

RESEARCH ARTICLE

**THE INFLUENCE OF EXCESSIVE LIFTING, AGE, AND WORKING PERIOD
ON THE INCIDENCE OF LOW BACK PAIN AMONG TRANSPORT WORKERS
(ANGKAT BEBAN BERLEBIH, USIA, DAN MASA KERJA
TERHADAP KEJADIAN LOW BACK PAIN PADA KULI ANGKUT)**

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ABSTRACT

LBP (Low Back Pain) is the most common musculoskeletal disorder in adults, affecting up to 84% of the population. The Directorate General of Health Services, Ministry of Health of the Republic of Indonesia, reported that approximately 60-80% of individuals worldwide experienced at least one episode of LBP during their lifetime. This study aims to evaluate the influence of excessive lifting, age, and job tenure on the incidence of LBP and its associated disability levels (mild, moderate, and severe) among market porters. The research method used is an observational analytic with a cross-sectional approach. The study sample consisted of 42 male porters who met the inclusion criteria: actively lifting loads greater than 15 kg without equipment, aged 20-60 years, and having a Body Mass Index $\leq 25\text{kg/m}^2$. Data were collected using the Oswestry Disability Index (ODI) questionnaire and analyzed through the chi-square and logistic regression tests. The results showed that age had a significant effect on the incidence of LBP ($p = 0.000$), while job tenure and load weight did not ($p > 0.05$). Logistic regression analysis revealed that age contributed 61.5% to the incidence of LBP, while job tenure and load weight only contributed 5.9%. In conclusion, although excessive lifting and job tenure positively correlate with the incidence of LBP among porters at the Cimahi Antri Market, these effects are not statistically significant, leaving age is the primary significant determinant.

Keywords: low back pain overload, oswestry disability index, porter

ABSTRAK

Suatu kelainan muskuloskeletal yang paling sering terjadi pada orang dengan usia dewasa adalah LBP (Low Back Pain) dengan presentase mencapai 84%. Direktorat Jenderal Pelayanan Kesehatan Kementerian Kesehatan Republik Indonesia menyatakan bahwa kurang lebih 60-80% orang di seluruh penjuru dunia pernah merasakan minimal 1 kali episode LBP selama hidup mereka. Penelitian ini bertujuan untuk mengetahui pengaruh angkat beban berlebih, usia, dan masa kerja pada kuli angkut dalam kaitannya dengan kejadian LBP dengan tingkat disabilitas ringan, sedang, dan berat. Metode penelitian yang digunakan adalah observasional analitik dan pendekatan cross sectional. Sampel penelitian terdiri dari 42 kuli angkut yang memenuhi kriteria inklusi, yaitu kuli angkut laki-laki tanpa bantuan alat angkut yang berusia 20-60 tahun dengan Indeks Massa Tubuh ≤ 25 dan mengangkat beban > 15 kg. Data dikumpulkan melalui kuesioner ODI (Oswestry Disability Index) dan dianalisis menggunakan uji chi square dan regresi logistik. Hasil penelitian menunjukkan bahwa usia berpengaruh signifikan terhadap kejadian LBP ($p = 0,000$), sedangkan masa kerja dan berat beban tidak berpengaruh signifikan ($p > 0,05$). Analisis regresi logistik menunjukkan bahwa usia memberikan kontribusi sebesar 61,5% terhadap kejadian LBP, sementara masa kerja hanya memberikan kontribusi sebesar 5,9% dan berat beban sebesar 5,9%. Simpulan dari penelitian ini adalah angkat beban berlebih dan masa kerja berpengaruh terhadap kejadian LBP pada kuli angkut di Pasar Antri Cimahi, namun tidaklah signifikan. Sedangkan usia merupakan faktor yang signifikan terhadap kejadian LBP pada kuli angkut.

Kata Kunci: beban berlebih, kuli angkut, low back pain, oswestry disability index

INTRODUCTION

Low Back Pain (LBP) is the most common musculoskeletal disorder, affecting up to 84% of adults.^{1,2} In 2020, approximately 619 million people worldwide experienced low back pain (LBP), and this number is projected to increase to 843 million people by 2050.^{3,4} Factors that may increase the likelihood of a person experiencing low back pain (LBP) include age, daily occupation, gender, and spinal abnormalities such as lordosis, kyphosis, and scoliosis.^{5,6}

