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ORIGINAL ARTICLE

The Incidence of Neck and Upper Back Pain in Cosmetic Packaging Workers

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Abstract

Background: Prolonged manual handling activities increase the risk of musculoskeletal disorders (MSDs), particularly neck pain and upper back pain, which are common among adult workers and may negatively affect work performance and quality of life. **Objective**: This study analyzes the relationship between age, gender, length of service, and stretching habits with complaints of neck pain and upper back pain among packaging production workers. **Method**: An analytical observational study with a cross-sectional design was conducted among 48 packaging production workers. Data were collected using structured questionnaires covering age, gender, length of service, and stretching habits. Neck pain complaints were assessed using the Neck Disability Index (NDI), while upper back pain was measured using a comparative pain scale. Data were analyzed using the chi-square test with a significance level of 0.05. **Results**: The majority of workers were early adults, with a maximum age of 52 years, and the majority were male. Several workers had worked for more than five years, with the longest length of service reaching 34 years. **Discussion**: Neck pain complaints were significantly associated with age (p = 0.002) and gender (p = 0.048), while length of service and stretching habits were not significantly associated. Upper back pain complaints were significantly associated with length of service (p = 0.016), whereas age, gender, and stretching habits showed no significant association. **Conclusion**: Age and gender were associated with neck pain, while length of service was associated with upper back pain among packaging production workers, highlighting the importance of ergonomic risk management and targeted preventive interventions.

Keywords: neck pain, upper back pain, packaging workers, stretching habits

INTRODUCTION

Overworked muscles will become damaged if left untreated. Monotonous activities performed over a prolonged period can cause musculoskeletal system problems, ranging from mild to severe muscle stiffness [1]. Common musculoskeletal complaints in adults include upper back pain and neck pain. This pain, stiffness, and discomfort are felt along the spine, from the base of the neck to the tailbone. Almost everyone experiences back pain at some point in their life [2].

Approximately 16.6% of the adult population experiences neck pain every year, and 0.6% of these individuals will progress to severe neck pain [3]. Previous research conducted on computer workers in Sudan found the prevalence of neck complaints was 64%, and shoulder pain was 41% [3].

Cosmetic packaging is part of the cosmetic production process at a cosmetic company. Activities include filling, labeling, and packaging products. The packaging process is carried out manually with the patient sitting and slightly bent over, or with the body facing downward. This condition causes the body to be in a static state, which can cause musculoskeletal disorders. When the body is in a static position for a long time, muscle contractions occur, especially in the back and neck muscles, which inhibits blood flow, which can inhibit the supply of oxygen to break down lactic acid. This position occurs repeatedly, causing tissue tears and the accumulation of metabolic waste. Tissue adhesions occur due to a lack of nutrients and oxygen, which causes ischemia [3]. This causes pain in the contracted muscles, especially in the neck area, which causes pain [4].

Neck and back pain can be influenced by several factors, including age, gender, length of service, and stretching habits. Age can influence pain because bone degeneration occurs with age, which can increase the risk of pain [5]. Gender influences complaints of neck and back pain due to a lack of physical activity, lower bone mineral density, and certain anatomical structures [6]. Length of service can influence neck and back pain complaints. Length of service relates to the length of time an individual is exposed to workplace exposure. The longer an individual works, the longer they are exposed to workplace exposure, which can lead to musculoskeletal disorders [7]. Regular stretching can help reduce neck and back pain because stretching increases blood circulation and oxygen flow to the brain, which has a positive impact on mental and emotional health [8].

Observations and interviews with several workers using the Neck Disability Index (NDI) questionnaire revealed complaints of neck and upper back pain. Their working posture tends to involve a slight hunched posture. This can lead to decreased oxygen supply to the muscles, impaired carbohydrate metabolism, and, as a result, lactic acid buildup, which can lead to muscle pain. [9]. Workers who experience neck and back pain usually also complain of headaches and upper back pain when lifting weights. Based on workers' complaints and observing the work system and posture, it is necessary to analyze the relationship between age, gender, length of service, and stretching habits with complaints of neck pain and upper back pain in cosmetic packaging production workers at cosmetic company.

METHOD

The data used for this cross-sectional study came from a survey with interviews of a population of production workers at cosmetic company, Semarang City, which is engaged in the distribution of drug and cosmetic trade services, as well as producing health products such as castor oil, vegetable oil, including cosmetics, with a total of 48 people. The inclusion criteria were workers in good health and willing to be respondents, and the exclusion criteria were workers not present at the time of the study. Data collected included complaints of neck pain and upper back pain, and risk factors related to

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age, gender, length of service, and stretching habits. Neck pain complaints were identified using a neck disability index questionnaire and upper back pain complaints were identified using a comparative pain scale questionnaire, while age, gender, length of service, and stretching habits were identified using a questionnaire through interviews. Chi-square analysis was performed to determine the relationship between independent and dependent variables. KEPK FKM Unimus has released the ethical approval number 033/KEPK-FKM/UNIMUS/2024 for this research.

