Journal of Health Promotion and Behavior (2023), 8(3): 216-225
Masters Program in Public Health, Universitas Sebelas Maret

Original research
Open Access

Analysis of Musculoskeletal Disorders Complaints among Ikat Weaving Craftsmen in Langa Bajawa, Ngada, East Nusa Tenggara in 2022

Agostin Nofembriyani Djawa[1)], Muntasir[2)], Soleman Landi[1)]

[1)]Study Program of Public Health, Faculty of Public Health, Universitas Nusa Cendana, Indonesia
[2)]Master's Program in Public Health, Faculty of Public Health Universitas Nusa Cendana, Indonesia

Received: 29 December 2022; Accepted: 17 January 2023; Available online: 16 July 2023

ABSTRACT

Background: Ikat weavers work manually and non-stop for a long duration of time, which increases the risk of occupational diseases such as musculoskeletal disorders (MSDs). Ikat weaving craftsmen perform work manually and non-stop for a long duration of time which generates occupational diseases such as musculoskeletal disorders (MSDs). This study aimed to determine the analysis of complaints of musculoskeletal disorders (MSDs) among ikat weavers in Langa Bajawa
Subjects and Method: A cross-sectional study were conducted from August to September 2022 among ikat weaving craftsmen in Langa Bajawa region, Ngada, East Nusa Tenggara. A total of 38 subjects were included in this study. The dependent variable was complaints of musculoskeletal disorders (MSDs). The independent variables were age, working period, duration of work, body posture, work-load, repetitive activity, stretching, and back rest. The data were collected with study questionnaires, Nordic Body Map questionnaires, Rapid Upper Limb Assessment (RULA) questionnaires, and observations. The data were analyzed using Chi-square.
Results: Age >35 years (OR= 1.07; 95% CI= 1.07 to 17.79; p= 0.034), working period >10 years (OR= 3.85; 95% CI= 0.98 to 15.12; p= 0.049), posture with RULA score >4 (OR= 5.66; 95% CI= 1.36 to 23.46; p= 0.013), working hours >8 hours/day (OR= 10.5; 95% CI= 2.16 to 51.42; p= 0.002), repetitive activity (OR= 11.55; 95% CI= 2.41 to 55.39; p= 0.001), rarely stretching (OR= 0.04; 95% CI= 0.00 to 0.27; p< 0.001), and not having a backrest (OR= 0.09; 95% CI= 0.02 to 0.44; p= 0.001) had a significant effect on complaints of musculoskeletal disorder in ikat weaving craftsmen. Meanwhile, the workload of a person who has a pulse of (> 125 BPM) affected the complaints of MSDs, however, it was statistically insignificant.
Conclusion: Age >35 years, working period >10 years, posture with a RULA score of >4, working hours >8 hours/ day, repetitive activities, rarely stretching, not having a backrest, and the workload of a person with a pulse rate (> 125 BPM) affect complaints of musculoskeletal disorder in ikat weaving craftsmen.

Keywords: complaints of musculoskeletal disorders, craftsmen, ikat weaving.

Correspondence:
Agostin Nofembriyani Djawa. Study Program of Public Health, Faculty of Public Health, Universitas Nusa Cendana, Indonesia. Jl. Adi Sucipto Penfui, Penfui, Maulafa, 85001, Kupang, East Nusa Tenggara. Email: agostinnofembriyanidjawa@gmail.com. Mobile: +62 823-1135-6914.

Cite this as:
Djawa AN, Muntasir, Landi S (2023). Analysis of Musculoskeletal Disorders Complaints among Ikat Weaving Craftsmen in Langa Bajawa,Ngada, East Nusa Tenggara in 2022. *J Health Promot Behav*. 08(03): 216-225. https://doi.org/10.26911/thejhpb.2023.08.03.06.

BACKGROUND

Musculoskeletal Disorders (MSDs) are problems that a person experiences with their skeletal muscles, which can range from very mild complaints to extremely painful ones that lead to complaints in the form of injuries to joints, ligaments, and tendons if the muscles are frequently subjected to static loads and for a long period of time (Tarwaka et al., 2004). Workers' health can be affected, if they experience persistent complaints of MSDs and are not treated immediately it can lead to chronic work-related illnesses and disabilities.

