



Description of Factors Related to de Quervain Syndrome Among Fermented Cassava Processing Workers in Indonesia

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Abstract

Background: De Quervain syndrome is characterized by chronic inflammatory pain resulting from overuse of the joints around the thumb and wrist. Cassava processing workers perform various repetitive movements during their work and are at risk of developing de Quervain syndrome. This study aimed to provide an overview of the risk factors for de Quervain syndrome among workers in the fermented cassava processing industry.

Methods: This study used a quantitative approach with descriptive methods in industries A, B, C, and D in Jember Regency. The Visual Analog Scale for Pain (VAS) was used to measure the pain experienced by workers, while the Assessment of Repetitive Tasks (ART) tool for the upper limbs was used to assess exposure to repetitive movements during the work process.

Results: The results showed that de Quervain symptoms were mostly experienced by workers in the right hand (65.7%), with symptoms of pain during movement. The proportion of symptoms on the right hand was mostly felt by workers aged ≥ 55 years (100%), female (87.5%), obese (100%), working for >5 years (70%), working >8 hours/day (66.7%), and performing repetitive motion >20 times/minute (70%).

Conclusion: Of the four industries studied, 23 and 17 workers experienced de Quervain symptoms on the right and left hands, respectively. Future researchers are expected to objectively measure de Quervain's complaints through the Finkelstein test.

Keywords: ART tools, de Quervain, food industry workers, risk factors, visual analogue scale

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Introduction

De Quervain syndrome is a chronic inflammation characterized by pain in the tendon membrane of the synovial sheath of the extensor pollicis brevis (EPB) and abductor pollicis longus (APL) muscles. Both are used to control the position, load-bearing, orientation, and balance of the thumb joint of the hand.¹ The cause is unknown, but overuse of the joints in the thumb and around the wrist can result in this syndrome. This can occur because certain long-term work activities can trigger

inflammation, pain and swelling around the wrist and thumb.²

De Quervain even leads to the loss of 2 million working days per year in developed countries.³ The prevalence of cases in the entire labor population in the world is 0.7%-36%.⁴ Based on sex-specific data, the prevalence was 0.13% among men and 0.36% among women.⁵ Another study in the UK also showed a greater prevalence in women (1.3%) and in men (0.5%).⁶ Women are estimated to be at an 8-fold higher risk of developing de Quervain than men. The highest number of

reported cases occurs in the age range of 30 to 55 years old.⁷

Based on literature studies, there are individual and occupational risk factors that have been identified and are associated with de Quervain. Individual factors were divided into age and gender, as in the prevalence data above, while occupational factors consisted of repetitive movements, work period, and duration of work.⁸ A correlation between repetitive motion and de Quervain on the right and left hands is known. This was proven in 53 coffee bean sorting workers at PT X who worked with a pinch grip work posture of ≥ 72 -74 times/minute at high speed.⁹ The statement is in line with the results of research on 28 quality control workers of the garment unit of PT X, which states that there is a correlation between repetitive motion, work period, and age with de Quervain.¹⁰ A greater risk of developing de Quervain was also found in respondents working in the culinary industry with a longer working period.¹¹ Additionally, work times per day also had a strong correlation with de Quervain.⁴

Fermented cassava processing is one of the jobs that requires repetitive movements, such as in home industries A, B, C, and D in Jember, which are located in strategic locations of the fermented cassava industry association. The work process is done manually, starting from cassava peeling, washing, steaming, fiber cleaning, fermentation, and weighing and packaging. Based on preliminary studies in the four industries, each worker performed repetitive hand muscle movements in two or more work processes. From the initial interviews, five out of six workers often felt pain in the area along the tendon of the thumb to the wrist during and after working for 6-8 hours per day. A worker while cleaning cassava fibers is able to perform repetitive movements 20-30 times/minute. Therefore, this study is novel compared to previous studies in terms of the method, type of risk factors, type of work, research location, and measurement of pain levels.

De Quervain symptoms need to be identified quickly, so as not to cause consequences such as lost work time, increased absenteeism, and increased pain which leads to decreased work

productivity.¹² In addition, it can cause numbness and severe muscle stiffness which leads to limitation of motion of the individual to carry out normal activities and disability.¹³ Based on this background, this study was conducted to examine the description of individual and occupational risk factors for de Quervain syndrome in fermented cassava processing workers in Jember Regency.

