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ORIGINAL ARTICLE

Analysis of Individual and Occupational Factors with Complaints of Musculoskeletal Disorders in Swallow Nest Cleaning

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ABSTRACT

Introduction: Workers of swallow nest industry are at risk of experiencing musculoskeletal disorders due to monotonous swallow nest cleaning activity which puts heavy load on their extremity area of the upper body. This research seeks to analyze the relationships of age, gender, nutritional status, exercise habits, working hours, and working position with complaints of musculoskeletal disorders in swallow nest cleaning workers at PT. Lentera Alam Nusantara. **Method:** This type of research uses observational with a cross-sectional approach. The population in this study were all workers in the cleaning and washing section of swallow nests at PT. Lentera Alam Nusantara Surabaya, totaling 50 people. Determination of the number of samples using simple random sampling lemmeshow formula, obtained a sample of 36 workers. **Results:** The majority of workers are 35 years old, female, obese nutritional status, rarely exercise, have 8 hours of work, moderate work position, and the majority have moderate muculoskeletal complaints. Based on the analysis test results using the spearman test, it shows that the factors that have a significant p-value <0.05 include ages, gender, nutrition status, exercise habits, and working hours. **Conclusion:** Thus, it can be concluded that there is a relationship between age, gender, nutrition status, exercise habits, and working hours with complaints of musculoskeletal disorders.

Keywords: musculoskeletal disorders, RULA, swallow nest cleaning workers

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INTRODUCTION

Indonesia is a Southeast Asian country currently experiencing industrialization. The rapid development of industrialization in this country is shown by the results of a census conducted by the Statistics Indonesia (2017), revealing that there were 25,566 registered companies in 2015, and the number increased sharply to 37,929 in 2016 (Central Bureau of Statisic Indonesia, 2017). Such phenomenon of rapid development in the industrial sector brings positive impacts in the economic sector. According to data compiled by the Organization for Economic Co-Operation and Development (OECD) (2018), Indonesia was ranked third in terms of Growth Domestic Product (GDP) growth among the five founding countries of Association of Southeast Asian Nations (ASEAN). The agency projected that Indonesia's economic growth would reach 5.4% in 2018 to 2022 (OECD, 2018). The emerging problems, especially those in the occupational health aspects, have been unresolved, both in formal or informal industrial institutions (Laksana, 2015).

Occupational health and safety is a mandatory protection practice for any workplace, whether it belongs to the large, medium, or small scale industrial sectors, considering that every workplace holds potential source of danger that can trigger the risk of occupational accidents and occupational diseases, even resulting in big losses (International Labor Organization, 2013) Occupational accidents and occupational diseases need special attention, considering that case findings are of significant value. A closer look at the statistics and estimates provided by the International Labor Organization in 2018 showed that that there were around 2.78

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million workers who died every year due to work accidents and diseases. Specifically, there were 2.4 million (86.3%) of occupational diseases and 380 thousand (13.7%) of occupational accidents. The incurred annual losses reached 3.94% of global GDP (International Labor Organization, 2018).

Based on the data presented by the International Labor Organization in 2018, it can be interpreted that the incidence of occupational diseases has high significant value when compared to occupational accidents, globally. These occupational diseases can be caused by various exposures from work process or activity, including diseases that attack specific organs, trigger cancers, and others (Presidential Decree, 2019). Every job has risks depending on the factors that can encourage a person's condition to manifest work-related illnesses/health problems. Some of the health problems experienced by workers due to non-ergonomic work positions are complaints in the joints and skeletal muscles which are commonly referred to as musculoskeletal disorders. This particular disorder can arise if the worker's body receives a continuous load for a long period of time, because it can endanger the health of the body's ligaments and joints (Tarwaka, 2019).