Skeletal muscle pain is the most frequent work pain, according to the National Safety Council, it takes 22% of the 1,700,000 cases. According to the analysis of the latest Global Burden of Disease (GBD) data, 1.71 billion people worldwide suffer from musculoskeletal problems. 441 million of these complaints come from high income countries with MSDs, followed by countries in the Western Pacific (427 million), and Southeast Asia (369 million) (WHO, 2022).

However, based on study findings, the prevalence of diagnosis for one form of MSDs complaints, namely joint disease, is 7.3% in the population over 15 years of age, while 6.10% is based on the characteristics of laborers, pushers, and domestic servants (Ministry of Health of Republic Indonesia, 2018). Indonesia's statistics concerning Musculoskeletal Disorders (MSDs) are not enough. According to research by the Ministry of Health in 2018 on 9,842 workers in 12 districts/cities on health problems in Indonesia, 40.5% of occupational diseases that affect workers have an association with their workplace. Musculoskeletal disease is the most common type of disease among Indonesian workers (16%), followed by cardiovascular disorders (8%) and neurological disorders (6%) and respiratory disorders (3%), and ENT disorders (1.5%) (Ministry of Health of Republic Indonesia, 2018).

In Indonesia, industrial development is currently very rapid, both in the formal and informal business sectors. The workforce in the informal sector is 58.35% or around 72.67 million people, while for the formal sector is 41.65% or around 51.87 million people. Thus, most of the workforce is absorbed in the informal sector. Occupational health problems occur in every industry, especially in industries that heavily rely on manual handling and performance (Mallapiang et al., 2021).

The high risk of larger MSDs problems is associated with some jobs, such as weavers, due to the manual and constant nature of their work (Krismayani & Muliawan, 2021). Weaving activities usually begin with the manufacture of cotton yarn, which is then manually dyed and made into fabric. In addition, the looms are also specifically made of local wood and bamboo materials. Mothers and young women aged 20-30 usually do most of the work involved in weaving.

In terms of ergonomics, the main weaving activity is carried out while sitting, with the bent over back, with no backrest, and folded leg, performing static and repetitive movements. Due to the demands for activity and occupational status, the body is in this position. On the other hand, neither employees nor employers pay attention to efforts to establish safe and healthy working conditions in the informal sector. Similarly, to this, the skill level and health knowledge of female employees are still not enough to predict the beginning of muscle problems (Luik et al., 2021).

Langa is a region with the highest number of ikat weaving industries in Ngada Regency, East Nusa Tenggara Province. The researchers' preliminary survey at the Ikat

Weaving Industry site by interviewing 13 people aged > 35 years on average, with a working period of > 5 years, discovered 11 people complaining of pain in the waist, back, arms, and neck. Musculoskeletal symptoms usually begin to appear between the ages of 25 and 26. Initial concerns usually begin to appear around the age of 35. The frequency of complaints increases with age, the strength and endurance of their muscles begin to decline, which will lead to problems in the muscles. Female workers are usually at twice the risk of upper and lower back pain compared male workers. This leads to the accumulation of injuries to the skeletal system, muscles and nervous system due to working postures or continuous repetitive motion disorders. (Rithinyo et al., 2022). This study aims to analyze complaints of musculoskeletal diseases (MSDs) endured by weavers in Langa Bajawa, East Nusa Tenggara.

SUBJECTS AND METHOD

1. Study Design

A cross-sectional study was conducted in Langa Bajawa region, Ngada, East Nusa Tenggara from August to September 2022.

2. Population and Sample

The population in the study was craftsmen who were specialized in ikat weaving. A total of 38 craftsmen used in this study and selected using total sampling.

3. Study Variables

The dependent variable was complaints of musculoskeletal disorders (MSDs). The independent variables were age, working period, duration of work, body posture, workload, repetitive activity, stretching, and back rest.

4. Operational Definition of Variables

Age was the age from the time of birth until the time the study was conducted. The instrument used was questionnaires**.**

Working period was the length of time the craftsman works in weaving, the instrument used was the questionnaire**.**

Workload was the amount of work conducted while performing work, it was measured using a stopwatch.