RESULTS

Of the 48 people measured, the average age was 37.44 years, the average length of service was 13.67 years, and the neck pain complaint score was 10.62%. A total of 22 people were included in the early adulthood category (45.8%), the proportion of men (68.8%) was greater than women (31.3%), work experience of more than 5 years dominated the subjects at 75%, and those who had a habit of increasing as many as 30 people (62.5%) among workers who reported neck pain.

Table 1. Individual characteristics

Variable	Category	*f*	%
Age	Late adolescence	6	12,5
	Early adulthood	22	45,8
	Late adulthood	5	10,4
	Early elderly	15	31,3
Gender	Male	33	68,8
	Female	15	31,3
Length of service	≤ 5 years	12	25,0
	> 5 years	36	75,0
Stretching habits	Yes	30	62,5
	No	18	37,5

Table 2. Distribution of neck pain complaints in cosmetic packaging production workers

No	Scale NDI	*f*	%
1	Pain level		
	Feel no pain	20	41,7
	Feel mild pain	16	33,3
	Feel moderate pain	9	18,8
	The pain felt is severe	2	4,2
	The pain felt was very severe	1	2,0
2	Early treatment		
	Can do it yourself normally without excessive pain	35	72,9
	Doing it yourself is normal, but a little painful.	10	20,8
	Able to perform self-care activities slowly and carefully.	3	6,3
3	Lifting		
	No pain	27	56,3
	A little pain	13	27,1
	Can lift in certain positions	4	8,3
	Lifting very light loads	4	8,3
4	Reading		
	No pain	32	66,7
	A little pain	13	27,1
	Can read (moderate pain)	1	2,1
	Unable to read as much as desired (moderate pain)	2	4,1
5	Headache		
	No pain	21	43,8
	A little pain	19	39,6
	Rarely moderately ill	6	12,5
	Frequent moderate illness	2	4,1
6	Concentration		
	Can concentrate	33	68,8
	Can concentrate (some difficulty)	9	18,8
	Having difficulty concentrating	5	10,4
	Having considerable difficulty concentrating	1	2,0
7	Work		
	Can do the job	34	70,8
	Can do the job but no more	8	16,7
	Can do the job as desired	6	12,5

No	Scale NDI	f	%
8	Drive		
	No pain	36	75,0
	A little pain	11	22,9
	moderate pain	1	2,1
9	Sleep		
	Have no sleep disorders	34	70,8
	Slight sleep disturbance	8	16,7
	Sleep disturbance 1-2 hours	3	6,3
	Sleep disturbance 2-3 hours	1	2,1
	Sleep is very disturbed	2	4,1
10	Recreation		
	Can do activities	36	75,0
	A little pain	11	22,9
	Little activity due to neck pain	1	2,1

58.4% of workers reported experiencing pain. 20.8% of workers were still able to perform initial treatment normally despite experiencing mild pain. Furthermore, 8.3% of workers were only able to lift weights in certain positions, and another 8.3% were only able to lift very light weights. Pain was most commonly experienced while reading, at 33.4%. 39.6% of workers reported experiencing mild headaches, while 31.3% had difficulty concentrating. Despite this, the majority of workers (70.8%) were still able to perform their jobs, and the majority (75.0%) were still able to carry out their daily activities.

Table 3. The workers neck pain complaints

NDI Category	f	%
No disability (0-8%)	25	52,1
Mild disability (10-28)	20	41,7
Moderate disability (30-48)	3	6,3

Most of the workers have no disabilities. The workers who experience mild and moderate disabilities are 41.7% and 6.3% respectively (Table 3). Most workers (58.3%) experienced complaints of upper back pain in the mild pain category, and (18.8%) in the moderate pain category (Table 4).

Table 4. The workers upper back pain complaints

Disability	f	%
No pain	11	22,9
Mild pain	28	58,3
Moderate pain	9	18,8

The proportion of neck pain complaints increases with age. Late adolescence is predominantly painless (50%), early adulthood experiences moderate pain (9.1%), late adulthood is predominantly characterized by mild pain (80%), and the early elderly group has the highest incidence of moderate pain (46.7%). More men (63.6%) than women (26.7%) reported no neck pain (63.6%). Those with less than five years of service experience no moderate disability, but 25% of those with more than five years of experience have moderate disability (Table 5).