An individual generally begins to experience symptoms of low back pain (LBP) between the ages of 25 and 65 years, with complaints commonly emerging from

the age of 35 years and increasing with advancing age. Job tenure refers to the duration of a person's work experience from the beginning of employment until the time the study is conducted, which may have either positive or negative impacts on workers. To assess the level of spinal pain, the Oswestry Disability Index (ODI) questionnaire is frequently used, as it has been proven to be reliable and valid.^{7,8}

An excessive load greater than 60% on the spine occurs when the pressure exceeds its normal physiological capacity, particularly in the lumbar segment, thereby increasing the risk of damage to the intervertebral discs, ligaments, and supporting muscles. In this study, the load

primarily originated from work-related activities, with 60% resulting from lifting or carrying loads on the shoulders, 20% from pushing or pulling, and 20% from carrying or handlifting objects.^{9,10}

Lifting and carrying loads are the primary risk factors for LBP due to the bending posture and axial pressure exerted on the spine, while pushing or pulling generates shear forces that accelerate fatigue of the back muscles. Carrying loads asymmetrically also increases load imbalance. The Indonesian Ministry of Health recommends a lifting limit of 15–20 kg for men and 12–15 kg for women. However, manual laborers in Indonesia often exceed these limits, increasing their susceptibility to developing LBP.^{9–11}

Lifting and carrying are two different physical activities. Lifting refers to moving a load from a lower position to a higher position, whereas carrying involves transporting a load from one location to another. The risk of LBP is higher during lifting because it often involves bending and direct pressure on the spine, especially when performed repeatedly or with improper technique. Meanwhile, carrying can also increase the risk of LBP, particularly when the load is heavy, carried over a long distance, or distributed unevenly, although the risk is generally lower than that associated with lifting.^{9,11}

Load carriers work by transporting goods from one location to another, particularly within traditional markets. Pasar Antri, the traditional market with the highest economic revenue in Cimahi City, West Java, was selected as the research site to examine the influence of excessive workload, age, and job tenure on the occurrence of LBP, with disability levels ranging from mild to severe among these carriers.¹²

MATERIALS AND METHODS

The study employed an analytical observational design with a cross-sectional approach, using structured interviews conducted by the researcher through the ODI questionnaire. This study was carried out at Pasar Antri Cimahi, a traditional marketplace for the wholesale and retails of fruits, vegetables, and other daily necessities. The research was conducted from August to December 2024.

The sample size for this study was determined using the Lemeshow formula, resulting in a sample size of 42 participants who were selected through a purposive sampling technique. The target population consisted of manual porters working at Pasar Antri, Cimahi. The inclusion criteria consisted of male manual porters aged 20–60 years who performed lifting activities without the assistance of transportation equipment and regularly lifted loads

exceeding 15 kg. The exclusion criteria were manual porters with a BMI greater than 25 kg/m² and those with pre-existing spinal abnormalities, including osteoporosis, lordosis, kyphosis, and scoliosis.

Body Mass Index (BMI) was determined by measuring body weight and height, then calculated using the formula $BMI = \text{weight (kg)} / \text{height (m)}^2$. Respondents with a BMI greater than 25 kg/m² were excluded from the study. Spinal abnormalities were assessed through comprehensive medical history taking, postural inspection, and physical examination, and supplemented by radiological evaluation when clinically indicated. The independent variables in this study included lifting loads exceeding 15 kg, measured using a manual scale, while the dependent variable was LBP, assessed using the ODI questionnaire to evaluate pain and disability. Data analysis was performed using the chi-square test and logistic regression analysis.

To ensure participant confidentiality, personal data contained in the informed

consent forms and the ODI questionnaire were anonymized by replacing individual names with subject identification codes. This study has received research approval from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Jenderal Achmad Yani (approval number: 041/UM1.09/2024; protocol number: M1.2408.031). Written informed consent was obtained from all participants prior to their enrollment in the study.

RESULTS AND DISCUSSION

Data analysis in this study consisted of univariate and bivariate analyses to determine the effect of excessive lifting, age and job tenure on the occurrence of low back pain (LBP) among 42 manual porters at Pasar Antri, Cimahi City.