Body posture was the body parts of the weavers in doing the work weaving ulos. The measurement was conducted using observation with measuring instruments were the RULA Assessment form, a protractor, and a ruler.

Working hours was the time of working activities within 24 hours in doing weaving including break time. Measured using observation with a Stopwatch.

Repetitive activities were the activities of ikat weaving craftsmen that are carried out continuously. The instrument used was questionnaires.

Stretching was a measure to minimize the risk of hazards in the workplace. The instruments used were questionnaires and observation sheets.

Backrest was a measure used to reduce complaints of pain in the back, waist, hips, and buttocks. The instruments used were questionnaires and observation sheets.

Complaint of MSDs was the pain in the skeletal muscle endured by the craftsmen. The measurement instruments used were the NBM (Nordic Body Map) Questionnaire and Observation.

5. Study Instruments

The primary data were collected through the interviews using questionnaires, and the secondary data were obtained from the published sources such as books and government reports.

6. Data Analysis

Univariate analysis was performed on each variable to produce a frequency distribution of each study variable. Bivariate analysis was performed to observe the association

between independent and dependent variables using Chi Square test.

RESULTS

1. Sample Characteristic

The study was conducted in the Langa Bajawa, East Nusa Tenggara area which including 5 villages, namely Beja Village, Bomari Village, Langagedha Village, and Borani Village and Boradho Village.

Table 1 describes the distribution and frequency of the characteristics of the study subjects by age, level of education, and marital status.

Table 1. Characteristics of Study Subjects.

Characteristics	Categories	Frequency (n)	Percentage (%)
Age	21 – 30	5	13.2
	31 – 40	9	23.7
	41 – 50	7	18.4
	51 – 60	8	21.1
	61 – 70	8	21.1
	71 – 80	1	2.6
Level of Education	Low	24	63.2
	Moderate	12	31.6
	High	2	5.3
Marital Status	Married	37	97.4
	Unmarried	1	2.6

Table 2. Frequency Distribution of Study Variables

Variables	Category	Frequency (n)	Percentage (%)
Complaint of musculoskeletal disorders (MSDs)	Moderate	16	42.1
	Severe	22	57.9
Age	Non-risky ≤ 35 years	14	36.8
	Risky > 35 years	24	63.2
Working Period	New	19	50
	Old	19	50
Workload	Pulse ≤ 125 BPM	26	68.4
	Pulse > 125 BPM	12	31.6
Body Posture	Non-risky	15	39.5
	Risky	23	60.5
Working hours	Non-risky ≤ 8 hours/day	13	34.2
	Risky > 8 hours/day	25	65.8
Repetitive Activity	≤ 10 times	19	50
	> 10 times	19	50
Stretching	Rarely	25	65.8
	Often	13	34.2
Backrest	Do not have	21	55.3
	Have	17	44.7

Based on table 2 it can be observed that several craftsmen suffered from severe musculoskeletal disorders with a percentage of 57. 9% whereas some other craftsmen suffered from moderate musculoskeletal disorders with a percentage of 42.1%. The age of respondents in this study ranged from 21-80 years, had low education, and were mostly married. Some respondents belonged to the category of risky working period of > 10 years and non-risky working period ≥ 6 – 10 years with a percentage of 50% respectively.

Most respondents had a risky workload with a pulse rate of > 125 BPM with a total of 12 people (31.6 %) whereas 26 subjects (31.6%) had a non-risky workload with a pulse rate of ≤ 125 BPM. Most respondents had a risky posture with a total of 23 people (60.5%) whereas 15 respondents (39.5%) had a non-risky posture. Some respondents did repetitive activities and some did not do repetitive activities with 50% respectively, 25 people (65.8%) had a work duration of > 8 hours/day, whereas 13 people (34.2%) had a work duration of ≤ 8 hours/day.