Based on stretching habits, both groups had similar rates. However, the highest rate of stretching was among those without disabilities, while those without stretching were most likely among those with mild disabilities. Based on age, the prevalence of no upper back pain decreased with age, with moderate pain being most common in the elderly group (46.7%).

The distribution of upper back pain data was even among men and women, with both groups experiencing moderate pain most frequently. Based on the length of service, the group with less than 5 years did not fall into the moderate pain category, but for those with more than 5 years of service, there was a moderate upper back pain category of 25%, and based on

stretching habits, both groups were dominated by the mild pain category. Age and gender were associated with complaints of neck pain, and length of service was associated with complaints of upper back pain.

Table 5. Relationship Analysis of Age, Gender, Length of Service, and Stretching Habits with Complaints of Neck Pain and Upper Back Pain in Workers

Variable	Neck Pain								p Value
	No disabilities		Mild disability		Moderate disability		Total		
	f	%	f	%	f	%	f	%	
Age									
Late adolescence (12-25) years	5	83,3	1	16,7	0	0,0	6	100,0	0,002
Early adulthood (26-35) years	17	77,3	4	18,2	1	4,5	22	100,0	
Late adulthood (36-45) years	1	20,0	4	80,0	0	0,0	5	100,0	
Early elderly (46-55) years	2	13,3	11	73,3	2	13,3	15	100,0	
Gender									
Male	21	63,6	10	30,3	2	6,1	33	100,0	0,048
Female	4	26,7	10	66,7	1	6,7	15	100,0	
Length of service									
≤ 5 tahun	9	75,0	3	25,0	0	0,0	12	100,0	0,185
> 5 tahun	16	44,4	17	47,2	3	8,3	36	100,0	
Stretching Habits									
Yes	18	60,0	10	33,3	2	6,7	30	100,0	0,321
No	7	38,9	10	55,6	1	5,6	18	100,0	
Variable	**Upper Back Pain**								**p value**
	No Pain		**Mild Pain**		**Moderate Pain**		**Total**		
	f	**%**	**f**	**%**	**f**	**%**	**f**	**%**	
Age									
Late adolescence (12-25) years	3	50,0	3	50,0	0	0,0	6	100,0	0,058
Early adulthood (26-35) years	5	22,7	15	68,2	2	9,1	22	100,0	
Late adulthood (36-45) years	1	20,0	4	80,0	0	0,0	5	100,0	
Early elderly (46-55) years	2	13,3	6	40,0	7	46,7	15	100,0	
Gender									
Male	8	24,2	21	63,6	4	12,1	33	100,0	0,265
Female	3	20,0	7	46,7	5	33,3	15	100,0	
Length of service									
≤ 5 tahun	6	50,0	6	50,0	0	0,0	12	100,0	0,016
> 5 tahun	5	13,9	22	61,1	9	25,0	36	100,0	
Stretching Habits									
Yes	8	26,7	17	56.7	5	16,7	30	100,0	0,774
No	3	16,7	11	61,1	4	22,2	18	100,0	

DISCUSSION

Relationship between Age, Gender, Length of Service, and Stretching Habits and Neck Pain

Research findings indicate a relationship between age and neck pain. Age is a significant factor in the occurrence of localized neck pain, with increasing age associated with increased muscle complaints. The aging process, particularly in individuals with long working lives, causes bone and muscle degeneration, which leads to decreased musculoskeletal stability [10].

Neck pain complaints are most common in the 31–50 age group, with the highest risk occurring around age 40 [5]. With age, organ function declines, including reduced fluid retention and tissue regeneration starting at age 30, which can reduce muscle and bone stability [10]. Among cosmetic packaging production workers at PT X, the majority of early elderly workers (46–55 years) experience mild disabilities (73.3%), while 13.3% experience moderate disabilities. This research aligns with research on tofu home industry workers in Semarang [5].

The results showed a relationship between gender and upper back pain complaints in cosmetic packaging production workers. Physiological differences between men and women, particularly muscle mass and strength, play a role in the occurrence of musculoskeletal complaints, with women tending to have lower muscle strength and therefore being more susceptible to neck and upper back pain [11].

In this study, the majority of female workers (10 out of 15) experienced neck pain with mild disability, and one experienced moderate disability. As many as 60.0% of female workers had entered menopause, which causes an imbalance in the estrogen and progesterone hormones, increasing the risk of bone and ligament loss. This is particularly true for postmenopausal women [12- 14]. This research aligns with previous research on sewing workers at cosmetic company, where women's muscle strength was only 60% that of men, particularly in the arm, back, and leg muscles [15].