Table 1 Univariate data recapitulation

Characteristics	Total (n=42)	Percentage
Age		
20-30 Years	9	21%
31-40 Years	15	36%
41-50 Years	12	29%
>50 Years	6	14%
BMI		
Underweight	3	7%
Normal Weight	25	60%
Overweight	14	33%
Length of Service		
<5 Years	4	10%
5-10 Years	9	21%
>10 Years	29	69%
Load Weight		
15-25 Kg	17	40%
26-50 Kg	17	40%
>50 Kg	8	19%
Low Back Pain		
Light	20	48%
Moderate	22	52%
Severe	0	0%

As shown in Table 1, a total of 9 participants (21%) were aged 20–30 years, 15 (36%) were aged 31–40 years, 12 (29%) were aged 41–50 years, and 6 (14%) were older than 50 years. Regarding nutritional status, 3 participants (7%) were classified as underweight, 25 (60%) had a normal BMI, and 14 (33%) were classified as overweight. The majority of participants had a a job tenure exceeding 10 years, accounting for 29 individuals (69%), while 9 individuals (21%) had worked for 5–10 years and 4 individuals (10%) had worked for less than 5 years. In terms of workload, a total of 17

participants (40%) were in each of the heavy lifting load categories of 15–25 kg and 26–50 kg, respectively, while 8 participants (19%) lifted more than 50 kg. Finally, the majority of LBP-associated functional disability were classified as moderate disability, affecting 22 participants (52%), while 20 (48%) exhibited mild disability.

The Effect of Excessive Load on LBP

The chi-square test and logistic regression analysis were used to determine the effect of excessive lifting loads on the incidence of low back pain (LBP),. All

statistical tests were evaluated at a 95% confidence level, with significance determined by a p-value < 0.05.

Table 2 Bivariate statistical analysis results of the effect of excessive workload on LBP

Load Weight		Occurrence of LBP			Total	p Value	R ²	P Value
		Light	Moderate	Severe				
15-25 Kg	n	6	11	0	17	0.379	0.059	0.177
	%	35.3%	64.7%	0.0%	100.0%			
26-50 Kg	n	9	8	0	17			
	%	52.9%	47.1%	0.0%	100.0%			
>50 Kg	n	5	3	0	8			
	%	62.5%	37.5%	0.0%	100.0%			
Total	n	20	22	0	42			
	%	47.6%	52.4%	0.0%	100.0%			

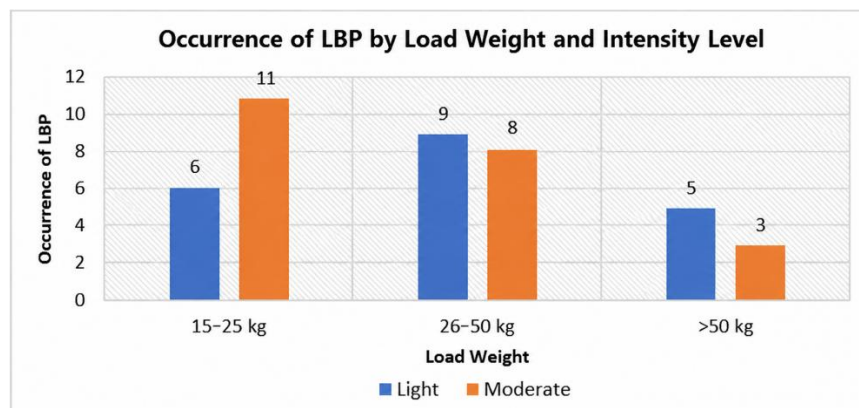


Figure 1 Load weight in relation to the occurrence of LBP.

These results are consistent with a previous study published in *Journal Medika Hutama* (2021), which found that lifting excessive loads has an impact on spinal health, particularly when performed repeatedly without adequate rest. Freight workers typically work 6–8 hours per day and lift loads weighing 15–50 kg

approximately 60–100 times, resulting in the accumulation of mechanical stress on the spine, muscles, and ligaments.^{13,14}

Loads of 15–25 kg are the most frequently lifted because they are considered tolerable, allowing the activity to be performed repeatedly with minimal rest. This repetitive condition leads to

muscle fatigue and repeated microtrauma to the lumbar spine, resulting in moderate LBP complaints. In contrast, loads of 26–50 kg are usually lifted more carefully or with assistance, thereby reducing the risk, while loads exceeding 50 kg are rarely lifted but carry the potential to cause acute musculoskeletal injuries. Lifting excessive loads can trigger LBP due to mechanical stress on the muscles, ligaments, and joints. Physical strain, repetitive muscle contractions, and insufficient recovery intervals further increase the risk among porters who are accustomed to working with heavy loads and minimal rest.^{13–17}

Manual load carriers are highly vulnerable to developing LBP due to heavy workloads, repetitive movements, and insufficient rest. Univariate analysis showed wide variations in age, BMI, job

tenure, and lifting load, with functional disability levels ranging from mild to moderate. However, bivariate analysis using Chi-Square analysis indicated that excessive lifting load was not significantly associated with LBP ($p > 0.05$). These findings are consistent with the a study in the *Journal of Community Medicine* (2024), which reported that the impact of workload on LBP may vary depending on population characteristics and other factors such as age and nutritional status.¹⁵

The Influence of Age on LBP

The following sections present the results of the chi-square and logistic regression analyses conducted to determine the effect of age on the incidence of LBP, evaluated at a 95% confidence level with a significance threshold set at $p < 0.05$.