2. Bivariate Analysis

Table 3. The association of Independent Variables and MSDs

Variables	Category	Complaints of Musculoskeletal Disorders (MSDS)				OR	CI 95%		p
		Moderate		Severe			Lower Limit	Upper Limit	
		n	%	n	%				
Age (years)	≤ 35 years	9	23.7	5	13,2	4.37	1.07	17.79	0.034
	>35 years	7	18.4	17	44,7				
Working period (years)	≥ 6–10	11	28.9	8	21.1	3.85	0.98	15.12	0.049
	>10	5	13.2	14	36.8				
Workload	Pulse rate (≤ 125 BPM)	11	28.9	15	39.5	1.02	0.25	4.10	0.970
	Pulse rate (> 125 BPM)	5	13.2	7	18.4				
Body Posture	Non-risky (≤ 4 RULA score)	10	26,3	5	13.2	5.66	1.36	23.46	0.013
	Risky (> 4 RULA score)	6	15.8	17	44.7				
Working hours	Non-risky (≤ 8 hours/day)	10	26.3	3	7.90	10.5	2.16	51.42	0.002
	risky (> 8hours/day)	6	15.8	19	50				
Repetitive activity	Non-risky (≤ 10 times)	13	34.2	6	15.8	11.55	2.41	55.39	0.001
	Risky (≥ 10 times)	3	7.90	16	42.1				
Stretching	Often	5	13.2	20	52.6	0.04	0.00	0.27	<0.001
	Rarely	11	28.9	2	5.3				
Backrest	Have	4	10.5	17	77.3	0.09	0.02	0.44	0.001
	Do not have	12	31.6	5	13.2				

Table 3 showed the results of the bivariate analysis using the chi-square test, age >35 years had a risk to increase complaints of MSDs by 1.07 times compared to ≤ age of 35 years (OR= 1.07; 95% CI= 1.07 to 17.79; p= 0.034), working period > 10 years had the possibility to increase complaints of MSDs by 3.85 times compared to working period ≥ 6–10 years (OR= 3.85; 95% CI= 0.98 to 15.12; p= 0.049), and both results were statistically significant.

A person with a RULA posture score >4 had the possibility to increase MSDs complaints by 5.66 times compared to a person with a RULA posture score <4 (OR= 5.66; 95% CI= 1.36 to 23.46; p= 0.013). Working hours >8 hours/day increased complaints of MSDs by 10.5 times compared to working hours ≤ 8 hours/day (OR= 10.5; 95% CI= 2.16 to 51.42; p= 0.002), and the results were statistically significant.

Repetitive activity increased MSDs complaints by 11.55 times (OR= 11.55; 95% CI= 2.41 to 55.39; p= 0.001), rarely stretched 0.04 times (OR= 0.04; 95% CI= 0.00 to 0.27; p< 0.001), and someone who did not have a backrest while working increased SMDs complaints by 0.09 times (OR= 0.09; 95% CI= 0.02 to 0.44; p= 0.001), and the results were statistically significant.

One who had a workload with a pulse rate (> 125 BPM) have the possibility to increase MSDs complaints by 1.02 times compared to someone who has a workload with a pulse rate (≤ 125 BPM) (OR= 1.02; 95% CI= 0.25 to 4.10; p= 0.970) however the result was not statistically significant.

DISCUSSION

Complaints of Musculoskeletal Disorders (MSDs) have several factors that influence each other and are classified into 3 categories, namely environmental, individual, and occupational. Environmental factors consist of temperature, noise, and light. Age, gender, smoking habits, physical strength, body mass index, working period, and workload are individual characteristics. Occupational factors consist of work posture, repetitive activities, working hours, and ergonomics.

Based on the results of the study using the chi-square test, an association was discovered between age and complaints of musculoskeletal disease among ikat weaving craftsmen who weaved in Langa Bajawa. The results of observations during the study showed that Ikat Weaving craftsmen continued to work and actively weave at an old age with an age range of > 35 years. The findings of the study observations revealed that Ikat Weaving craftsmen were still actively weaving in the age range of more than 35 years. The results of this study are in line with a study conducted by Shobur, et al (2019) which shows that older workers or those who are over 35 years old have an 8,000 times higher risk of suffering from musculoskeletal disorders (MSDs) than workers who are younger (Shobur et al., 2019).