According to the data provided by the Global Burden of Disease (GBD), there were approximately 1.71 billion people in the world who suffered from musculoskeletal disorders. The prevalence of musculoskeletal disorders based on age and diagnosis of severity varies widely. Musculoskeletal disorders are statistically the largest contributor to years lived with disability (YLDs) status worldwide, amounting to 149 million (17% of the accumulated YLDs worldwide) (Cieza *et al*., 2020). The Survey of Occupational Injuries and Illnesses (SOII) in 2018 explained that 272,780 cases of musculoskeletal disorders were recorded, while in 2011 there were 311,840 cases of musculoskeletal disorders recorded in the United States. The incidence rate of musculoskeletal disorders in full-time workers was 27.2 per 10,000 cases in 2018, and 35.4 per 10,000 cases in 2011 (Bureau of Labor Statistics US, 2020). Musculoskeletal disorders can be manifested due to several individual-related factors such as age, gender, fitness, anthropometry, and occupational factors such as repetition of movements while working, non-ergonomic working position, as well as physical environmental factors such as vibration and temperature that lead to complaints of musculoskeletal disorders (Sekaaram and Ani, 2017; Tarwaka, 2019; Indica Danida *et al*., 2020)

Currently, there is no research report on the prevalence or incidence of musculoskeletal disorders and related factors in swallow nest workers in Surabaya. Workers in the swallow nest industry are at risk for musculoskeletal disorders due to monotonous work activity in the swallow nest cleaning section which triggers loads on the extremity areas of the upper body such as the wrists, nape of the neck, and also the back.

PT. Lentera Alam Nusantara is engaged in raw and processed products of swallow nest. Workers in swallow nest cleaning and washing section have significant risk of suffering from musculoskeletal disorders due to unnatural work postures and continuous load on the arms and fingers when plucking swallow feathers. Based on a preliminary survey conducted by the researcher to five production workers, it was revealed that all five workers complained of pain in the right and left wrists, neck, and back. The pain, especially in the right and left wrists, was felt even after a short break. The complaints in back pain were temporary and the pain would disappear when taking a break from work. In a day of work, sometimes they work up to 7 p.m. due to daily targeted work system and there is no limit to overtime hours. Workers must meet their monthly target of at least 32 kg. Based on the previously elaborated background, this research seeks to analyze the relationship of individual factors such as age, gender, nutritional status, exercise habits, occupational factors such working hours and working position, with complaints of musculoskeletal disorders in swallow nest cleaning workers at PT. Lentera Alam Nusantara Surabaya in 2021.

METHODS

This research belongs to observational research with a cross-sectional approach when viewed from its implementation time dimension. The population of this research were all workers in the swallow nest cleaning and washing section at PT. Lentera Alam Nusantara Surabaya, amounting to 50 workers. Sample selection was done using the simple random sampling formula of Lemeshow with a statistical Z value of 19.6 and d value as the error limit set at 10%, giving result of 36 workers. Participants were selected based on randomization of workers at PT. Lentera Alam Nusantara. The researcher applied an inclusion criterion of workers who were willing to participate in this research by signing informed

consent before their data were collected. This research was held at PT.Lentera Alam Nusantara Head Office and Branch Office Production section from February 2021 until end of March 2021.

Age, gender, nutritional status, exercise habits, working hours, and working position became the independent variables in this research while complaints of musculoskeletal disorder was the dependent variable. Nutritional status was assessed through the Body Mass Index (BMI) from the calculation of body weight (kg) divided by height (meter). Their heights were measured using height gauge and weights were measured using weight scale. Working position was measured with the Rapid Upper Limb Assessment (RULA) observation sheet and cellphone camera images for documentation and simplification of analysis. The RULA method was chosen to measure the working position whether such position is at risk of experiencing disorder or not in terms of ergonomic sitting position while working. This method is particularly appropriate because most of participants' activities did not require moving around a lot and the dominant part that experienced repetition was the extremity of the upper body.

To determine the severity and location of complaints on the musculoskeletal system, the researcher used a standard questionnaire that has been used in various previous research, namely the Nordic Body Map questionnaire. Spearman test statistical analysis was used to see whether there are relationships between the independent variables and dependent variable with a significance value of $\alpha = 0.05$. This research has passed the ethical feasibility test from the Ethics Committee of Airlangga University, Faculty of Dental Medicine with the issuance of number: 054/HRECC.FODM/ II/ 2021.