Methods

This study used a quantitative approach and descriptive methods. The research was conducted in fermented cassava processing industries A, B, C, and D in Jember Regency. The four industries were selected based on the criteria of using manual work processes, requiring repetitive movements, and having diverse worker demographics. Data collection will be conducted from December 2024 to April 2025. The study population consisted of 35 production workers from four fermented cassava processing industries, with the inclusion criterion of being a permanent worker and the exclusion criterion of having gouty arthritis. A total sampling technique was applied, resulting in all 35 workers being included in the research sample.

Before data collection, each worker was given an informed consent form explaining the study and asking whether they were willing to participate in the study. Workers were then asked about their sociodemographic characteristics, such as age, sex, and Body Mass Index (BMI). BMI was determined by measuring weight and height using a bathroom scale and microtoise. Data on work-related variables included work period, work time, and repetitive motion. Documentation in the form of photos and videos of the work process was collected for all participating workers to assess their exposure to repetitive movements using the ART tool.¹⁴ If workers experienced symptoms, the pain scale was measured using the Visual Analog Scale for Pain (VAS). The VAS used to measure pain level provides a scale ranging from 0 (no pain) to 10 (severe, uncontrolled pain). Respondents pointed to a number that represented the level of pain they felt. VAS has been shown

to be valid and reliable in several studies across various disease conditions and can be used by different population groups regardless of educational background.^{15,16}

Secondary data were obtained through literature studies and documentation to review data belonging to the Jember Regency Industry and Trade Office. Data were analyzed descriptively and reviewed using crosstabs before being presented in tables and narratives.

Results

Table 1 shows the individual characteristics of the 35 workers in the four fermented cassava processing industries. The largest distribution of workers aged 25-34 years old was 16 (45.7%), who were spread throughout the production process. Moreover, 27 (77.1%) were men, and 24 (68.6%) had a normal BMI. The youngest worker was 17 years old from industry B, while the oldest was 59 years old from industry D. The average age of the workers

was 36 years. In addition, there were 5 workers from industries A, B, and C (14.3%) with obese BMI levels in the peeling, weighing, and packaging processes.

Table 2 presents the occupational characteristics of the 35 workers in the four industries. Most workers, 25 (71.4%) had worked for ≤ 5 years and were spread across all production processes. The average tenure of workers ≤ 5 years was four years, while the average tenure of workers > 5 years was eight years. The longest working period was 20 years, which was carried out by workers in Industry A. There was no significant difference in the number of workers with a working duration of ≤ 8 hours (48.6%) or > 8 hours (51.4%) per day. More workers, 30 (85.7%), performed highly repetitive movements in the work process, with an average of 47 times/min. Workers have adapted to meeting daily targets, so work progresses rapidly.

Table 1. Distribution of Individual Characteristics of Fermented Cassava Processing Industry Workers

Variable	Amount (n)	Percentage (%)
Age		
15-24 years old	7	20.00
25-34 years old	16	45.70
35-44 years old	7	20.00
45-54 years old	4	11.40
≥ 55 years old	1	2.90
Sex		
Male	27	77.10
Female	8	22.90
Body Mass Index (BMI)		
Underweight		
Low ($<18,5$)	4	11.40
Normal ($18,5-25,0$)	24	68.60
Overweight		
Preobese ($25,1-27,0$)	2	5.70
Obese ($>27,0$)	5	14.30

Table 2. Distribution of Work Characteristics on Fermented Cassava Processing Industry Workers

Variable	Amount (n)	Percentage (%)
Work Period		
≤ 5 years	25	71.40
> 5 years	10	28.60
Work Time		
≤ 8 hours	17	48.60
> 8 hours	18	51.40
Repetitive Motion		
Low (≤ 10 times/minute)	3	8.60
Medium ($11-20$ times/minute)	2	5.70
High (> 20 times/minute)	30	85.70

Table 3 presents the distribution of respondents based on de Quervain symptoms. The presence of symptoms was assessed based on the type of work, level of repetitive motion, occurrence of symptoms, and location of pain. Most of the 23 workers (65.7%) experienced symptoms in their right hand, while 17 (48.6%) experienced symptoms in their left hand. In general, workers experience pain symptoms in the area from the base of the thumb to below the wrist when moving their right hand and using their left hand to support cassava during the peeling and cleaning of cassava fibers. Pain often appears when workers perform repetitive movements for 3-4 hours or in the middle of the day, requiring longer breaks between movements. The highest level of pain was moderate. Workers have adapted to the work process so that they assess pain as a

risk of work that can still be endured. Most workers had moderate exposure, indicating the need for further assessment of the impact of exposure on workers.