Based on the results of the study using the chi-square test, an association was discovered between the working period and complaints of musculoskeletal disorders among ikat weaving craftsmen who weave in Langa Bajawa. According to research-based observations, many ikat weavers had been employed since completing primary school, with the longest working period was between 20 - 30 years and the shortest between 5 - 6 years. Due to the work that was often done for a very long time, respondents with a longer working period reported greater symptoms of severe musculoskeletal disorders problems, such as those affecting the waist, back, and buttocks. The risk of prolonged exposure in the workplace

increases with the length of one's working career. A worker with a working period of more than 5 years can be considered to have a long service history, while a worker with a service period of less than or equal to 5 years is considered new in the labor force (Sakinah, 2012). The results of this study are in line with a study conducted by Badriyyah et al. (2021) which shows that there is an association between working period and musculoskeletal disorders because most of Pandai Sikek weavers have been weaving since they were in elementary school. Those who have a very long working period are very likely to have complaints of musculoskeletal disorders (Badriyyah et al., 2021).

Based on the results of the study using the chi-square test, it was discovered that there was no relationship between workload and complaints of musculoskeletal disorders among ikat weaving craftsmen who weaved in Langa Bajawa. It was due to the fact that the craftsmen were already familiar with their work and there was no load of >50kg, despite the fact that they weaved continuously for a long period in a static position, which could cause their muscle strength to weaken. Although there was no correlation through statistical testing, it was obvious from the results of the univariate test that a risky workload was equal to a non-risky workload because during weaving the craftsmen still had time to relax.

The results of this study are in line with a study by Khofiyya et al (2020) concerning baggage handling service workers at Ahmad Yani International Airport Semarang, which shows that there is no correlation between workload and complaints of musculoskeletal disorders because these workers experience downtime as waiting for check-in goods to enter the conveyor and while waiting for the plane to arrive. As a result of the demanding need for energy and oxygen in metabolism for muscles that perform above their capacity due to limited recovery time, it is conceivable that complaints of musculoskeletal problems are not caused by muscle fatigue (Khofiyya et al., n.d.). This study is not in line with a study conducted by Kattang et al. (2018) which discovered a correlation between workload and musculoskeletal complaints with an increasing complaint rate along with increasing workload (Kattang et al., 2018).

Based on the results of the study using the chi-square test, an association was discovered between body posture and complaints of musculoskeletal disease among ikat weavers in Langa Bajawa. As a result of the observations by the researchers, it was discovered that tie weavers generally had a firm working attitude, their bodies tend to lean forward, their legs were often in an unstable position, and their necks sometimes bend over in such a way that long enough to increase the risk of complaints of musculoskeletal disorders. The results of this study are in line with a study conducted by Ones et al. (2021) regarding weavers in South Letneo Village, West Insana District, North Central Timor Regency, which shows a relationship between work posture and MSDs complaints, one of which is Low Back Pain (LBP) caused by the position of the weaver's spine that bends over a long period (Ones et al., 2021).

Based on the results of the study using the chi-square test, a relationship was found between the duration of work spent working and complaints of musculoskeletal disorders among langa Bajawa ikat weavers. According to interviews conducted with several craftsmen, working time > 8 hours can produce cloth within a period of 3 days with a rest period of about 5-10 minutes for lunch or dinner. According to the theory, there should be compatibility between work

time and rest time to reduce musculoskeletal complaints because the longer a person works, the higher the risk it will receive and the longer it will take for energy recovery. The results of this study are in line with the research conducted by Utami et al. (2017) there is a correlation between the amount of time spent working and musculoskeletal complaints. The findings of this study support the researcher's research. In addition, it is claimed that if working hours exceed one hour, problems may arise such as reduced work efficiency and health problems that may have a negative impact on productivity (Utami et al., 2017).

Based on the results of the study using the chi-square test, an association was discovered between musculoskeletal complaints and repetitive activity among Ikat Weaving craftsmen in Langa Bajawa. Repetitive activity is observed in weavers as a result of these observations. In craftsmen, this activity can cause problems with the muscular system. The results of this study are in line with the study conducted by Sari (2019), which found an association between repetitive activity and the OR= 8.00 value determined from the analysis findings, which show that weavers who often engage in repetitive activities have 8.0 0 times higher risk of developing musculoskeletal disorders than those who rarely do it (Sari, 2019).