RESULT

Characteristics of Swallow Nest Cleaning Workers of PT. Lentera Alam Nusantara Surabaya

From Table 1, it can be seen that participants aged ≥ 35 years were 24 (66.7%) workers, and those aged <35 years were 12 (33.3%) workers. All of them were in the productive age for work and no underage worker was found.

Table 2 shows that the majority of participants were female with a total of 28 (77.8%) workers and the rest were male with a total of eight (2.2%) workers.

Table 3 shows that most participants had overweight category of nutritional status (20 workers, 55.6%) and 16 (44.4%) workers had normal category of nutritional status. The calculation of their nutritional status was determined by calculation of body weight (Kg) divided by body height squared (meter).

The distribution of participants based on exercise habits can be seen in Table 4. The majority of workers, 29 (80.6%) participants, at PT Lentera Alam Nusantara rarely exercised with an intensity of 0 to 3 times a maximum of in a month. There were seven (19.4%) workers who exercised at least 1 to 3 times in a week. The frequency of exercise in one activity for gymnastic activities takes between 15 to 45 minutes. Jogging takes about 15 to 30 minutes in the morning.

Table 1. Distribution of Ages at PT. Lentera Alam Nusantara Surabaya in 2021

Ages	n	%
< 35 years	12	33.3
≥ 35 years	24	66.7
Total	36	100.0

Table 2. Distribution of Gender at PT. Lentera Alam Nusantara Surabaya in 2021

Gender	n	%
Male	8	2.2
Female	28	77.8
Total	36	100.0

Table 3. Distribution of Worker Nutritional Status at PT. Lentera Alam Nusantara Surabaya in 2021

Nutritional Status	n	%
Normal (18.5-25.0)	16	44.4
Overweight (> 25.0)	20	55.6
Total	36	100.0

Table 4. Distribution of Worker Exercise Habit at PT. Lentera Alam Nusantara Surabaya in 2021

Exercise Habit	n	%
Rare (0-3 times/month)	29	80.6
Freequently (1- 3 times/week)	7	19.4
Total	36	100.0

Data regarding the working hours of participants at PT. Lentera Alam Nusantara is described in Table 5. Based on the data, it can be seen that most workers who had ≤ 8 working hours a day were 21 (58.3%) workers. Meanwhile, those who worked more than the stipulated working hours, namely eight hours a day, were 15 (41.7%) workers.

Ergonomic Risks of Working Position and Complaints of Musculoskeletal Disorders at PT. Lentera Alam Nusantara Surabaya

The working position in swallow nest cleaning section was assessed using the RULA method to view risks from an ergonomic point of view in the upper limb and transforming working position into angles and scores. The scores obtained were used as a consideration for suggestions to prevent musculoskeletal disorders. Information and data are presented in Table 6. Based on Table 6, it can be interpreted that most workers had moderate risk working position (26 workers, 72.2%).

Data related to complaints of musculoskeletal disorders in workers were obtained through the Nordic Body Map instrument with four options of questions regarding the severity and location of pain felt in all parts of the body. Based on the severity of musculoskeletal disorders presented in Table 7, it can be interpreted that the majority of workers at PT. Lentera Alam Nusantara Surabaya felt complaints of moderate severity (17 workers, 47.2%) and low severity (4 workers, 11.1%).

Table 5. Distribution of Working Hours at PT. Lentera Alam Nusantara Surabaya in 2021

Working Hours	n	%
≤8 hours/day	21	58.3
>8 hours/day	15	41.7
Total	36	100.0

Table 6. Distribution of Working Position Ergonomically using the RULA Method at PT. Lentera Alam Nusantara Surabaya in 2021

Working Position Risk	n	%
Low	10	27.8
Moderate	26	72.2
Total	36	100.0

Analysis of Individual Factors with Complaints of Musculoskeletal Disorders at PT. Lentera Alam Nusantara Surabaya

The analysis results of individual factors such as age, gender, nutritional status, and exercise habits with complaints of musculoskeletal disorders using cross-tabulations and Spearman statistical tests with a significance of $\alpha = 0.05$ are presented in Table 8. Based on Table 8, it can be interpreted that there were 14 (58.3%) workers aged ≥ 35 years who experienced musculoskeletal complaints with high severity of pain. Meanwhile, among 12 workers who were <35 years old, only one (8.3%) worker experienced musculoskeletal complaints with high severity. The majority of workers aged <35 years suffered moderate severity of musculoskeletal complaints (10 workers, 83.3%). The results of Spearman statistical test with a significance value of 0.05 showed a p-value of 0.036. This means that there is a relationship between age and complaints of musculoskeletal disorders in workers at PT. Lentera Alam Nusantara Surabaya.