Table 4 presents data on the number of workers with de Quervain 'symptoms based on individual characteristics. Based on the proportion, symptoms were greater in both hands of workers aged ≥ 55 years because they were only in charge of peeling. A higher proportion of symptoms was also found in both hands of female workers due to hand movements when cleaning cassava fibers, often causing discomfort. On the other hand, the proportion of symptoms in workers with obesity is higher because workers' posture tends to be less precise, and there is greater pressure on the hands when completing work.

Table 3. Distribution of Workers Based on de Quervain Syndrome Symptoms

Variable	Right Hand		Left Hand	
	Amount (n)	Percentage (%)	Amount (n)	Percentage (%)
de Quervain				
Yes	23	65.7	17	48.6
No	12	34.3	18	51.4
Symptom				
Pain at rest	2	5.7	3	8.6
Pain on movement	23	65.7	17	48.6
Pain Scale VAS				
No pain (0)	12	34.3	18	51.4
Mild pain (1-3)	11	31.4	4	11.4
Moderate pain (4-6)	12	34.3	13	37.1
Repetitive motion exposure value				
Low (0-11)	6	17.1	6	17.1
Moderate (12-21)	29	82.9	27	77.1
High (≥ 22)	0	0.0	2	5.7

Table 4. Distribution of de Quervain Symptoms Based on Individual Characteristics

Variable	Right Hand				Left Hand				Total	
	Yes		No		Yes		No		N	%
	n	%	n	%	n	%	n	%		
Age (years old)										
15-24	6	85.7	1	14.3	4	57.1	3	42.9	7	100.0
25-34	11	68.8	5	31.3	7	43.8	9	56.3	16	100.0
35-44	3	42.9	4	57.1	3	42.9	4	57.1	7	100.0
45-54	2	50.0	2	50.0	2	50.0	2	50.0	4	100.0
≥ 55	1	100.0	0	0.0	1	100.0	0	0.0	1	100.0
Sex										
Male	16	59.3	11	40.7	12	44.4	15	55.6	27	100.0
Female	7	87.5	1	12.5	5	62.5	3	37.5	8	100.0
BMI										
Underweight	2	50.0	2	50.0	2	50.0	2	50.0	4	100.0
Normal	14	58.3	10	41.7	11	45.8	13	54.2	24	100.0
Preobese	2	100.0	0	0.0	1	50.0	1	50.0	2	100.0
Obese	5	100.0	0	0.0	3	60.0	2	40.0	5	100.0

Table 5 shows the number of workers with de Quervain symptoms based on occupational characteristics. The proportion of symptoms on both hands of workers with a work period of > 5 years was higher owing to the length of work activities and repetitive movements. In terms of work duration, this is due to increased repetitive movements to meet daily targets within ≤ 8

hours/day, as well as increased pressure on the left hand used to support the cassava during > 8 hours/day of work. Most workers who perform repetitive motions > 20 times/minute experience symptoms in both hands because high repetitive motion can cause tendon muscle inflammation in the thumb and wrist area

Table 5. Distribution of de Quervain Symptoms Based on Work Characteristics

Variable	Right Hand				Left Hand				Total	
	Yes		No		Yes		No			
	n	%	n	%	n	%	n	%	n	%
Work Period										
≤ 5 years	16	64.0	9	36.0	11	44.0	14	56.0	25	100.0
> 5 years	7	70.0	3	30.0	6	60.0	4	40.0	10	100.0
Work Time										
≤ 8 hours	11	64.7	6	35.3	9	52.9	8	47.1	17	100.0
> 8 hours	12	66.7	6	33.3	8	44.4	10	55.6	18	100.0
Repetitive Motion (times/minute)										
≤ 10	1	33.3	2	66.7	0	0.0	3	100.0	3	100.0
11-20	1	50.0	1	50.0	1	50.0	1	50.0	2	100.0
> 20	21	70.0	9	30.0	16	53.3	14	46.7	30	100.0

