muscles which also affects their stability⁽⁸⁾. Thus, in that age range, batik crafters do have a high risk of experiencing musculoskeletal disorders.

Period of Service

The results also showed that most of the batik crafters

had worked > 3 years and had experienced a high and very high risk of musculoskeletal disorders. According to a previous study conducted by some researchers, a longer period of service has a greater likelihood of experiencing MSDs⁽¹⁰⁾. The period of service is one of the factors that can affect complaints of lower back pain⁽⁴⁾. Longer period of service or work will affect muscular system caused by several factors, one of which is continuous static load and repetitive activities⁽¹¹⁾.

Complaint Levels of Musculoskeletal Disorders (MSDs) Based on Rapid Upper Limb Assessment (RULA)

Based on the calculation of RULA on 42 batik crafters under the assistance of Ademos Bojonegoro, most of them had a very high risk to the right side of the body. The left side of the body also had the same high and very high risk. It was because batik crafters used their right hand more so that the right hand was not in an ergonomic position. It was also not supported by an adequate work station since there was no hand support or armrest, while the left hand was in an awkward position because it did not have adequate armrests as well. The greater the angle formed by the shoulder, the higher the complaint of shoulder pain felt⁽¹²⁾. Fatigue and injury to muscles are two of the effects of an ergonomic work attitude.

During the making of batik tulis (hand-drawn batik), a crucial step that requires a long time is *mencanting* (the design phase using a traditional tool called a *canting*) since it requires high patience and accuracy. *Mencanting* in hand-drawn batik industry is carried out in a sitting position and often with a slightly bent back. sitting posture for too long causes weak abdominal muscles and curved spine so that workers get tired easily⁽⁴⁾. In addition, if the work position is carried out continuously and for a long time, it will cause complaints to the musculoskeletal system.

Furthermore, the placement of the fabric used by the respondents was too low, resulting in neck flexion. The neck that is bent down for a long time can cause pain, supporting finding of a study on workers working in front of computer⁽¹³⁾. They found that placing the monitor too low can increase the activity of the upper neck muscles and can cause pain in the upper neck and shoulders. Several studies conducted in the textile business which

were also carried out using the RULA method showed that many workers experienced complaints of pain in the neck area and waist area^{(14),(15)}.

Another factor causing complaints to the musculoskeletal system is that the worker's body position is not ergonomic in which there are demands for tasks, work tools, and workstation designs that are not in accordance with the worker's abilities⁽¹⁶⁾. Based on the identification results, most of the work positions were not ergonomic for example that there was no back support so that the back could not relax; the knees could not be bent 90 degrees (the seat was too low); and there was no armrest that caused the hands tired. During that time, batik crafters worked continuously in a non-ergonomic position (bent); sitting on a *dingklik* or a small stool without a backrest. This position is dangerous because it causes musculoskeletal disorders. Study of Musculoskeletal Disorders (MSDs) confirmed that 67.7% of cases were experienced by batik crafters who experienced MSDs complaints on the neck, right back, and waist⁽¹⁷⁾.

Complaint Levels of Musculoskeletal Disorders (MSDs) Based on Nordic Body Map (NBM) Method

Based on research conducted on 42 batik crafters under the assistance of Ademos Bojonegoro using the Nordic Body Map (NBM) assessment sheet, more varied results were obtained. Based on the checklist, the most frequent complaints by workers were pain in the upper and lower neck, right shoulder, back, waist, right upper arm, right and left wrist, and knee. Musculoskeletal disorders (complaints in the parts of the skeletal muscles that a person feels from very mild to very painful) can be grouped into two: 1) reversible complaints or muscle complaints that occur when the muscles receive a static load, and 2) persistent complaints or muscle complaints that are persistent⁽⁴⁾.

Based on the Nordic Body Map (NBM) checklist, batik crafters often complain of pain in several points, especially in the upper body, because they are in a constant position for a long time without doing light stretching movements. In fact, the duration that a person is in a non-ergonomic condition can reduce the body's ability which can eventually lead to injury⁽¹⁸⁾. Such monotonous conditions will make crafters experience neck pain or stiff, causing headaches^(14,15,19) and it can

spread to the shoulders, hands, and back. This is also in line with a study conducted in the textile industry using the Nordic Body Map method which found that a lot of workers complained of pain in torso, neck, shoulders and several other places⁽²⁰⁾.

Additionally, batik crafters do the entire work process in a sitting position. Working in a sitting position for more than 95% of the total working hour can increase the risk of neck pain⁽²¹⁾. Unnatural posture which is also caused by inadequate work station design can also increase complaints of pain in the upper body⁽²²⁾.

One of the complaints of musculoskeletal disorders felt by respondents could be due to the respondent's working period of more than 3 years. It supports a study which found that workers with longer period of service are more likely to experience MSDs⁽²³⁾. The other two causes of MSDs complaints on batik crafters include the static work posture in a sitting position for a long time and minimal movement. This can lead to increased load on muscles and tendons, which causes blood flow to the muscles to be blocked and results in fatigue and pain⁽²⁴⁾.

Conclusion

Based on the results of the study conducted, all batik crafters have a high and very high risk of musculoskeletal disorders. This shows that this condition is dangerous and must be addressed immediately to prevent batik crafters from experiencing occupational diseases which can also have a fatal impact on their quality of life and also their productivity. To reduce complaints of Musculoskeletal Disorders (MSDs) experienced by batik crafters under the assistance of Ademos Bojonegoro in the moderate category, it is necessary to take action to improve work stations and work postures to reduce the complaints experienced.

Conflict of Interest: There is no conflict of interest in this study.

Source of Funding: The study was funded by Universitas Airlangga, Indonesia.

Ethical Clearance: This study is undergone ethical clearance through The Universitas Airlangga Faculty of Dental Medicine Health Research Ethical Commission. Protocol number is: 292/HRECC.FODM/VI/2020

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