Table 3 Bivariate statistical analysis results of the effect of age on LBP

Age	Occurrence of LBP			Total	p Value	R2	p Value
		Ringan	Sedang	Berat			
20-30 Years	n	9	0	0	9	0.000	0.615
	%	100.0%	0.0%	0.0%	100.0%		
31-40 Years	n	9	6	0	15	0.000	0.615
	%	60.0%	40.0%	0.0%	100.0%		
40-50 Years	n	2	10	0	12	0.000	0.615
	%	16.7%	83.3%	0.0%	100.0%		
>50 Years	InI	IOI	6	0	6	0.000	0.615
	%	IO.0%	IOO.O%	IO.O%	IOO.O%		
Total	InI	20	22	0	42	0.000	0.615
	%	47.6%	52.4%	0.0%	IOO.O%		

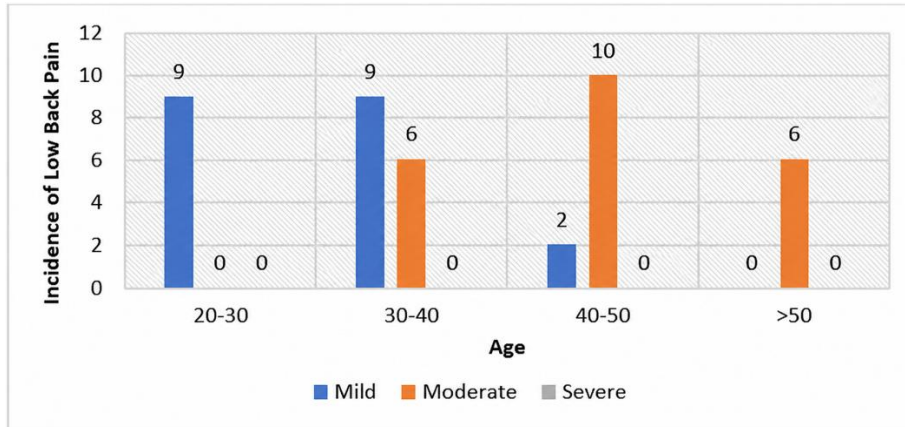


Figure 2 Age in relation to the occurrence of LBP.

These results align with a study published in the *Journal of Public Health and Community Medicine* (2021), which demonstrated that LBP can occur between the ages of 20 and 50 years, with the risk increasing significantly after 35 years of age. Approximately 70% of complaints appear within the age range of 25–65 years, a trend driven by age-related degenerative processes, including osteoporosis, reduced muscle and bone strength and elasticity, as well as a decrease in fluid and the intervertebral discs (IVD), which

collectively compromise spinal stability.^{15,16,18}

The Effect of Length of Employment on Low Back Pain

The following sections present the results of the chi-square and logistic regression analyses conducted to determine the effect of **job tenure** on the incidence of LBP, **evaluated at** a 95% confidence level **with** a significance threshold **set at $p < 0.05$** .

Table 4 Bivariate statistical results of the effect of length of employment on LBP

Length Of Service		Occurrence of LBP			Total	p Value	R2	p Value
		Light	Moderate	Severe				
<5 Years	n	2	2	0	4	0.112	0.059	0.184
	%	50.0%	50.0%	0.0%	100.0%			
5-10 Years	n	7	2	0	9	0.112	0.059	0.184
	%	77.8%	22.2%	0.0%	100.0%			
>10 Years	n	11	18	0	29	0.112	0.059	0.184
	%	37.9%	62.1%	0.0%	100.0%			
Total	n	20	22	0	42	0.112	0.059	0.184
	%	47.6%	52.4%	0.0%	100.0%			