Discussion

More workers experienced de Quervain symptoms in the right hand because of its dominant use in grasping the knife. Workers also perform repetitive movements while peeling and cleaning cassava fibers. Meanwhile, the left hand is used as a support to hold the cassava firmly.¹⁷ The appearance of symptoms in the left hand is caused by prolonged pressure when grasping the cassava with the fingers abducted or spread, causing downward flexion of the wrist. This leads to discomfort, pain, and inflammation of the skin. Symptoms appear after working for 3-4 hours per day or after more than 6 months in the industry. Workers with these symptoms are often assigned to the peeling and cassava-fiber-cleaning process.¹⁸ In industries A, B, and C, job rotation has been implemented; therefore, although each worker has a main task, they are also assigned to washing, steaming, or packaging. Meanwhile, in industry D, workers have a fixed work process without any job rotation, but the process is only carried out every 2-3 days a week. Long working hours combined with a work process that requires highly repetitive movements in the fermented cassava

processing industry cause workers to experience pain in the lateral wrist muscles. Pain that appears when the hand is moved is one of the symptoms of de Quervain caused by tendon inflammation.¹⁹ Sometimes, there can be difficulty moving the wrist or thumb in more severe conditions.²⁰

In the fermented cassava processing industry, the workforce is dominated by younger, productive-age workers, with an average age of 36 years. Workers of productive age can handle heavier work processes, including peeling, washing, steaming, cooling, and fermenting. Meanwhile, older workers are assigned lighter work processes, such as washing, cleaning cassava fibers, weighing, and packaging. The heavier the workload, the higher the level of fatigue.²¹ Workers approaching 40 years of age also have the potential to experience severe fatigue, which can lead to symptoms or skeletal muscle injuries owing to the gradual degeneration of organ function.²² In terms of proportion, workers aged ≥ 55 years' experience symptoms in both hands. Over time, those aged > 55 years begin to experience a decline in their abilities. In previous research, it was stated that the peak prevalence of de Quervain

disease occurs around the age of 40-50 years.²³ Likewise, the prevalence of de Quervain is more experienced by restaurant chefs with an age range of 30-40 and 40-50 years.¹¹ The older the age of workers, the more vulnerable they are to a decrease in performance and physical strength.²⁴ Advancing age causes the elasticity of muscles, bones, and other tissues to decrease. Tendons become stiffer and more susceptible to microtrauma from long-term repetitive movements performed during the work process.²⁵

Men are more frequently assigned to work processes that are more strenuous or carry higher risks and hazards, while women handle work processes that require concentration and accuracy, are repetitive, and require lower-level skills.²⁶ In the fermented cassava processing industry, male workers cover most of the production processes, from peeling to shipping, while women are assigned to cassava fiber cleaning and packaging. Physiologically, men have greater muscular ability and physical strength than women do. Male workers also do not easily experience boredom or fatigue when completing monotonous work processes.²⁷ Proportionally, de Quervain symptoms were more common among female workers in both hands. This result is in line with the finding of more cases in women (1.3%) than in men (0.5%).²³ The right hand performs repetitive movements, while the left hand is used as a support when grasping cassava. When working, women put more pressure on their wrists, so that the grip posture of the left hand becomes less ergonomic and tends to lean too far downward. Female workers are more susceptible to occupational musculoskeletal injuries due to differences in muscle fiber distribution and type, hormones, and other physiological characteristics.²⁸

Body Mass Index (BMI) reflects body structure and the amount of weight the body can bear. The further a worker's BMI deviates from the normal range, the greater the potential for injury due to muscle, joint, or bone disorders. This is due to an imbalance in the body composition. Excess weight can trigger pain or inflammation around the joints and muscle

tissue, increasing the risk of musculoskeletal injury.²⁹ This narrowing caused by fatty tissue is worsened by high work activity involving repetitive hand movements, which can increase friction between the tendon and the tendon sheath, resulting in inflammation.³⁰ The work process in the fermented cassava processing industry involves substantial muscle loading due to high repetitive movements carried out over long periods, such as in the peeling or cassava-fiber-cleaning process. In these work activities, workers with excess BMI are more susceptible to injury, as the mechanical load on their muscles exceeds their body's capacity.³¹

The longer an industry has been established, the wider its target market, requiring owners to recruit additional employees to meet the increasing daily production targets. New workers do not yet have the experience and skills of more senior workers.³² New workers need to focus more on adapting to the work environment and learning how to avoid accidents. Various types of risky hand postures, such as grasping by spreading the fingers, bending the wrist, and grasping tools to perform repetitive movements, have the potential to increase microtrauma to the tendons over time. Tendon tissue can experience a decrease in structural function if it is not accompanied by sufficient time for recovery between work activities.^{33,34} The tendon space will also narrow if the synovial membrane thickens, which contributes to irritation in the form of pain and inflammation.³⁵ Culinary industry workers who have worked longer than others have a higher risk of exposure to de Quervain.¹¹