Of the eight male workers, most of them suffered from musculoskeletal disorders with high severity (7 workers, 87. 5%). Meanwhile, out of 28 female workers, most of them had complaints of musculoskeletal disorders with moderate severity (17 workers, 60.7%). The statistical test using Spearman test showed that there is a relationship between gender and complaints of musculoskeletal disorders among workers at PT. Lentera Alam Nusantara Surabaya with a p-value of 0.023.

The data regarding nutritional status presented in Table 8 can be interpreted that out of 16 workers with normal nutritional status, 10 (62.5%) workers felt musculoskeletal disorder complaints of moderate severity. Of the 20 workers who had overweight nutritional status, 11 (55%) had complaints of musculoskeletal disorder with high severity. The results of statistical tests using spearman test

Table 7. Distribution of Musculoskeletal Disorders Complaints at PT. Lentera Alam Nusantara Surabaya in 2021

MSDs Complaint Severity	n	%
Low	4	11.1
Moderate	17	47.2
High	15	41.7
Total	36	100.0

showed a p-value of 0.002, which means that there is a relationship between nutritional status and complaints of musculoskeletal disorders among workers at PT. Lentera Alam Nusantara Surabaya.

From Table 8, it can also be seen that out of 29 workers who rarely exercised, as many as 14 (48.3%) workers had complaints of musculoskeletal disorders at both moderate and high severities. Of the seven workers who often exercised, there were three (42.9%) workers who felt complaints of musculoskeletal disorder with moderate and low severities. The Spearman statistical test results showed a significance value of p-value of 0.016 which means that there is a relationship between exercise habits and complaints of musculoskeletal disorders among workers at PT. Lentera Alam Nusantara Surabaya.

Analysis of Occupational Factors with Complaints of Musculoskeletal Disorders at PT. Lentera Alam Nusantara Surabaya

The analysis results of occupational factors such as working hours in a day and ergonomic working position with complaints of musculoskeletal disorders using cross-tabulations and Spearman statistical tests with a significance of $\alpha = 0.05$ are presented in Table 9.

Based on Table 9, it can be seen that out of 15 workers who had working hours >8 hours a day, there were 10 workers who had complaints of musculoskeletal disorder with high severity. The results of statistical tests using spearman with a significance value of 0.05 showed a p-value of 0.015 where this means that there is a relationship between working hours in a day and complaints of

Table 8. Cross Tabulation of Individual Factors with Complaints of Musculoskeletal Disorders at PT. Lentera Alam Nusantara Surabaya in 2021

Individual Factors	Musculoskeletal Disorders Complaint						Total		P-value
	Low		Moderate		High				
	n	%	n	%	n	%	N	%	
Age									
< 35 years	1	8.3	10	83.3	1	8.3	12	100	0.036
≥ 35 years	3	12.5	7	29.2	14	58.3	24	100	
Gender									
Male	1	12.5	0	0	7	87.5	8	100	0.023
Female	3	10.7	17	60.7	8	28.6	28	100	
Nutritional Status									
Normal (18.5-25,0)	2	12.5	10	62.5	4	25	16	100	0.002
Overweight (> 25.0)	2	10	7	35	11	55	20	100	
Exercise Habit									
Rare (0-3 times/month)	1	3.4	14	48.3	14	48.3	29	100	0.016
Freequently (1- 3 times/week)	3	42.9	3	42.9	1	14.3	7	100	

Table 9. Cross Tabulation of Occupational Factors with Complaints of Musculoskeletal Disorders at PT. Lentera Alam Nusantara Surabaya in 2021

Occupational Factors	Musculoskeletal Disorders Complaint						Total		P-value
	Low		Moderate		High				
	n	%	n	%	n	%	N	%	
Working Hours									
≤8 hours/day	2	9.5	14	66.7	5	23.8	21	100	0.036
>8 hours/day	2	13.3	3	20	10	66.7	15	100	
Working Position Risk									
Low	0	0	8	80	2	20	10	100	0.023
Moderate	4	15.4	9	34.6	13	50	26	100	

musculoskeletal disorders among workers at PT. Lentera Alam Nusantara Surabaya. Furthermore, Table 9 also shows data about ergonomic working position at PT. Lentera Alam Nusantara.

