

# Relationship between Working Tenure and Working Posture with Musculoskeletal Grievance in Batik Madura Workers

Galuh Sista Prabarukmi<sup>1</sup>, Noeroel Widajati<sup>2</sup>

<sup>1</sup>Research Scholar, <sup>2</sup>Professor, Department of Occupational Health and Safety, Public Health Faculty, Airlangga University, 60115, Surabaya, East Java, Indonesia

## Abstract

**Introduction:** Batik is one of the cultural heritages of Indonesian people. Batik is the result of acculturation of Javanese, Hindu and Islam which is written on a sheet of fabric. The process of making batik fabric takes a long time. This condition causes many batik workers experience work related disease, such as musculoskeletal grievance. This research aimed to analyze the relationship between working tenure and working posture with musculoskeletal grievance in Batik Madura workers.

**Methods:** This research was an observational research with a cross sectional design. The research population was all Batik Madura workers. The sample in this study was 61 Batik Madura workers. The variables researched included working tenure, working posture and musculoskeletal grievance.

Data were collected by observation, filling out research questionnaires, and Nordic Body Map (NBM). The data analysis used was the Spearman correlation.

**Results:** There was no relationship between working tenure with musculoskeletal grievance with a value of  $p = 0.837$  and there was relationship between working posture with musculoskeletal grievance with a value of  $p = 0.000$ .

**Conclusion:** The working tenure didn't have relationship with musculoskeletal grievance. The working posture had a relationship with musculoskeletal grievance.

**Keywords:** *working tenure, working posture, musculoskeletal grievance*

## Introduction

Batik is one of many cultural heritages in Indonesia has confirmed by UNESCO in 2009 as a masterpiece of oral and intangible human heritage to Indonesia. Therefore, every October 2 is designated as the national batik day on which every community in Indonesia wears a batik shirt. Batik fabrics in Indonesia have various motifs and colors. Batik motifs are created with messages and hopes that are sincere and noble, so that they will

bring goodness and welfare as well as happiness to the wearer<sup>1</sup>. Occupational Safety and Health is a thought and effort made to ensure wholeness and perfection both physically and spiritually so that workers can carry out work activities safely, comfortably, and achieve physical endurance, work power, and a high level of health<sup>2</sup>. Occupational safety and health must be applied in various types of industries, both formal and informal industries. However, occupational safety and health efforts in the informal industry in Indonesia still lack special attention to informal industry owners. This condition causes workers in informal industries in Indonesia to experience many occupational accidents and work related diseases.

Work related disease is a disease caused by work, work tools, materials, processes, and the work

---

### Corresponding Author:

**Noeroel Widajati**

Department of Occupational Health and Safety, Public Health Faculty, Airlangga University  
Campus C, Jalan Mulyorejo, 60115, Surabaya, East Java, Indonesia, Telp: +6285730961962  
E-mail: noeroel.widajati@fkm.unair.ac.id

environment. Work related disease also defined as a health disorder, both physically and spiritually arising from or exacerbated by work activities or conditions work related<sup>3</sup>. Work related disease doesn't get intervention can cause a decrease in worker productivity which will have an impact on industries in Indonesia experiencing losses. Workers in informal industries such as the batik industry have a great potential to experience work related disease. Data of International Labor Organization showed that every year there was 2.78 person died due to work related disease<sup>4</sup>. Data of Ministry of Health in Indonesia showed that 26.78% of workers in Indonesia experience diseases due to the work they do<sup>5</sup>. One of the work related diseases that can be experienced by batik workers is Musculoskeletal Disorders (MSDs).

Musculoskeletal Disorders (MSDs) is disturbance experienced by workers on muscles, joints and tendons in all parts of the body<sup>6</sup>. Musculoskeletal grievance can be constant or intermittent, that usually persists for a prolong period of time and is not always attributed to a specific cause<sup>7</sup>. The data of Health Research and Development Agency in 2013 showed prevalence of workers suffering from Musculoskeletal Disorders in Indonesia of 11.9% and workers reporting musculoskeletal grievance of 24.7%<sup>8</sup>. Musculoskeletal grievance caused by many factors. According to Graveling, musculoskeletal grievance caused by repetition, posture, force, and duration<sup>9</sup>. Research conducted by Tjahayuningtyas showed that musculoskeletal grievance caused by age, exercise habit, posture, job tenure, body mass index and workload<sup>10</sup>.