The process of producing tapai singkong, from peeling to packaging, can take a long time, lasting approximately 6-7 hours. However, two of the four tapai singkong industries studied, namely industries B and C, apply working hours of >8 hours because they have more daily production targets and a limited number of workers. In this process, repetitive movements are often performed, and the posture of workers is often not ergonomic. The surge in demand from consumers on certain days also influences the industry to

apply overtime until night or morning, resulting in longer working durations. If long working hours are maintained, this can have adverse effects, such as an increased risk of musculoskeletal injuries among workers.^{36,37} Continuous repetitive movements also have the potential to cause muscle fatigue which leads to microtrauma and inflammation.³⁸ A high rate of de Quervain symptoms has also been reported among mechanics working more than 8 hours per day.⁴

The work process in the fermented cassava processing industry requires a high level of repetitive motion, reaching an average of 43.5 times/min. The workers move at a high speed, which causes the movements to be almost continuous. The process that requires highly repetitive movements consists of cassava peeling, fiber cleaning, and fermentation, which require optimal focus. A moderate level of hand strength is required to firmly grasp the knife during the peeling and fiber cleaning processes. These high-frequency repetitive movements can lead to an increased risk of musculoskeletal injuries in the hand area.³⁹ This is in line with the findings that repetitive movements > 20 times/minute in the form of flexion and deviation of the ulna and use in extreme positions for more than 2 hours a day are risk factors for de Quervain.⁴

Conclusion

Of the four fermented cassava processing industries in Jember Regency, 23 workers experienced de Quervain symptoms in the right hand, while 17 experienced them in the left hand. More workers who reported de Quervain symptoms were involved in the peeling and cleaning of cassava fiber. The repetitive motion exposure assessment yielded a medium score, indicating the need for further evaluation of the extent to which this exposure affects workers. According to the VAS measurement, the highest level of pain was moderate pain, experienced by 12 and 13 workers on the right and left hands, respectively. The most common symptom was pain during movement in the area from the base of the thumb to below the wrist joint. The average age of the

respondents with symptoms was 38 years. Based on individual risk factors, de Quervain's symptoms were more common among workers aged ≥ 55 years, female workers, and those with an overweight BMI. Based on occupational risk factors, de Quervain symptoms were more common among workers with > 5 years of service (averaging 7 years), a working duration of > 8 hours a day, and repetitive motion exceeding 20 times/minute.

A limitation of this study is the potential for self-reported bias. Since the data regarding pain intensity and musculoskeletal symptoms were collected using subjective scales, the results may be influenced by the workers' individual pain thresholds and their personal perceptions of the condition. Despite these limitations, the use of subjective assessment tools is a widely accepted and practical approach for initial screening in occupational health settings, providing valuable baseline data for future evaluations.

The researchers suggest that industry owners organize worker shifts, provide education and supervision on work posture, and implement microbreaks of 30 s to 2 min every 20 min. Workers are recommended to stretch between changes in the work process, pay attention to upper body work postures, and consult health workers if they experience worsening pain in the thumb and wrist area. In addition, future researchers should conduct Finkelstein's test to objectively measure de Quervain symptoms to obtain more accurate data and examine the significance of the relationships between variables and risk factors for de Quervain symptoms.

Ethics approval

This study was approved by the Health Research Ethics Commission, Faculty of Public Health, University of Jember (approval number: 579/KEPK/FKM-UNEJ/II/2025).

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Author Contribution

The researchers were involved in the entire research process, from preliminary studies and data collection to data analysis and compiling the results into a final research article.