Based on the results of the study using the chi-square test, an association was discovered between stretching and complaints of musculoskeletal disorders among ikat weaving craftsmen in Langa Bajawa. According to the results of the interviews conducted, the ikat weaving craftsmen stretch their legs by walking casually or by doing exercises such as raising their hands to avoid muscle disorders in the hands and feet. The results of this study are in line with the study conducted by Nasution (2020), which shows an association between physical fitness and complaints of MSDs. A value of 0.137 for the odd ratio (OR), indicates that the probability of complaints of MSDs is 0.137 times lower in respondents with good physical fitness compared to respondents with poor physical fitness. This is due to the fact that the majority of respondents regularly do stretching or exercise, which lowers or eliminates the complaints of MSDs (Nasution, 2020).

The results of this study are in line with a study conducted by Wahyuni (2019), which shows a significant association between complaints of musculoskeletal disease and physical fitness. Lack of sleep and rest will have an impact on a person's physical fitness. Exercises that require a lot of effort without proper rest will result in muscle discomfort, thus muscle problems will be more likely to occur in those who are not in good physical condition. Healthy workers have the reserved energy to do additional work without endangering their health (Wahyuni, 2019).

Based on the results of the study using the chi-square test, an association was discovered between the backrest and musculoskeletal disease in ikat weaving craftsmen who weaved in Langa Bajawa. From the results of observations, researchers discovered that many craftsmen did not have backrests. The work position of sitting for a relatively long period without a backrest caused complaints in the middle back, and pain in the buttocks, and greatly affects complaints of musculoskeletal disorders. Craftsmen who had backrests, use pillows as a base under the hips and buttocks to prevent complaints of musculoskeletal disorders. The results of this study are in line with a study conducted by Yani (2018) which shows an association between prolonged sitting without a backrest and the

risk of low back pain as a type of complaint of musculoskeletal disorders, with p< 0.001 where one of the risk factors for low back pain is the long period of the lecture process that students must follow after a long period of activity and sitting period (Yani, 2018).

Suggestions for the Bajawa City Health Office that it is expected to provide Occupational Health and Safety counseling for informal and formal workers. It is also expected to evaluate and check the use of dyes used in woven fabrics so that they do not exceed the predetermined standards and guidelines. Suggestions for Ikat Weaving Craftsmen are that they are expected to prioritize occupational health and safety, especially in limb areas that are prone to complaints of MSDs and to do stretching before and after working, routinely do physical activities and exercises such as afternoon walks that can reduce pain due to the complaints of MSDs.

AUTHOR CONTRIBUTION

Agostin Nofembriyani Djawa was the main researcher who selected the study topic, data analysis and made the manuscript for publication, Muntasir was the supervisor in making the manuscript for publication, Soleman Landi was the academic counselor.

FUNDING AND SPONSORSHIP

This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

ACKNOWLEDGMENT

The author would like to send their gratitude to the research subjects who have been willing to be the respondents of the study.

REFERENCES

Badriyyah ZH, Setyaningsih Y, Ekawati E (2021). Hubungan Faktor Individu, Durasi Kerja, Dan Tingkat Risiko Ergonomi Terhadap Kejadian Musculoskeletal Disorders Pada Penenun Songket Pandai Sikek. Jurnal Kesehatan Masyarakat (Undip), 9(6), 778–783.

Kattang, SGP, Kawatu, PAT, Tucuan AAT. (2018). Hubungan Antara Masa Kerja Dan Beban Kerja Dengan Keluhan Muskuloskeletal Pada Pengrajin Gerabah Di Desa Pulutan Kecamatan Remboken Kabupaten Minahasa. Jurnal KESMAS, 7(4).

Kementrian Kesehatan Republik Indonesia. (2018). Laporan Hasil Riset Kesehatan Dasar (Riskesdas). In Badan Litbangkes Kementerian Kesehatan RI (p. 674).