Study related to musculoskeletal grievance in the batik workers have been carried out in Indonesia. Research conducted by Santosa and Ariska in 2018 showed that risk factors affecting musculoskeletal grievance are type of work, age, work procedure, working posture, gender and working tenure<sup>11</sup>. The study of Savitri, Hardian, and Sumekar in 2015 showed that inappropriate working posture when batik making caused musculoskeletal grievance<sup>12</sup>. The study of Ramadhiani, Widjasena, and Jayanti in the batik workers in Kampong Batik Laweyan Surakarta showed that working duration and shoulder's angle while extending are risk factors of musculoskeletal grievance<sup>13</sup>. The research conducted by Isnaini, Bagyono, and Hendrarini in women lighters in the Village of Jarum Klaten showed that musculoskeletal

grievance caused by working duration<sup>14</sup>.

Batik Madura is one of informal industries engaged in the manufacture of batik cloth that develops in Bangkalan Regency. In the region, Tanjung Bumi Sub-District is among the largest producer and supplier of batik in Madura. The production activities in Batik Madura composed by several steps, such as the washing of plain mori cloth (Ketel), the drawing of the outlines of batik pattern (Rengreng), the drawing of small designs (Kuri), the application of wax using canting (Essean), the covering of cloth portion in which no designs are drawn (Nebheng), the process of dyeing, performed twice, and removal or dissolution of wax using boiling water (Lorot). This study aims to determine the relationship between working tenure and working posture with musculoskeletal grievance in Batik Madura workers.

## Materials and Methods

This study was an observational study with a cross-sectional design. This study was conducted on Batik Madura's home industry, Tanjung Bumi Sub-District, Bangkalan Regency, Madura, Indonesia in January 2020. The population of this study was all Batik Madura workers as much as 81 people. The sampling technique in this study used with proportional stratified random sampling. Sample used in this study was all batik workers in Batik Madura's home industry as much as 61 people.

Measurement of working tenure was carried out by filling out a research questionnaire and interview. Before asking respondents about working tenure, respondents were given an explanation about research implementation and respondents asked to fill out an informed consent if they agreed to take part in the research. Working tenure categorized into beginning, moderate, and long categories. Measurement of the working posture was carried out by observation when the workers during their work activities. The observation was performed by taking pictures of the workers' working postures during batik production which were then analyzed using the Rapid Entire Body Assessment (REBA). The working posture categorized into low, moderate, high, and very high categories. Next, the respondents were asked to fill a Nordic Body Map (NBM) questionnaire containing 28 limbs presenting with musculoskeletal grievance by inserting a check mark on one of MSD grievance choices namely no pain, mildly painful, painful, and very painful

according to their individual condition.

The data analysis technique in this study was univariate and bivariate analysis. Univariate analysis was conducted by determine frequency distribution for each variable, such as working tenure, working posture and musculoskeletal grievance. The bivariate analysis was carried out to analyze the relationship between working

tenure and working posture with musculoskeletal grievance using the Spearman correlation test with  $\alpha = 0.05$ .

## Results and Discussion

### Working Tenure

**Table 1. Distribution of Working Tenure in Batik Madura Workers**

Category	Frequency (n)	Percentage (%)
Beginning	22	36.0
Moderate	25	41.0
Long	14	23.0
Total	61	100.0

The results of working tenure were categorized in to 3 categories, namely beginning, moderate and long. Table 1 showed that 25 respondents (41%) was in beginning category, 22 respondents (36%) was in moderate category and 14 respondents (23%) was in long category.

Working tenure is one of musculoskeletal grievance risk factors. Working tenure can cause musculoskeletal grievance because working tenure will cause fatigue, monotonous, and repetitive work activities, which are the main cause of musculoskeletal grievance<sup>15</sup>.

### Working Posture

The assessment of working posture on 61 Batik Madura workers was performed by documenting working posture of the Batik Madura workers during

working activities in the form of photos and videos. Then, the documentation results analyzed with the Rapid Entire Body Assessment (REBA) method. REBA way was divided into two clusters, A and B. Cluster A REBA analyzed body parts, namely neck, legs and trunk while Cluster B REBA analyzed body parts, namely forearms, upper arms, and wrists.

The results of working posture assessment with the Rapid Entire Body Assessment (REBA) method were categorized into 4 categories, namely low, moderate, high, and very high categories. Table 2 showed that 27 respondents (44.3%) had working posture in the high category risk level, 20 respondents (32.8%) were in the very high category risk level, 14 respondents (23%) were in the moderate category risk level, and no one respondents in the low category of working posture.

