

Duration of Mejejaitan and the Risk of De Quervain's Tenosynovitis Among Banten Artisans in Gianyar Regency

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ABSTRACT

Introduction: Religious rituals in Balinese Hinduism involve numerous ceremonies with offerings called banten. An essential stage in making Banten is mejejaitan, where artisans use staplers instead of bamboo skewers in crafting. However, prolonged use of staplers and highly repetitive behaviour can increase the risk of de Quervain's tenosynovitis. This study aims to determine the relationship between the duration of mejejaitan and the risk of developing de Quervain's tenosynovitis among Banten artisans in Gianyar Regency.

Methods: This observational study used a cross-sectional approach, with purposive sampling yielding 88 subjects. The independent variable was the duration of mejejaitan, while the dependent variable was de Quervain's tenosynovitis. Data collection was conducted through direct interviews to gather information about the duration of mejejaitan. Additionally, specific tests such as the WHAT test were performed to assess the risk of de Quervain's tenosynovitis, and pain intensity was measured using the NRS.

Results: Data analysis using the Spearman rho test yielded a p-value of 0.018, indicating a relationship between the duration of mejejaitan and the risk of de Quervain's tenosynovitis. The correlation coefficient r of 0.251 showed a positive correlation, suggesting a direct relationship with a low correlation strength.

Conclusion: The longer the duration of mejejaitan without rest, the higher the risk of developing de Quervain's tenosynovitis.

Keywords: de Quervain's tenosynovitis, mejejaitan, Banten artisans

INTRODUCTION

Bali is known as one of the world's premier tourist destinations, and it is located in Indonesia. It is renowned for attractions that cannot be found elsewhere, such as its natural beauty, diverse cuisine, and local communities' unique traditions and culture. Gianyar, one of the regions in Bali, is particularly famous for its art, traditions, and customs. Gianyar Regency is rich in Balinese culture and arts and is home to numerous artists and artisans, including painters, dancers, sculptors, and ritual specialists, among many other artisans.

The traditions of Balinese society are reflected in the numerous religious rituals performed by the Hindu community.¹ According to a survey conducted by BPS in 2020, the population of Bali reached 4,317,404, with 3,247,283 people adhering to Hinduism, accounting for 86.8% of the total population. This indicates that the majority of Bali's population practices Hinduism.² Hindu religious ceremonies involve numerous rituals that utilize offerings known as banten.³ Banten are the mediums or offerings used to connect with the divine.⁴ Banten offerings are composed of various supporting elements include traditional snacks (jaje Bali), fruits, and intricately crafted items known as jejitaitan.⁵

Mejejaitan is a series of steps in crafting the complementary elements of Banten for Balinese Hindu ceremonies. In this activity, specific leaves are cut into desired shapes and then arranged or sewn together.⁶ In essence, the task of mejejaitan is predominantly undertaken by women, as it requires patience, skill, and an understanding of religious scriptures. Additionally, this work must emphasize aesthetics to provide a sense of peace for both the Creator and those who enjoy it, thus being considered an art form. Nowadays, preparing ceremonial equipment independently is no longer feasible. Practical mindsets and time constraints have made purchasing these items quick, efficient, and reliable.⁷ The demand for quick and instant solutions has created opportunities for service and product providers of ceremonial offerings. Therefore, the role of tukang banten is crucial as they provide services and products for assembling and preparing ceremonial items.¹

Tukang Banten is responsible and obligated to prepare ceremonial offerings for the Hindu community.³ In the process of mejejaitan, in the past, tukang banten used "smart" (bamboo skewers) to stitch together young coconut leaves or similar materials according to the applicable guidelines.¹ However, with the advancement of technology, tukang banten nowadays uses a stapler in the mejejaitan activity. A stapler is a tool used to join several sheets of paper or similar materials by driving a thin metal strip through the sheets and folding the ends of the strip. In the context of

mejejaitan, a stapler is utilized as a replacement for bamboo skewers to bind together young coconut leaves during the stitching process. The working posture during the mejejaitan process using a stapler focuses on wrist and finger movements.⁸ The three-hand working postures during mejejaitan using a stapler involve pressing with the thumb, gripping, and applying pressure with both fingers.⁹ Typically, the hand posture when using a stapler involves gripping, which is performed at high speed (repetitive behaviour), which poses a potential risk of developing de Quervain's tenosynovitis.¹⁰