Khofiyya AN, Suwondo A, Jayanti S (2019). Hubungan Beban Kerja, Iklim Kerja, dan Postur Kerja Terhadap Keluhan Musculoskeletal Disorders Pada Pekerja Baggage Handling Service Bandara. 1–10. Doi: 10.14710/jkm.-v7i4.24970

Krismayani D, Muliawan P (2021). Hubungan Faktor Individu Dan Faktor Okupasi Terhadap Keluhan Musculoskeletal Disorders Pada Pengrajin Tenun Ikat di Kabupaten Klungkung. Archive of Community Health, 8(1), 29–42. Doi: 10.24843/-ACH.2021.v08.i01.p03

Luik SA, Rat JM, Setyobudi A (2021). The Effect of Workplace Stretching Exercise on Reducing Musculoskeletal Complaints in Ndao Ikat Weaving Workers in Rote Ndao District. Lontar: J. Community Health, 3(3), 13. 3–140

Mallapiang F, Azriful, Nildawati, Syarfaini, Muis M, Adriansyah (2021). The

relationship of posture working with musculoskeletal disorders (MSDs) in the weaver West Sulawesi Indonesia. Gaceta Sanitaria, 35, S15–S18. Doi: 10.1016/j.gaceta.2020.12.005

Nasution RK (2020). Faktor Yang Berhubungan dengan Keluhan Musculoskeletal Disorders Pada Pekerja Tenun di Galery Ulos Sianipar. Universitas Islam Negeri Sumatera Utara.

Ones M, Sahdan M, Tira DS (2021). Faktor yang Berhubungan dengan Keluhan Nyeri Punggung Bawah (Low Back Pain) pada Penenun di Desa Letneo Selatan Kecamatan Insana Barat Kabupaten Timor Tengah Utara. Media Kesehatan Masyarakat, 3(1), 72–80. Doi: 10.35508/mkm

Rithinyo M, Loatong P, Noyming S (2022). Musculoskeletal Disorders in Workers of the Silk Weaving Preparation Process: A Study Case of Surin Province, Thailand. The Journal of King Mongkut's University of Technology North Bangkok, 32(4), 647–658.

Sakinah (2012). Faktor Yang Berhubungan Dengan Keluhan Nyeri Punggung Bawah Pada Pekerja Batu Bata Di Kelurahan Lawawoi Kabupaten Sidrap. Universitas Hasanuddin Makassar.

Sari FI (2019). Analisis Musculoskeletal Disorder (MSDs) Pada Pekerja Tenun Ikat di Kelurahan Tuan Kentang Kota Palembang Tahun 2019 [Bina Husada Palembang].

Shobur S, Maksuk M, Sari FI (2019). Faktor Risiko Musculoskeletal Disorders (MSDs) Pada Pekerja Tenun Ikat Di Kelurahan Tuan Kentang Kota Palembang. Jurnal Medikes (Media Informasi Kesehatan), 6(2), 113–122.

Tarwaka, Bakri SH, Sudiajeng L (2004). Ergonomi untuk Keselamatan, Kesehatan Kerja dan Produktivitas UNIBA Press., Surakarta (U. PRESS (ed.); 1st ed.). UNIBA PRESS.

Utami U, Karimuna SR, Jufri N (2017). Hubungan Lama Kerja, Sikap Kerja dan Beban Kerja Dengan Muskuloskeletal Disorders (MSDs) pada Petani Padi Di Desa Ahuhu Kecamatan Meluhu Kabupaten Konawe Tahun 2017. Jimkesmas: Jurnal Ilmah Mahasiswa Kesehatan Masyarakat, 2(6), 1–10.

Wahyuni CA (2019). Hubungan Kesegaran Jasmani dan Sikap Kerja dengan Keluhan Muskuloskeletal Pada Pengrajin Manik Kaca di Jombang. Jurnal Kesehatan Masyarakat, 2(1), 221–224. Doi: 10.30651/jkm.v4i2.2085

WHO (2022). Musculoskeletal health. https://www.who.int/newsroom/fact-sheets/detail/musculoskeletalconditions.

Yani BS (2018). Hubungan Lama Duduk Tanpa Sandaran Terhadap Risiko Terjadinya Nyeri Punggung Bawah Pada Mahasiswa Farmasi UMM. Universitas Muhammadiyah Malang.