**Table 2. Distribution of Working Posture in Batik Madura Workers**

Category	Frequency (n)	Percentage (%)
Low	0	0.0
Moderate	14	23.0
High	27	44.3
Very high	20	32.8
Total	61	100.0

The rigid working posture causes the position of body parts move away from the natural positions. This condition lead the workers have a risk of musculoskeletal grievance<sup>16</sup>.

### Musculoskeletal Grievance

The assessment of musculoskeletal grievance perceived by the 61 Batik Madura workers was performed by the way of interviews and filling the Nordic Body Map (NBM) questionnaire containing 28 body muscles were felt pain by the workers. The musculoskeletal grievance was categorized into low, moderate, high, and very high categories. Table 3 showed that 25 respondents (41%) in the high category, 20 respondents (32.8%) in the very high category, 16 respondents (26.2%) in the moderate category, and no one respondents in the low category of musculoskeletal grievance.

**Table 3. Distribution of Musculoskeletal Grievance in Batik Madura Workers**

Category	Frequency (n)	Percentage (%)
Low	0	0.0
Moderate	16	26.2
High	25	41.0
Very high	20	32.8
Total	61	100.0

The result of musculoskeletal grievance in 61 Batik Madura workers measured on 61 Batik Madura workers using Nordic Body Map questionnaire showed that 28 respondents (45.9%) felt very pain in the spine. 23 respondents (37.7%) felt pain in the waist. The most rather pain felt by 23 respondents (37.7%) in the left leg and 21 respondents (34.43%) felt less pain in the left elbow. The results of musculoskeletal complaint show Table 4 below.

**Table 4. Distribution of Musculoskeletal Grievance Location in Batik Madura Workers**

Organ	No Pain		Mildly Painful		Painful		Very Painful		Total	
	n	%	n	%	n	%	n	%	N	%
Upper neck	15	24.59	12	19.67	20	32.79	14	22.95	61	100.00
Lower neck	11	18.03	12	19.67	16	26.23	22	36.07	61	100.00
Left shoulder	12	19.67	16	26.23	16	26.23	17	27.87	61	100.00
Right shoulder	11	18.03	16	26.23	16	26.23	18	29.51	61	100.00
Left upper arm	12	19.67	12	19.67	17	27.87	20	32.79	61	100.00
Spine	8	13.11	9	14.75	16	26.23	28	45.90	61	100.00
Right upper arm	8	13.11	9	14.75	19	31.15	25	40.98	61	100.00
Waist	7	11.48	8	13.11	23	37.70	23	37.70	61	100.00
Buttock	9	14.75	7	11.48	20	32.79	25	40.98	61	100.00
Buttom	8	13.11	10	16.39	17	27.87	26	42.62	61	100.00
Left elbow	21	34.43	22	36.07	9	14.75	9	14.75	61	100.00
Right elbow	17	27.87	13	21.31	17	27.87	14	22.95	61	100.00
Left lower arm	9	14.75	17	27.87	17	27.87	18	29.51	61	100.00
Right lower arm	9	14.75	17	27.87	19	31.15	16	26.23	61	100.00
Left wrist	10	16.39	11	18.03	20	32.79	20	32.79	61	100.00
Right wrist	10	16.39	12	19.67	18	29.51	21	34.43	61	100.00
Left hand	20	32.79	17	27.87	13	21.31	11	18.03	61	100.00
Right hand	18	29.51	20	32.79	8	13.11	15	24.59	61	100.00
Left thigh	14	22.95	10	16.39	10	16.39	27	44.26	61	100.00
Right thigh	15	24.59	12	19.67	10	16.39	24	39.34	61	100.00
Left knee	13	21.31	13	21.31	18	29.51	17	27.87	61	100.00
Right knee	16	26.23	11	18.03	14	22.95	20	32.79	61	100.00
Left calf	9	14.75	14	22.95	20	32.79	18	29.51	61	100.00
Right calf	10	16.39	12	19.67	17	27.87	22	36.07	61	100.00
Left ankle	15	24.59	19	31.15	12	19.67	15	24.59	61	100.00
Right ankle	15	24.59	14	22.95	15	24.59	17	27.87	61	100.00
Left leg	17	27.87	23	37.70	14	22.95	7	11.48	61	100.00
Right leg	19	31.15	11	18.03	20	32.79	11	18.03	61	100.00