Among 26 workers with moderate working position risk, 13 of them (50%) had musculoskeletal disorder complaints with high severity, nine (34.6%) workers had musculoskeletal disorder complaints with moderate severity, and four (15.4%) workers had musculoskeletal disorder complaints with low severity. The statistical test using Spearman showed that there was no relationship between ergonomic working position and complaints of musculoskeletal disorders among workers at PT. Lentera Alam Nusantara Surabaya with a p-value of 0.378.

DISCUSSION

Characteristic of Swallow Nest Cleaning Workers of PT. Lentera Alam Nusantara Surabaya

From the results of this research, it can be seen that those over 35 years of age dominate the workers in the bird's nest cleaning section. Age is defined as a biological timeframe from the day of birth to the time the study was carried out. Sani and Noeroel (2021) describe that age plays a role closely related to somatic aspects such as skills, body fitness, and anthropometry, where age also has a bearing on tenure. As the age increases, the working period is also accompanied by an increase. With the increase in working time and age, a person can decrease muscle endurance due to frequent work and daily activities. At the age of 35 years and over, there is a decrease in the power of cell regeneration in the form of escalation of tissue damage. The damaged tissue will be replaced with scar tissue where this condition causes reduced fluid, especially to lubricate the joints (Krismayani *et al*., 2021)

The majority of workers in the section cleaning swallow nests are female. This is because the work activities carried out do not require labor characteristics in terms of physical and muscular endurance, but rather patience and thoroughness in work. This condition can be caused by physical and psychological factors. From a psychological perspective, women are more prone to receive psychological pressure at work when compared to men, even though the portion of work given is the same (Heidari *et al*., 2019). Women generally have smaller body dimensions and have fewer muscles than men so that resistance to loading and or pain can be tolerated longer in the male gender (Yang *et al*., 2019).

Data regarding the nutritional status of workers in the swallow nest cleaning section of PT. Lantera Alam Nusantara show that most are at the level of overweight. Nutritional status is defined as the resolution of the body due to consumption or intake of food and nutrients into the body. Being overweight is a reminder that the body is not doing well. With excess body weight than normal, fat that cannot be digested is transferred to the abdomen and stored in adipose tissue as a reserve. Excessive accumulation in this section can lead to increased pressure due to increased load so that it can have an impact on the health conditions of bones and joints (Hanifah *et al*., 2021)

Workers in the nest cleaning section rarely get used to regular exercise. The intensity of the most common exercise habits between never to three times a month. Routine exercise provides positive benefits for the physiological condition of the body organs. By exercising regularly and properly, can minimize the risk of developing joint disease due to increased bone mass and density. Apart from being beneficial for bones, regular exercise can help improve heart rhythm health, lungs and blood circulation (Alamsyah, 2021).

Working hours are calculated based on the standards of the Ministry of Manpower of the Republic of Indonesia that, in a day, workers are employed a maximum of eight hours and overtime is calculated. There are 15 workers who do overtime to meet daily and weekly targets so that they work more than normal working hours. Working hours that exceed normal time can actually reduce work productivity due to being in an awkward position and lead to the appearance of fatigue (Krismayani *et al*., 2021). By increasing the duration of work beyond the capacity of the individual, it can have an impact on not achieving maximum work performance. With regard to the weekly work duration, a person can work best if he is proportioned to 40-50 hours of work if he works between 6 to 8 hours a day. If the weekly working hours are excessive, it can be possible to create a bad stigma among workers (Sani and Noeroel, 2021).