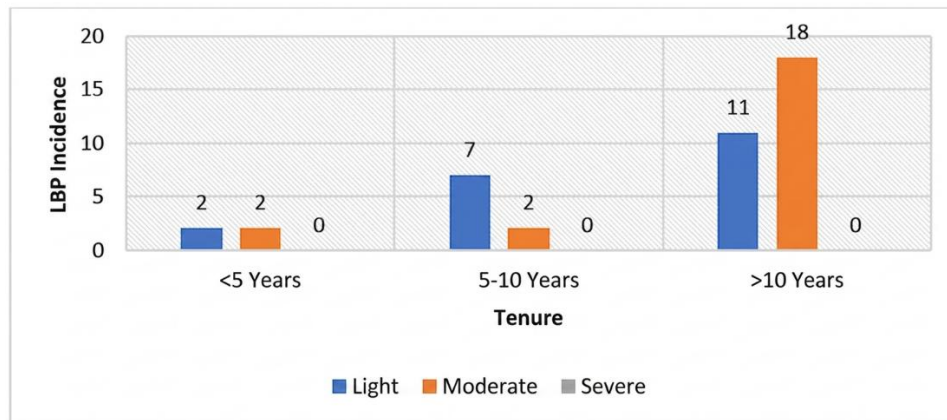


Figure 3 Length of working period and incidence of LBP.

These findings are consistent with the *Research of Education and Art Link in Nursing Journal (2019)*, which showed that an extended length of employment correspond to a higher the risk of Low Back Pain (LBP) due to repetitive movements, decreased joint strength, and muscle fatigue. Univariate analysis described that the majority of respondents experienced mild to moderate disability; however, the bivariate test did not find a significant relationship between job tenure and LBP severity ($p > 0.05$). Nevertheless, length of employment remains a contributing factore through mechanisms such as accumulated minor injuries, spinal degeneration, static posture, monotonous work, and excessive mechanical load. The main risk factors for LBP in this population include musculoskeletal fatigue, non-ergonomic posture, and long working hours without attention to ergonomics.^{18–22}

CONCLUSION

This study demonstrates that age is the most significant factor influencing the occurrence of Low Back Pain, accounting for 61.5% of cases among porters at Pasar Antri Cimahi. In contrast, excessive load lifting (5.9%) and job tenure (5.9%) represent minor contributing factores that did not reach statistical significance. Conclusively, age, excessive load lifting, and job tenure collectively play a role in increasing the risk of LBP, with mild to moderate levels of functional disability.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest related to the publication of this article.

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BIBLIOGRAPHY

1. Wu A, March L, Zheng X, Huang J, Wang X, Zhao J, et al. Global low back pain prevalence and years lived with disability from 1990 to 2017: estimates from the Global Burden of Disease Study 2017. *Ann Transl Med.* 2020 Mar;8(6):299.
2. Shokri P, Zahmatyar M, Falah Tafti M, Fathy M, Rezaei Tolzali M, Ghaffari Jolfayi A, et al. Non-spinal low back pain: Global epidemiology, trends, and risk factors. *Health Sci Rep.* 2023 Sep 4;6(9).
3. GBD 2019 Diseases and Injuries Collaborators. Global burden of 369 diseases and injuries in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet.* 2020 Oct 17;396(10258):1204–22.
4. GBD 2021 Low Back Pain Collaborators. Global, regional, and national burden of low back pain, 1990-2020, its attributable risk factors, and projections to 2050: a systematic analysis of the Global Burden of Disease Study 2021. *Lancet Rheumatol.* 2023 Jun;5(6):e316–29.
5. Shiri R, Falah-Hassani K, Heliövaara M, Solovieva S, Amiri S, Lallukka T, et al. Risk Factors for Low Back Pain: A Population-Based Longitudinal Study. *Arthritis Care Res (Hoboken).* 2019 Feb 29;71(2):290–9.
6. Wami SD, Abere G, Dessie A, Getachew D. Work-related risk factors and the prevalence of low back pain among low wage workers: results from a cross-sectional study. *BMC Public Health.* 2019 Dec 8;19(1):1072.
7. Cook CE, Garcia AN, Wright A, Shaffrey C, Gottfried O. Measurement Properties of the Oswestry Disability Index in Recipients of Lumbar Spine Surgery. *Spine (Phila Pa 1976).* 2021 Jan 15;46(2):E118–25.
8. Yee TJ, Fearer KJ, Oppenlander ME, Kashlan ON, Szerlip N, Buckingham MJ, et al. Correlation Between the Oswestry Disability Index and the North American Spine Surgery Patient Satisfaction Index. *World Neurosurg.* 2020 Jul;139:e724–9.
9. Ihsan T, Silvia S, Derosya V, Edwin T, Dewi MS. Risk Assessment of