Relationship Between Working Tenure with Musculoskeletal Grievance

**Table 5. Distribution of Relationship Between Working Tenure with Musculoskeletal Grievance**

Working Tenure	Musculoskeletal Grievance						Total	
	Moderate		High		Very High			
	n	%	n	%	n	%	n	%
Beginning	4	18.2	13	59.1	5	22.7	22	100.0
Moderate	6	24.0	11	44.0	8	32.0	25	100.0
Long	6	42.9	1	7.1	7	50.0	14	100.0
Total	16	26.2	25	41.0	20	32.8	61	100.0
p-value = 0.837								

\* Significant at p-value < 0.05

The statistical analyze using Spearman Correlation produced p-value of 0.837. It means that there is no relationship between working tenure with musculoskeletal grievance. This study were in line with the study by M.A, Sabilu, and Pratiwi in 2016 showed that there was no relationship between working tenure with musculoskeletal grievance. The study of M.A, Sabilu, and Pratiwi in 2016 showed that working tenure is a related factor with length of time of someone has worked in a industry. Related to this, musculoskeletal grievance is chronic disease that requires a long time to develop and manifest. Someone has a long working

tenure so someone exposed to these risk factors for musculoskeletal disorders then greater the risk for developing musculoskeletal grievance<sup>17</sup>. There is no relationship between working tenure with musculoskeletal grievance on Batik Madura workers because most of the workers are recruited by Batik Madura's owners during their working period in the beginning category, so that the musculoskeletal grievance felt by the workers are not based on the working tenure the worker has.

#### Relationship Between Working Posture with Musculoskeletal Grievance

**Table 6. Distribution of Relationship Between Working Posture with Musculoskeletal Grievance**

Working Posture	Musculoskeletal Grievance						Total	
	Moderate		High		Very High			
	n	%	n	%	n	%	n	%
Moderate	11	78.6	3	21.4	0	0.0	14	100.0
High	5	18.5	21	77.8	1	3.7	27	100.0
Very High	0	0.0	1	5.0	19	95.0	20	100.0
Total	16	26.2	25	41.0	20	32.8	61	100.0
p-value = 0.000								

\* Significant at p-value < 0.05

The statistical test using the Spearman Correlation produced a p-value of 0.000. It means that there was a relationship between working posture with musculoskeletal grievance. Static working posture during working activities cause blockage of blood flow in the body that the body's organs suffer from deficit of oxygen and glucose in the blood. This condition forces body to generate a metabolism byproduct in the form of lactic acid that gives rise to soreness when it builds up<sup>18</sup>. This study were in line with Saputro, Mulyono, and Puspikawati in 2018, the study showed that there was a correlation between working posture and musculoskeletal grievance in batik workers in Virde Batik Collection<sup>19</sup>. Similarly, Santosa and Ariska also found a correlation between working posture and musculoskeletal grievance in batik artisans with a p-value of 0.001<sup>11</sup>. Unergonomic working posture make up the position of the body parts move away from natural positions. This posture shows strong evidence as a risk factor which can lead to musculoskeletal grievance<sup>20</sup>.

### Conclusion

This study draws conclusions that the majority of Batik Madura workers have a working tenure in the beginning category, working posture in high category, and musculoskeletal grievance in high category. There is no relationship between working tenure with musculoskeletal grievance in the Batik Madura workers. There is a relationship between working posture with musculoskeletal grievance in the Batik Madura workers.

To avoid musculoskeletal grievance in the Batik Madura workers, workers are advised to break for 20 minutes when working by moving head, leg and body. The owners of Batik Madura advised to do a redesign to workplace starting by providing chair with back support and armrests as well as *gawangan* (a bamboo frame over which the cloth to be waxed is draped).

**Acknowledgments:** We would like to say thank you to all parties that are involved in this study, especially workers and the owners of Batik Madura who have been willing to become the respondents in this research.

**Ethical Clearance:** This study was approved by Ethic Committee in Faculty of Dental Medicine, Universitas Airlangga, Indonesia with registration number 325/HRECC.FODM/VII/2020.