Ergonomic Risks of Working Position and Complaints of Musculoskeletal Disorders at PT. Lentera Alam Nusantara Surabaya

The characteristics of job in the swallow nest cleaning and washing section are categorized as

repetitive and requiring very high accuracy. The activities drain more energy compared to physical activity because in completing the tasks, workers are required to dominantly utilize cognitive processing abilities such as concentration, focus, and accuracy. Indeed, when viewed from the physiological burden to the body, thinking is a light job so that spends low calories. However, in terms of responsibility and morale, this activity is tougher when compared to physical work (Tarwaka, 2019).

In addition to requiring high accuracy, the job of swallow nest cleaning puts a considerable burden on the upper body extremities such as fingers, arms, neck, shoulders, head, and shoulders in a static repetitive state for eight hours of work. The repetitive movement is a triggering musculoskeletal disorders because the muscles get continuous pressure from workloads without getting a break to rest tense muscles (Tarwaka, 2019). From the results of data collection on 36 participants of swallow nest cleaning workers, it can be seen that all workers complained of pain in the neck, shoulders, back, hands, especially on the buttocks of the fingers.

This result is in line with research conducted by Krismayani *et al*. (2021) that the complaints of musculoskeletal disorders felt by weavers in the Klungkung area, namely on the back (69.05%), hips (54.76%), and neck (52.38%). This is because the work posture in the swallow nest cleaning section is almost the same as that of the weaver workers, especially in erognomy sitting position. Worker tends to sit for a long time where there is no balanced back on the chair to align the spine so that the back on tense, stiff, and is exacerbated by the lack of stretching done by the worker so that the back is equally the dominant part of the location of complaints.

Complaints from the calves to the feet are rarely felt by workers because the work process in the repetitive swallow nest cleaning section is carried out in a sitting condition for hours and with ergonomic working position such as the head being too close to the display table to clean the nest, working in a bent position without any support back rest, pressing movements on the fingers during the swallow feather removal process, and the shoulders in static state to maintain stability when plucking swallow feathers, etc. As many as 48% of workers complained in the leg area due to the position of the legs while working in a hanging state due to the height of the table legs that are not in accordance with individual anthropometry. This result is in line with the research done by Salimatusadiah *et al*. (2021) on accessories fitting operators whose work position is dominated by the neck, which is bent too close to the display and the position of the legs that are crossed or not ergonomic standards can result in inhibition of work productivity due to neck and leg pain. Although this work position has a light risk, it is not safe if it is carried out for a long duration and intense repetitions because it can exacerbate pain complaints at a higher level.

Relationships between Individual Factors with Complaints of Musculoskeletal Disorders

The Spearman statistical test results showed that age is related with complaints of musculoskeletal disorders. When viewed from the cross tabulation in Table 8, workers with age ≥35 years had a higher tendency to experience complaints of musculoskeletal disorders when compared to those aged <35 years. These results are in line with Umami's (2019) research on injection workers at PT ARPS that there is a relationship between age and complaints of musculoskeletal disorders with a p-value of 0.005.

Age is a factor that can make complaints of musculoskeletal disorders to become worse. The more a person gets older, the worse his physical and body condition (Tjahayuningtyas, 2019). Complaints of musculoskeletal disorders related to work begin at age 35 and the condition worsens as the age increases. This condition happens as the age increases, the ability and endurance of the muscles shrink so that it increase the risks of muscle and joint complaints (Tarwaka, 2019). This theory is supported by the results of research from Shobur *et al*., (2019) that workers at an advanced age, namely ≥35 years of age, have an eight times greater chance of having musculoskeletal complaints than younger workers. Judging from the facts related to this condition, it can be interpreted that workers who are at the age of 35 should be given work activities that are not too burdensome for their physique, especially the joints, because they belong to vulnerable group.

Based on the results of spearman test, it is stated that there are variables of gender with complaints of musculoskeletal disorder in swallow nest cleaning section at PT. Lentera Alam Nusantara Surabaya. The number of male workers experienced complaints of musculoskeletal disorders with a higher degree of severity than women. This is in line with the research result of Saputro *et al*., (2019) on batik craftsmen that there is a relationship between

gender and complaints of musculoskeletal disorders with a p-value of 0.014. Shobur *et al*. (2019) provided another opinion that there is no significant relationship between gender and complaints of musculoskeletal disorders in workers with a p-value of 0.702. No significant relationship was found because the workload and work activities assigned were equal, there was no diversification so that the research results could not capture any significant results.