References

1. Suryani A. Sindrom De Quervain: Diagnosis dan Tatalaksana. *Cermin Dunia Kedokteran* 2018;45(8):592–595.
2. Adiputra DD, Rahman I. Penatalaksanaan Fisioterapi pada Kasus De Quervain Syndrome Dextra dengan Modalitas Ultrasound dan Hold Relax di RSAU Salamun Kota Bandung. *Excellent Midwifery Journal* 2021;4(2):21–27.
3. Badri F Al. Work-Related De Quervain's Tensosynovitis (DQT): The Diagnosis Dilemma. *Cureus*. 2023;
4. Ramdan IM, Nur A, Sultan M, Adrianto R, Baharudin I. De Quervain's Disease among Motorcycle Repair Mechanics and Related Factors. *Indian J Public Health Res Dev* 2022;13(1):156–163.
5. Shen P-C, Chang P-C, Jou I-M, Chen C-H, Lee F-H, Hsieh J-L. Hand tendinopathy risk factors in Taiwan. *Medicine (Baltimore)* 2019;98(1).
6. Satteson E, Tannan SC. De Quervain Tenosynovitis. *StatPearls* 2023;
7. Kementerian Kesehatan RI. De Quaervain's Syndrome [Homepage on the Internet]. Kementerian Kesehatan RI. 2022 [cited 2024 Nov 14]; Available from: https://yankes.kemkes.go.id/view_artikel/1580/de-quaervains-syndrome
8. Fitriana F, Soemarmo DS, Adi NP, Herqutanto, Prawiroharjo P. Analysis of The Relationship between Manual Handling and Individual Factors with De Quervain Syndrome in Workers of Heavy Equipment Manufacturing Company PT. K. *The Indonesian Journal of Community and Occupational Medicine* 2024;4(2):45–51.
9. Amanda NF, Kurniawan B, Widjasena B. Hubungan Gerakan Berulang dan Postur Kerja Posisi Tangan Terhadap Kejadian De Quervain's Tenosynovitis Syndrome pada Buruh Sortasi Biji Kopi (Studi Kasus pada Buruh Sortasi Biji Kopi di PT. X). *Jurnal Kesehatan Masyarakat* 2020;8(4):490–496.
10. Wiguna EP. Hubungan Gerakan Berulang, Masa Kerja, dan Usia dengan Keluhan de Quervain's Syndrome pada Pekerja Quality Control Unit Garmen PT. X. 2019;
11. Dinodia K, Singh S, Kumar A. Prevalence of De Quervain's Tenosynovitis among Restaurant Station and Junior Chef using Physical Assessment Test. *Int J Health Sci Res* 2024;14(5):268–274.
12. Williams Y, Ntatamala I, Adams S. Work-Related Upper Limb Disorders in Health Workers: A Case of de Quervain's Tenosynovitis with Ongoing Hand Pain. *Occupational Health Southern Africa* 2024;30(2):72–79.
13. Naim K, Wahyuni. Relationship between Pregnancy and Lactation Status and De Quervain's Syndrome. *IJM: Indonesian Journal of Medicine* 2024;09(02):228–235.
14. Health and Safety Executive Assessment of repetitive tasks of the upper limbs (the ART tool) Guidance for employers [Homepage on the Internet]. Available from: www.hse.gov.uk/msd/uld/art.
15. Anpura L. Utility of numerical and visual analog scales for evaluating the post-operative pain in rural areas. *International Journal of Advances in Medicine* 2019;6(2):284.
16. Rabea Begum M, Hossain MA. Validity And Reliability of Visual Analogue Scale (Vas) For Pain Measurement.
17. Challoumas D, Ramasubbu R, Rooney E, Seymour-Jackson E, Putti A, Millar NL. Management of de Quervain Tenosynovitis: A Systematic Review and Network Meta-Analysis. *JAMA Netw Open* 2023;6(10):E2337001.
18. Ramchandani J, Thakker A, Tharmaraja T. Time to Reconsider Occupation Induced De Quervain's Tenosynovitis: An Updated Review of Risk Factors. *Orthop. Rev. (Pavia)*. 2022;14(3).
19. Veronica E, Primayanti IDAID, Adiatmika IPG. Hubungan Antara Intensitas Penggunaan Smartphone dengan Risiko Kemunculan Sindrom De Quervain pada Mahasiswa Program Studi Sarjana Kedokteran dan Profesi Dokter Fakultas Kedokteran Universitas Udayana. *Jurnal Medika Udayana* 2021;10(4):50–55.
20. Fakoya AO, Tarzian M, Sabater EL, Burgos DM, ... de Quervain's disease: A discourse on etiology, diagnosis, and treatment. *Cureus*. 2023;
21. Rusila Y, Edward K. Hubungan Antara Umur, Masa Kerja dan Beban Kerja Fisik dengan Kelelahan Kerja pada Pekerja di Pabrik Kerupuk Subur dan Pabrik Kerupuk Sahara di Yogyakarta. *Jurnal Lentera Kesehatan Masyarakat* 2022;1(1):39–49.
22. Fathonah OPN, Nisa FS, Chahyadhi B. Hubungan Beban Kerja Fisik Dan Beban Kerja Mental Dengan Kelelahan Kerja pada Pekerja di PT.X Surakarta. *Jurnal Kesehatan Masyarakat* 2023;11(5):515–520.
23. Rutkowski M, Rutkowski K. Potential effects, diagnosis, and management of De Quervain Tenosynovitis in the aesthetics community: A Brief Review, Case Example, and Illustrative Exercises. *J. Clin. Aesthet. Dermatol.* 2023;16(9).
24. Aisah N, Fachrin SA, Suyuti S. Hubungan Umur dan Beban Kerja Terhadap Keluhan Nyeri Punggung Bawah pada Pekerja Produksi Sarabba. *Window of Public Health Journal* 2024;5(2):243–251.