Based on the study results, no relationship was found between length of service and neck pain complaints. However, there was a trend toward pain complaints among workers with more than 5 years of service, with 47.2% experiencing mild disabilities and 8.3% experiencing moderate disabilities, a higher percentage than workers with less than 5 years of service. Neck pain complaints are thought to be related to excessive muscle workload, repetitive movements, static work postures, and hunched or bent-over work positions, which are exacerbated by poor ergonomic work facilities. These findings align with previous research on employees of PT Angkasa Pura (Persero) Makassar, which also showed no relationship between length of service and neck pain complaints [16].

The results showed no relationship between stretching habits and neck pain complaints in workers. However, the percentage of neck pain complaints was higher among workers who did not stretch compared to those who did. This condition is thought to be caused by a lack of proper stretching training, resulting in inappropriate stretching techniques and duration. Most workers only performed brief stretches before work, lasting about 5 minutes, which is considered insufficiently effective in reducing muscle tension. Non-specific and irregular stretching has the potential to cause

additional tension in the neck muscles. Theoretically, stretching exercises performed correctly, regularly, and for an adequate duration can help reduce muscle stress, increase flexibility, and prevent neck pain [17].

Relationship between Age, Gender, Length of Service, and Stretching Habits and Neck Pain

Statistical test results showed no relationship between age and upper back pain complaints. Upper back pain complaints were found in all age groups, with the majority of early adult workers experiencing mild pain (68.2%) and moderate pain (9.1%), while in the early elderly group, there was mild pain at 40.0% and moderate pain at 46.7%. Although theoretically age is associated with an increased risk of musculoskeletal disorders (MSDs) due to decreased muscle strength and function, the results of this study indicate that upper back pain complaints can occur in various age groups. In general, MSD complaints begin to be felt between the ages of 25-65 years, where the first complaint can be felt at age 35 and will continue to increase with age [18,19].

In this study, age did not directly influence upper back pain complaints, but rather was influenced by other factors such as job characteristics and physical activity. Prolonged sitting, non-ergonomic work postures, and repetitive movements are suspected to contribute to the development of upper back pain. This finding aligns with previous research that found no association between age and musculoskeletal disorders (MSDs) among tofu workers in the informal industry [20].

Based on the analysis, no association was found between gender and complaints of upper back pain. This is likely because the majority of cosmetic packaging workers are male, so the data distribution does not fully reflect the risk in women. Complaints of upper back pain were more common among male workers, with 63.6% experiencing mild pain and 12.1% experiencing moderate pain. These complaints were more related to job characteristics, such as repetitive activities, workload, and prolonged working positions, than to gender itself. In general, gender does not directly cause back pain but is influenced by other factors such as workload, posture, anatomical differences, and physiological aspects related to activity and work capacity. There was a relationship between length of service and complaints of upper back pain in cosmetic packaging workers. The longer the length of service, the longer the duration of exposure to physical stress in the workplace, which can reduce muscle performance and increase the risk of musculoskeletal disorders [10]. Some workers with less than 5 years of service, some experience mild pain, which is thought to be related to the adaptation process to work. Theoretically, longer service periods increase the muscle load due to work activities, potentially leading to musculoskeletal pain [21–23].

Workers with more than 5 years of service experience a higher risk of back pain compared to those with less than 5 years of service [24]. This is consistent with previous research on sarong weaving workers in Pemalang, farmers and office workers in Rwanda which showed that decreased muscle endurance with longer service experience increases the risk of subjective back complaints [25, 26].

No association was found between stretching habits and complaints of upper back pain. This is suspected to be due to workers' inappropriate

stretching, both in terms of the type of movement, the targeted muscles, and the frequency. Workers only performed a small portion of the recommended stretching movements, making them ineffective in targeting upper back muscles and reducing pain. Non-specific and inconsistent stretching was considered to have little benefit in preventing or reducing complaints of upper back pain. This is consistent with research in the tofu manufacturing industry that found no significant association between stretching habits and complaints of MSDs

CONCLUSION

Research has shown a correlation between age, gender, and neck pain. Increasing age is associated with a decline in physiological function, which contributes to pain. Furthermore, women are more susceptible to neck pain due to their relatively lower muscle strength. Meanwhile, work experience is associated with back pain, with longer work duration increasing the risk of musculoskeletal disorders (MSDs).

RECOMMENDATIONS

Companies are advised to prevent musculoskeletal disorders by considering factors such as age, gender, and length of service through the application of ergonomic principles, workload management, job rotation, and scheduled rest periods. Furthermore, ergonomic education and training, along with appropriate and regular stretching exercises, are needed to reduce the risk of musculoskeletal disorders (MSDs).

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