Gender is a predictor that can trigger complaints of musculoskeletal disorders, especially in the muscles. Physiologically, female's muscles have a strength of 66.7% compared to male's muscles (Tarwaka, 2019). Thus, it can affect the resistance in bearing the burden they feel. This shows that, in general, the muscle capacity and capabilities of males are better than females, especially in arms, legs, and spine (Tarwaka, 2019). Complaints in females often occur because females experience menopausal cycle that triggers erosion of bone tissue. This results in bone density to decrease. Decreased bone density can increase susceptibility to complaints about musculoskeletal disorders in their limbs.

The cross-tabulation presented in Table 8 means that musculoskeletal complaints with a high severity are mostly experienced by workers who have over weight nutritional status, to be precise in workers with BMI calculation results >25.00. Based on the results of this study, it indicates that there is a relationship between nutritional status with musculoskeletal complaints. This finding is in line with the result of previous research conducted by Irawati *et al*. (2020) that there is a relationship between nutritional status and musculoskeletal complaints in tailors in West Java with a p-value of 0,000. This result somehow contradicts a research conducted by Prahastuti *et al*. (2021) that there is no relationship between nutritional status and complaints of musculoskeletal disorders in market laborer in South Jakarta with a p-value of 0.454.

Nutritional status triggers the manifestation of musculoskeletal complaints as a resolution of excessive body size (Graveling, 2019). An overweight person has an abnormal body size and, because of this condition, it can put additional strain on the joints in performing activities, especially the muscles in the leg area. An overweight body can also disrupt the balance of the muscle and skeletal systems in carrying body weight and additional weight so that it can increase the risk of musculoskeletal complaints (Tarwaka, 2019). This can occur because the part of the body that has a role in supporting the weight of the front is overstressed due to the load causing contraction of the back muscles. This condition can put pressure on the nerve pads in the spinal area and can trigger HNP (hernia nucleus pulposus) if the load due to nutritional status lasts for a long period of time (Irawati *et al*., 2020).

Based on the results of the study, it was found that the number of workers who rarely exercised with an intensity of 0 to 3 times a month had a greater frequency than workers with frequecly 1-3 times/week. The commonly performed exercises include jogging, cycling, and gymnastics. With the lack of exercise intensity, 14 workers felt moderate musculoskeletal disorders and 14 had high severity. The low intensity of exercise at PT. Lentera Alam Nusantara was due to the fact that workers did not have enough time to allocate their spare time for exercising. All workers actually understood that exercising can make muscles and joints more flexible and lighten their load, but they can only be done on Saturdays and Sundays. On a typical day, workers needed to meet their daily nest cleaning targets.

The Spearman statistical test results illustrate that there is a relationship between exercise habits and musculoskeletal complaints at PT. Lentera Alam Nusantara. This result is in line with the findings of Ginanjar *et al*. (2018) on Bogor City convection SMEs workers with a p-value of 0.012 that there is a relationship between exercise habits and MSDs complaints. However, this research contradicts the results of research by Danida *et al*. (2020) on workers at Hotel Kartika Chandra who explained that there is no significant relationship between exercise habits and musculoskeletal complaints (p-value 0.657) (Danida *et al*., 2020). The intensity of regular exercise can prevent the risk of discomfort in the muscles and can improve body fitness (Helmina *et al*., 2019). Workers are advised to spend 15 minutes before work doing exercises and stretching. By stretching, they slowly can train the efficiency of the cardiorespiratory system. Muscle contraction can occur with the help of oxygen and the cardiorespiratory system plays a role in supplying oxygen to body cells (Rachmawati and Shoim, 2019).