De Quervain's tenosynovitis is inflammation of the tendon sheath, causing pain at the base of the thumb and radiating to the lower arm, resulting in tendon swelling.¹¹ De Quervain's tenosynovitis is caused by the degeneration of mucus with the deposition of fibrous tissue related to increased vascularity and acute inflammation in the synovial layer. This deposition leads to thickening of the tendon sheath, resulting in the impingement of the APL and EPB tendons, thus causing inflammation and severe pain. Several factors considered to be causes of de Quervain's tenosynovitis include overuse or excessive use of the hand, static positioning of the thumb without changes in position, repetitive or repetitive use of the hand in work, and prolonged holding of weight.¹²

While everyone is at risk of developing de Quervain's tenosynovitis, women have a higher risk factor at 1.3% compared to 0.5% in men, with the peak prevalence occurring between the ages of 40 and 60 years. Research conducted by Tianxiao Ma in 2018 in Xingtai, China, on a sample of adolescents found that prolonged daily use of mobile games and hand posture significantly correlated with a positive rate of de Quervain syndrome ($p < 0.05$).¹³ In Indonesia, based on research conducted by Priutami (2021) on 90 Banten traders, the results showed that 47 respondents (52.2%) were diagnosed positive, while 43 respondents (47.8%) were diagnosed negative for de Quervain syndrome. Despite studies on de Quervain's tenosynovitis being conducted in Indonesia, there have been several limitations in previous research, with the majority using specific tests such as the Finkelstein test, which has a sensitivity value of 67% and a specificity value of 68%.¹⁴ Meanwhile, there is a specific test with higher sensitivity but less commonly used, known as the WHAT test, with a sensitivity value of 99% and a specificity value of 29%. Information and research on mejejaitan in Bali must also be available.

Based on the background and literature review presented above, the hypothesis is obtained that a longer duration of mejejaitan significantly correlates with an increased incidence of de Quervain's tenosynovitis. This research is essential as it can provide new insights into the duration of mejejaitan activities, cultural and economic activities in Bali, and their association with the risk of de Quervain's tenosynovitis. This topic has yet to be studied.

Based on the exposition provided, the researcher believes that the duration factor of mejejaitan among Banten artisans, especially for prolonged periods without rest, can influence the occurrence of de Quervain's tenosynovitis complaints. Therefore, the researcher is interested in investigating this topic further. This study aims to determine the relationship between the duration of mejejaitan and complaints of de Quervain's tenosynovitis among Banten Artisans in Gianyar Regency.

METHOD

This study is an analytical observational study using a cross-sectional design. The target population is Banten artisans in Bali, while the accessible population comprises Banten artisans in Gianyar. The research was conducted from April to October 2023 at several locations in Gianyar Regency, specifically at Griya Punia Tembuku Serongga, Griya Pacung Bitera, Pasraman Griya Gede Wayahan Buruan, Bali Serati Organizer, and Pasar Pesenan.

The study sample must meet several eligibility criteria. Inclusion criteria include being registered as a resident of Gianyar Regency, evidenced by presenting an Identity Card or similar proof, agreeing to participate in the study and signing informed consent, working as a Banten artisan for more than six months, and being female with an age range of 35-60 years. Exclusion criteria include subjects not participating in interview sessions and using skewers in mejejaitan activities. The sample was obtained using purposive sampling, resulting in 88 participants after adding 10% dropout criteria.

In this study, research parameters include direct interviews to determine the duration of mejejaitan, the WHAT test to assess the risk of de Quervain tenosynovitis, and the Numerical Rating Scale (NRS) to assess pain intensity, conducted by trained physiotherapists assisted by the research team. Data analysis was performed using IBM SPSS 26 software, consisting of univariate and bivariate analyses. Univariate analysis variables include duration of mejejaitan, complaints of de Quervain tenosynovitis, age, and gender. Bivariate analysis in this study aims to test the hypothesis to determine the relationship between the duration of mejejaitan and complaints of de Quervain's tenosynovitis among Banten artisans, using the Spearman rho correlation test. The Research Ethics Committee of the Faculty of Medicine, Udayana University, reviewed the research procedures and granted research approval with the number 846/UN14.2.2.VII.14/LT/2023.

RESULTS

The study was conducted from April to October 2023. The total population of Banten artisans in GPTS, GPB, PGGWB, BSO, and PP was 106 individuals. Using the purposive sampling formula, the sample size was determined to be 86 individuals after adding 10% dropout criteria. Of 98 individuals who met the inclusion criteria, 10 showed refusal and non-cooperation and had to be excluded. Thus, the research sample consisted of 88 individuals, as depicted in Figure 1.