**Source of Funding:** The source of funding in this study from author's personal funds.

**Conflict of Interest:** Nil

### References

1. Parmono K. Nilai Kearifan Lokal dalam Batik Tradisional Kawung. *J Filsafat*. 2013;23(2):134–46.
2. Redjeki S. Kesehatan dan Keselamatan Kerja. Pertama. Jakarta: Pusdik SDM Kesehatan Kementerian Kesehatan; 2016.
3. Utami AP. Identifikasi Bahaya dan Penilaian Risiko Kesehatan dan Keselamatan Kerja (K3) pada Unit Kiln dan Coal Mill Tonasa IV PT. Semen Tonasa Pangkep Tahun 2017. UIN Alauddin Makassar; 2017.
4. International Labour Organization. Meningkatkan Keselamatan dan Kesehatan Pekerja Muda. Jakarta; 2018. 1–50 p.
5. Ministry of Health Indonesia. Infodatin K3 (Keselamatan dan Kesehatan Kerja). Jakarta; 2018.
6. Health and Safety Executive. Work Related Musculoskeletal Disorders Statistics (WRMSDs ) in Great Britain, 2019. 2019.
7. El-Metwally A, Shaikh Q, Aldiab A, Al-Zahrani J, Al-Ghamdi S, Alrasheed AA, et al. The Prevalence of Chronic Pain and Its Associated Factors Among Saudi Al-Kharj Population; A Cross Sectional Study. *BMC Musculoskelet Disord*. 2019;20(1):1–9.
8. Health Research and Development Agency. Riset Kesehatan Dasar (RISKESDAS 2013) National Report. Riskesdas 2013. Jakarta; 2013.
9. Graveling RA. Ergonomics and Musculoskeletal Disorders (MSDs) in the Workplace A Forensic and Epidemiological Analysis. First Edit. New York: CRC Press; 2019. 89–94 p.
10. Tjahayuningtyas A. Faktor yang Mempengaruhi Keluhan Musculoskeletal Disorders (MSDs) pada Pekerja Informal. *Indones J Occup Saf Heal*. 2019;8(1):1–10.
11. Santosa A, Ariska DK. Faktor-Faktor yang Berhubungan dengan Kejadian Musculoskeletal Disorders pada Pekerja Batik di Kecamatan Sokaraja Banyumas. *MEDISAINS J Ilm Ilmu-Ilmu Kesehat*. 2018;16(1):42–6.

12. Savitri IW, Hardian, Sumekar TA. Hubungan antara Aktivitas Membatik dengan Gangguan Sistem Muskuloskeletal pada Pengrajin Batik Tulis. *Media Med Muda*. 2015;4(4):985–95.
13. Ramadhiani KF, Widjasena B, Jayanti S. Hubungan Durasi Kerja, Frekuensi Repetisi dan Sudut Bahu dengan Keluhan Nyeri Bahu pada Pkerja Batik Bagian Canting di Kampoeng Batik Laweyan Surakarta. *J Kesehat Masy*. 2017;5(5):215–25.
14. Isnaini RN, Bagyono T, Hendrarini L. Gambaran Faktor Risiko Keluhan Muskuloskeletal Disorders pada Pembatik Perempuan di Desa Jarum Kecamatan Bayat Kabupaten Klaten Tahun 2019. In: *FLEPS 2019 - IEEE International Conference on Flexible and Printable Sensors and Systems, Proceedings*. 2019. p. 1–46.
15. Sari RO, Rifai M. Hubungan Postur Kerja dan Masa Kerja dengan Keluhan Muskuloskeletal Disorders (MSDs) pada Pembatik Giriloyo. *J Chem Inf Model*. 2019;53(9):1689–99.
16. Hartono AFD, Soewardi H. Analisis Faktor-Faktor Risiko Penyebab Muskuloskeletal Disorders dan Stres Kerja (Studi Kasus di PLN PLTGU Cilegon). *J Ilm Tek Ind*. 2018;6(3):1–13.
17. M.A. MI, Sabilu Y, Pratiwi AD. Faktor yang Berhubungan dengan Keluhan Muskuloskeletal Disorders (MSDs) pada Penjahit Wilayah Pasar Panjang Kota Kendari Tahun 2016. *J Ilm Mhs Kesehat Masy Unsyiah*. 2016;1(2):184143.
18. Haryanti N, Ramdan IM. Gangguan Muskuloskeletal pada Pekerja Batu Bata Merah. In: *Proceeding Seminar Nasional Perhimpunan Ergonomi Indonesia “Sustainable Ergonomic for Better Human Well-Being.”* 2015. p. M-6-M–10.
19. Saputro CB, Mulyono, Puspikawati SI. Hubungan Karakteristik Individu dan Sikap Kerja terhadap Keluhan Muskuloskeletal pada Pengrajin Batik Tulis. *JPH RECODE*. 2018;2(1):1–10.
20. Evadarianto N, Dwiyaniti E. Postur Kerja dengan Keluhan Muskuloskeletal Disorders pada Pekerja Manual Handling Bagian Rolling Mill. *Indones J Occup Saf Heal*. 2017;6(1):97–106.