Relationships between Occupational Factors with Complaints of Musculoskeletal Disorders

Most workers worked ≤8 hours per day (21 workers). However, there were 15 workers who

had >8 working hours. This is because there are no standard regulations as to how many hours workers are allowed to continue their work. Therefore, the company provides overtime freedom to pursue daily targets. Based on the results of the study, it showed that workers with working hours >8 hours had the most complaints of musculoskeletal disorders with a high severity level than workers with working hours ≤8 hours. Workers who work more >8 hours a day have a 6.7 times risk of experiencing musculoskeletal complaints compared to workers who work for ≤8 hours (Rahayu *et al*., 2020).

Spearman statistical test shows that there is a relationship between working hours in a day and complaints of musculoskeletal disorders. This result is in line with a research on computer user workers at BPS of North Sumatra in 2018, showing that there is a significant relationship between working time in a day and complaints of musculoskeletal disorders (Anjanny *et al*., 2019). Similar research done by Simorangkir, Siregar and Sibagaring (2021) at labor in the informal sector that works on traditional garments, also known as Ulos, in North Tapanuli revealed that working time has a significant relationship with musculoskeletal disorders complaint.

A research conducted by Rahayu *et al*. (2020) revealed that there is no relationship between the working hours in a day and complaints of musculoskeletal disorders in the personnel bureau of the Ministry of Health of Indonesia. With the increasing working hours, it will make the body persist in a non-ergonomics repetitive posture, which causes the muscles to contract more frequently and ultimately raises complaints related to skeletal muscles and joints (Ramadhiani *et al*., 2017).

Table 9 presents that the working position at PT. Lentera Alam Nusantara, especially in swallow nest cleaning workers, had moderate severity, half of which with moderate work positions experience complaints of musculoskeletal disorders with high severity. This finding suggests that a higher level of less ergonomic working position can lead to higher complaints of musculoskeletal disorders. This statement is in line with the results of research from Ginanjar *et al*. (2018) that workers with less ergonomic working postures have a 6.03 times greater risk of suffering from musculoskeletal disorders when compared to workers with normal or low postures.

Based on the results of statistical tests using Spearman, it was shown that there was no relationship between ergonomic working position and complaints of musculoskeletal disorder. In this research, working position is categorized as medium and low levels, where the higher the level experienced, the higher risks of muscle and skeletal disorders will be. The analysis of ergonomic working position mostly showed moderate level, but this condition requires follow-up and allows for readjustment in working position to prevent problems with the limbs (Tarwaka, 2019).

Factors that cause unrelated results include company policies that are made more flexible regarding periods or hours of rest. When workers feel that there are complaints related to MSDs such as pain in the shoulders, neck, palms and others, the workers will be given the opportunity to rest for 10 to 15 minutes to do stretching and relaxation. It is not uncommon for workers to be given massage treatment by their co-workers to reduce stiffness in the area of the body that hurts. In addition, when viewed from the period of the company. This company was only founded in late 2018. So most of the workers have low tenure. With low tenure, it is possible that exposure to MSDs is not enough to cause health problems (Maakip *et al*., 2016; Dernovšček *et al*., 2018).

This result is supported by a research conducted by Tjahayuningtyas (2019) that there is no significant relationship between working position and complaints of musculoskeletal disorders in tofu makers at Sidaorjo. Another research shows that there is a relationship between working position with musculoskeletal complaints in tailors in West Java (Irawati *et al*., 2020).

CONCLUSION

The majority of workers in the swallow nest cleaning section at PT. Lentera Alam Nusantara Surabaya in performing their work activities have based on the RULA observation sheet, working position, having moderate risk and feel complaints of musculoskeletal disorders with moderate severity. The results of correlation and Spearman tests at the 0.05 significance level illustrate that there are relationships between age, gender, nutrition status, exercise habits, and working hours with complaints of musculoskeletal disorders. As the age increases, it will be accompanied by increased risk of musculoskeletal complaints. Females are more prone to experiencing musculoskeletal complaints. Workers with an overweight nutritional

status have higher musculoskeletal complaints when compared to normal nutritional status. Workers who rarely exercise experience higher musculoskeletal complaints than workers who frequently exercise. Workers who have working hours >8 hours a day tend to feel high musculoskeletal complaints when compared to workers who work for 8 hours. The higher the value of the ergonomic working position indicates that the worker is at risk for experiencing complaints of musculoskeletal disorders with high severity.

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