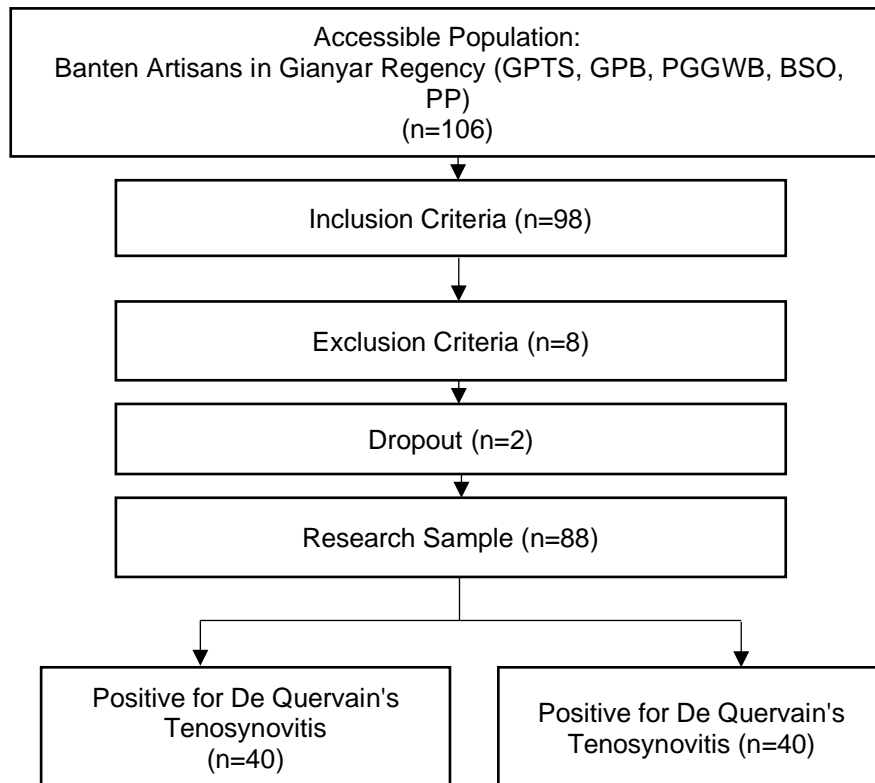


Figure 1. Research Flowchart

The characteristics of the sample in the study are based on age, duration of mejejaitan, and complaints of de Quervain tenosynovitis, as outlined in Table 1.

Table 1. Sample Characteristics Based on Age

Age	Number (n)	Percentage (%)
35-40 years	7	8.0
41-50 years	41	46.5
51-60 years	40	45.5
Total	88	100

Based on Table 1, the characteristics of the sample according to age are as follows: there are seven individuals (8.0%) aged between 35-40 years, 41 individuals (46.5%) aged between 41-50 years, and 40 individuals (45.5%) aged between 51-60 years. The characteristics of the sample based on the duration of mejejaitan can be seen in Table 2.

Table 2. Sample Characteristics Based on Duration of Mejejaitan

Duration of Mejejaitan	Number (n)	Percentage (%)
<2 hours/day	3	3.4
2-4 hours/day	31	35.2
4-6 hours/day	30	34.1
6-8 hours/day	21	23.9
8-10 hours/day	3	3.4
Total	88	100

Based on Table 2, the distribution of the sample according to the duration of mejejaitan is as follows: there are three individuals (3.4%) with a duration of <2 hours/day, the most common duration range is 2-4 hours/day with 31 individuals (35.2%), followed by 4-6 hours/day with 30 individuals (34.1%), 6-8 hours/day with 21 individuals (23.9%), and 8-10 hours/day with three individuals (3.4%). The characteristics of the research sample based on pain intensity can be seen in Table 3.

Table 3. Characteristics of the Research Sample Based on Pain Intensity

Pain Intensity	Number (n)	Percentage (%)
No Pain	40	45.5
Mild Pain	30	34.1
Moderate Pain	15	17.0
Severe Pain	3	3.4
Total	88	100

In Table 3, it is found that the majority of pain intensity based on the WHAT test from the research sample is as follows: no pain in 40 individuals (45.5%), mild pain in 30 individuals (34.1%), while moderate pain in 15 individuals

(17.0%), and severe pain in 3 individuals (3.4%). The distribution of sample characteristics based on age can be seen in Table 4.