- Work Posture in Indonesian Rubber Factory Workers. J@ti Undip: Journal of Industrial Engineering. 2021 Jun 11;16(2):116–22.
10. Agustin H, Eko Saputro M, Public Health – Universitas Ahmad Dahlan, Soepomo Street F, Umbulharjo District, Yogyakarta, D.I. Yogyakarta. Manual material handling education for the prevention of musculoskeletal disorders in catering industry workers in banguntapan village, bantul. Vol. 6, Meilana Nawang S. Yogyakarta; July 2020.
11. Revani HD, Dewi P, Wardani R, Ellina AD. Analysis of workload on the incidence of neck pain and low back pain among physiotherapists in hospitals in the East Java region. Jurnal Ilmiah Keperawatan (Scientific Journal of Nursing). 2024 Feb 29;10(1):188–93.
12. Dhiya Azhar Putriaji. *Redesign of Pasar Antri Baru and Pasar Antri Terminal, Cimahi City, with an Integrated Area Concept*. Jurnal Poster Pirata Syandana [Internet]. June 2023 [cited May 11, 2024]; 4:1–1. Available from: <https://ejournal2.undip.ac.id/index.php/jpps/article/view/18765>
13. Rahmawati A. RISK FACTOR OF LOW BACK PAIN. Jurnal Medika Hutama [Internet]. 2021 Oct;3(1):1–7. Available from: <http://jurnalmedikahutama.com>
14. Program P.; Masyarakat PK, Lestari I, Russeng S, Thamrin Y. The relationship between workload and working posture with complaints of low back pain. Journal of Muslim Community Health (JMCH) 2023 [Internet]. 2023;4(2):118–25. Available from: <https://doi.org/10.52103/jmch.v4i2.1209JournalHomepage:https://pasca-umi.ac.id/index.php/jmch>
15. Aghni Haunan AZ, Dian Lestari R, Sulistyowati E. Workload, age, and body mass index are risk factors for the occurrence of low back pain and hemorrhoid symptoms among porters in Malang Regency. Journal Of Community Medicine. 2024;12(1):1–9.
16. Bayu Aditya Trisnaning Kasih. The Relationship Between Age, Workload, Body Position, and Physical Activity on the Incidence of Low Back Pain Among Staff Nurses at EMC Sentul Hospital in 2023. Journal of Health Science Service. 2023 Jul 20;3(2):160–74.
17. Mawaddah Syafitri N, Rum Rahim M, Thamrin Y, Rachmat M, Ansar J, Muhammad L, et al. Relationship between Workload and Work

- Attitude with Low Back Pain Complaints among Workers at Rumah Jahit Akhwat Makassar. 25 JKMM. 2019 Mar;2(1):25–32.
18. Jovial Noli F, Jufri Sumampouw O, Tamardy Ratag B. Age, Length of Employment, and Complaints of Lower Back Pain among Tofu Factory Workers. *Journal of Public Health and Community Medicine*. 2021 Jan;2(1):15–21.
19. Rasyidah AZ HDM. REAL in Nursing Journal; Research of Education and Art Link in Nursing Journal; Work tenure, work posture, and gender in relation to low back pain complaints.REAL in Nursing Journal (RNJ). 2019 Aug 2;2(2):66–71.
20. Agustin A, Puji LKR, Andriati R. The Relationship Between Working Duration, Length of Employment, and Working Posture with Low Back Pain Complaints Among Staff at Office X, South Jakarta.*Journal of Health Research Science*. 2023 Jun 1;3(1):13–22.
21. Kesehatan JI, Sains &, Astuti I, Septriana D, Romadhona N, Achmad S, et al. Journal of Integrated Health and Science (JIKS); Low Back Pain and Smoking Habits, Body Mass Index, Length of Employment, and Workload among Waste Collectors. *Journal of Integrated Health and Science [Internet]*. 2019;1(1):74–8. Available from: <http://ejournal.unisba.ac.id/index.php/jiks>
22. Aulia AR, Wahyuni I, Jayanti S. Association between Work Duration, Length of Employment, and Work Posture with Complaints of Low Back Pain among Handwritten Batik Workers in Kampung Batik Kauman, Pekalongan City. *Indonesian Public Health Media*. 2023 Apr 1;22(2):120–4.