25. Shaffiranisa E, Sari DP, Chusaeri AR, Rahmawati BA, Novsyaini ZPR, Irmayanto T. Trigger Finger Hand, Pathophysiology and Management. *Jurnal Biologi Tropis* 2023;23(1):419–425.
26. Wulandari RS, Subaidi. Kesenjangan Gender dalam Industri Tembakau: Analisis Pembagian Kerja pada Buruh Tani Tembakau di Pulau Lombok. *HORIZON: Indonesian Journal of Multidisciplinary* 2025;3(1):6–21.
27. Santriyana N, Dwimawati E, Listyandini R. Faktor-Faktor yang Berhubungan dengan Kelelahan Kerja pada Pekerja Pembuat Bolu Talas Kujang di Home Industry Kelurahan Bubulak Tahun 2022. *PROMOTOR: Jurnal Mahasiswa Kesehatan Masyarakat* 2023;6(4):370–377.
28. Joseph G, Sumampouw OJ, Kandou GD. Keluhan Muskuloskeletal pada Nelayan. *Kesmas: Jurnal Kesehatan Masyarakat Universitas Sam Ratulangi* 2023;12(1):34–40.
29. Rani FAC, Cahyani EI, Hardini KF. Hubungan Indeks Massa Tubuh dan Posisi Kerja dengan Keluhan Muskuloskeletal pada Ibu Rumah Tangga di Desa Bedali. *SEHATMAS: Jurnal Ilmiah Kesehatan Masyarakat* 2024;3(3):635–645.
30. Aesia YF, Widiyati DE, Sulistyowati E. Peran Faktor Risiko dalam Peningkatan Kejadian Wrist Pain dan Thumb Pain. *Jurnal Kedokteran Komunitas* 2023;11(2).
31. Setiadi, Irawandi D. Hubungan Indeks Massa Tubuh Dengan Gangguan Otot. *JUKEJ: Jurnal Kesehatan Jompa* 2023;2(2):17–25.
32. Jayanti KN, Dewi KTS. Dampak Masa Kerja, Pengalaman Kerja, Kemampuan Kerja Terhadap Kinerja Karyawan. *JEMBA: Jurnal Ekonomi Pembangunan, Manajemen dan Bisnis, Akuntansi* 2021;1(2):75–84.
33. Badri F Al. Work-Related De Quervain's Tenosynovitis (DQT): The Diagnosis Dilemma. *Cureus* 2023;
34. Firminger CR, Edwards WB. Effects of cyclic loading on the mechanical properties and failure of human patellar tendon. *J Biomech* 2021;120.
35. Muthu S, Annamalai S, Kandasamy V. Tenosynovitis of hand: Causes and complications. *World J Clin Cases* 2024;12(4):671–676.
36. Gorce P, Jacquier-Bret J. A systematic review of work-related musculoskeletal disorders among physical therapists and physiotherapists. *J. Bodyw. Mov. Ther.* 2024; 38:350–367.
37. Mahmood T, Afzal W, Mahmood W, Maqsood U, Sumiya A. Frequency of work-related musculoskeletal disorders among physical therapists: a systematic review. *Revista Brasileira de Medicina do Trabalho*. 2025;23(3).
38. Gregg C, Visconti VV, Albanese M, et al. Work-Related Musculoskeletal Disorders: A Systematic Review and Meta-Analysis. *J. Clin. Med.* 2024;13(13).
39. Syarif AK, Rossabel ER, Thalib MS, Ridwan AM. Laporan Kasus Carpal Tunnel Syndrome pada Petugas Data Analisis. *Jurnal Akta Trimedika* 2024;1(3):276–284.