Table 4. Distribution of Sample Characteristics Based on Age

Variables	N	Minimum	Maximum	Average	Standar Deviation
Age	88	35	60	49.20	5.620
Valid	88				
N	88				

Based on Table 4 above, it can be seen that the lowest age of Banten artisans in Gianyar Regency is 35 years, and the highest is 60 years, with a mean value of 49.20 and a standard deviation (level of data dispersion) of 5.620. The distribution of the risk of de Quervain tenosynovitis based on the duration of mejejaitan can be seen in Table 5.

Table 5. Distribution of Risk of De Quervain Tenosynovitis Based on Duration of Mejejaitan

Duration of Mejejaitan	No Pain	Mild Pain	Moderate Pain	Severe Pain	Total
<2 hours/day	3	0	0	0	3
2-4 hours/day	19	9	1	2	31
4-6 hours/day	7	15	7	1	30
6-8 hours/day	11	5	5	0	21
8-10 hours/day	0	1	2	0	3
Total	40	30	15	3	88

Table 5 shows that among the samples conducting mejejaitan with a duration of <2 hours/day, there were three individuals, none of whom experienced positive pain. Furthermore, among the samples conducting mejejaitan for 2-4 hours/day, there were 31 individuals, with 19 individuals showing no pain, nine individuals experiencing mild pain, one experiencing moderate pain, and two experiencing severe pain. Similarly, among the samples conducting mejejaitan for 4-6 hours/day, there were 30 individuals: 7 individuals showing no pain, 15 individuals experiencing mild pain, five individuals experiencing moderate pain, and one experiencing severe pain. Next, among the samples conducting mejejaitan for 6-8 hours/day, there were 21 individuals, with 11 individuals showing no pain, five individuals experiencing mild pain, and none experiencing moderate to severe pain. Finally, among the samples conducting mejejaitan for 8-10 hours/day, there were three individuals: one experiencing mild pain, 2 experiencing moderate pain, and none experiencing moderate to severe pain.

The duration can be interpreted as the time range or time something takes place. In this study, the duration of mejejaitan is measured in hours per day. Each banten artisan has a different duration when performing mejejaitan activities. The results of the Spearman's Rho correlation test between the duration of mejejaitan and the risk of de Quervain tenosynovitis can be seen in Table 6.

Table 6. Results of Spearman's Rho Correlation Test between Duration of Mejejaitan and Risk of De Quervain Tenosynovitis

Variables	Corellation	p-value
Durasi Mejejaitan	0.251	0.018
Risiko DQS		

The statistical analysis using the Spearman's Rho correlation test yielded a p-value of 0.018 ($p < 0.05$), indicating a significant relationship between the two variables, namely the duration of mejejaitan and the risk of de Quervain tenosynovitis among Banten artisans in Gianyar Regency. Additionally, the correlation coefficient obtained from this analysis is 0.251, indicating a positive result and a low-strength direct correlation.

DISCUSSION

Characteristics of Research Subjects

The study was conducted from April to October 2023 at several griya (traditional Balinese compounds) and markets in Gianyar Regency, including Griya Punia Tembuku Serongga, Griya Pacung Bitera, Pasraman Griya Gede Wayahan Buruan, Bali Serati Organizer, and Pasar Pesenan. Using purposive sampling, the sample size was determined to be 86 individuals after adding a 10% dropout criterion. Ten of 98 individuals who met the inclusion criteria showed refusal and non-cooperation and had to be excluded. Thus, the research sample consisted of 88 individuals. Based on the interviews, the research sample worked for 8 hours per day, including a one-hour break.

Most of the participants in this study fall within the age range of 41-50 years, totalling 43 individuals. Most Banten artisans are retired mothers who have taken up mejejaitan as a side job to earn additional income. Age is one of the factors influencing the risk of de Quervain tenosynovitis. This aligns with Veronica's study (2021), which suggests that older individuals are more susceptible to de Quervain tenosynovitis due to degeneration and inflammation of muscles and tendons over time and with age.¹¹ This study is also supported by Skef's 2018 research, which states that everyone is at risk of developing de Quervain tenosynovitis. Still, women have a higher risk factor, with a prevalence of 1.3%, compared to 0.5% in men, with the peak prevalence occurring between the ages of 40 and 50 years.¹⁵

The duration range of mejejaitan among the research participants is 2-4 hours/day, with 31 individuals (35.2%). This occurs because out of an 8-hour workday, the research participants only engage in mejejaitan for 2-4 hours/day, while the rest of the time is allocated for other tasks such as metanding. Following this, the duration of mejejaitan for 4-6 hours/day is represented by 30 individuals (34.1%) from the research sample. Subsequently, in third place is 6-8 hours/day, with 21 individuals (23.9%). This is because several research participants continue their mejejaitan activities at home during the evening hours.

According to data from BPS RI in 2019, the average working hours per week in the non-agricultural sector were 41.3 hours, equivalent to 5 to 6 hours per day.¹⁶ Working hours significantly impact individual productivity, as individuals who work for more than 4 hours tend to experience a decline in productivity. Therefore, breaks are necessary to restore physical condition, and taking a break after working four consecutive hours is recommended for approximately half an hour. The optimal working hours, including break time, are 8 hours daily.¹⁷ This is similar to a study by Haikal et al. (2020) involving 104 smartphone users who experienced de Quervain syndrome, with 100 respondents using smartphones for more than 5 hours per day.¹⁸ This condition occurs because prolonged and repetitive use of smartphones with the thumb and wrist can cause an increased load on the joints, leading to acute injuries to the EPB and APL tendons, resulting in inflammation of the tendon sheath and eventual complaints of pain.¹⁹

In this study, the specific examination used was the WHAT test, and pain measurement was conducted using the NRS, resulting in 48 individuals (54.5%) being positively diagnosed with de Quervain tenosynovitis. This group was further categorised into several groups: mild pain, consisting of 16 individuals (18.2%); moderate pain, consisting of 30 individuals (34.1%); and severe pain, consisting of 11 individuals (12.5%). This aligns with the findings of a study by Hardiyanty (2020) regarding the repetitive use of muscles in the wrist and thumb over a prolonged duration, leading to damage to the tendon sheath. Consequently, there is a decrease in the production and quality of synovial fluid, which serves as a lubricant, resulting in friction between tendons and the tendon sheath, ultimately leading to inflammation and complaints of pain.²⁰

In this study, the youngest age among the Banten traders in Gianyar Regency was 35 years old, while the oldest was 60 years old, with a mean value of 49.20 and a data dispersion level of 5.620. Three individuals engaged in Banten-making activities for less than 2 hours daily, and none experienced positive pain. This condition occurred because those who engaged in Banten-making for less than 2 hours per day had various activities, such as mending, which prevented monotony in a single activity for a long duration. Furthermore, 31 individuals engaged in Banten-making for 2-4 hours per day, with 19 experiencing no pain, 9 experiencing mild pain, 1 experiencing moderate pain, and 2 experiencing severe pain.

This situation arose because those who engaged in banten-making for 2-4 hours per day did not take breaks or stretch between banten-making activities. Similarly, 30 individuals were involved in Banten-making for 4-6 hours per day, with 7 experiencing no pain, 15 experiencing mild pain, 5 experiencing moderate pain, and 1 experiencing severe pain. Additionally, 21 individuals engaged in Banten-making for 6-8 hours per day, with 11 experiencing no pain, 5 experiencing mild pain, and none experiencing moderate or severe pain. This occurred because individuals who engaged in Banten-making for 4-6 hours and 6-8 hours per day rarely took breaks or stretched between Banten-making activities, especially nearing holidays with many orders. These results are consistent with a study by Ali in 2023, which stated that frequent smartphone use leads to complaints of pain and weakness in the base of the thumb/wrist, indicating positive de Quervain syndrome in those individuals.²¹

Furthermore, three individuals engaged in Banten-making for 8-10 hours per day, with 1 experiencing mild pain and 2 experiencing moderate pain, while none experienced severe pain. This condition occurred because prolonged pain complaints gradually became habitual, making the pain seem less noticeable or disruptive over time. Individuals' acceptance of prolonged pain sensations can enhance their comfort and functional abilities in daily life.²² This is consistent with the findings of Widayati (2016), which suggest that managing prolonged pain can improve an individual's functional skills, sense of security, and overall quality of life.²³

The Relationship Between Banten-Making Duration and the Risk of De Quervain Tenosynovitis

The correlation between the Banten-making duration and de Quervain tenosynovitis risk was examined. The analysis, conducted using Spearman's Rho correlation, revealed a significant relationship between the two variables among Banten sellers in Kabupaten Gianyar. The p-value obtained was 0.018, indicating statistical significance, with a correlation coefficient 0.251. This positive correlation suggests that as the duration of Banten-making increases, the risk of de Quervain tenosynovitis also tends to rise, albeit with a low correlation strength.

This is consistent with the study by Priutami et al. (2021), which suggests that the longer Banten makers engage in Banten-making activities, the greater the intensity of de Quervain tenosynovitis pain.⁸ This finding is also consistent with the study by Rohideta and Asnawi (2017), which demonstrates a significant relationship between the duration of PlayStation usage and De Quervain's Syndrome.²⁴ Another relevant study to this finding is the one by Hardiyanty et al. (2020), which suggests that the higher the intensity of online game usage, the higher the risk of DQS occurrence.²⁰

Long working durations without rest can lead to repetitive strain injuries (RSIs) in the hands and wrists.²⁴ De Quervain tenosynovitis is one of the injuries resulting from RSI. One of the factors causing de Quervain tenosynovitis is long working durations. This can occur because individuals working for extended periods force the APL and EPB tendon muscles to contract repetitively at a high rate, leading to repetitive minor injuries.¹² This finding is consistent with Amanda's (2020) study, which demonstrates a relationship between repetitive movements and DQT.¹²

De Quervain's tenosynovitis is a pain resulting from repetitive hand movements in tasks, leading to inflammation around the styloid process of the radius.¹⁰ De Quervain's tenosynovitis occurs due to tenosynovitis and myxomatous degeneration, which correspond to chronic degenerative processes.²⁵ This inflammation affects the tendons of the extensor pollicis brevis (EPB) muscle and the abductor pollicis longus (APL) muscle, two muscles with similar functions, namely, moving the thumb away from the hand.¹⁰ Pathophysiologically, De Quervain's tenosynovitis results from prolonged overuse of the fingers or repetitive minor trauma, leading to dysfunction of the tendon sheath.²⁶ Dysfunction of the tendon sheath leads to reduced production and quality of synovial fluid, which serves as a lubricant, resulting in friction between the muscle and the tendon sheath.²⁵ Repeated friction over a prolonged duration can lead to inflammation of the tendon sheath, followed by the proliferation of fibrous tissue. This tissue proliferation fills almost the

entire tendon sheath, causing restricted movement. Consequently, the friction between the APL and EPB tendons stimulates the nerves around these muscles, resulting in pain when the thumb moves.²⁰

Common symptoms of De Quervain's tenosynovitis include pain in the thumb area at the wrist when performing radial deviation movements and increased pain during ulnar deviation movements of the wrist.¹⁰ Several factors contribute to the development of De Quervain's tenosynovitis, including prolonged work durations and repetitive thumb movements with loading on the carpometacarpal joint.²⁷ Direct trauma to the area of the EPB and APL muscles can cause tissue damage and inflammation, subsequently triggering the onset of pain.²⁰ The damage to the joint resulting from the inflammatory process leads to erosion of the bone at the joint's edge due to invasion by granulation tissue and osteoclast resorption, resulting in tenosynovitis accompanied by collagen invasion into the tendon, leading to tendon rupture.²⁷

The pain in the thumb can impact the coordination of movements and daily activities involving pinching, gripping, and grasping.²⁸ Therefore, physiotherapy management is highly essential. The management includes education and modification of ergonomic activities. Patients are advised for ideal thumb immobilization for 4-6 weeks to prevent further edema, cold compress to reduce pain and swelling, splinting to alleviate pain and restrict movement, massage to relieve muscle tension, and eccentric and isometric exercises to enhance soft tissue strength.²⁶

According to Jadhav et al. (2014), conservative physiotherapy management involves treatment using a paraffin wax bath, pulse ultrasound, deep friction massage, and strengthening exercises. The treatment procedure includes immersing the thumb into a paraffin wax bath using a dip and soak method. The thumb is dipped 3-4 times until a thin layer of wax forms, then immersed in the paraffin wax for 15 minutes at a temperature of 50°C. Subsequently, pulse ultrasound is applied with a frequency of 1 MHz and power of 0.08 watt/cm² using a 4 cm² diameter applicator for 10 minutes. Afterward, massage deep, transverse friction on the affected nodules to reduce pain and irritation. Then, provide strengthening exercises such as squeezing a ball. This treatment is administered daily for 15 days.²⁹

The limitations of this study include a small sample size, rendering the research sample inadequate to represent the population. The study participants worked for 8 hours engaging in desk-related activities but also performed other activities such as washing dishes, cooking, or other tasks that pose a risk for developing De Quervain's tenosynovitis. Consequently, the researchers couldn't control physical activities. Additionally, some study participants combined staplers and tacks in desk-related activities, and the pain measurement tools were subjective.

CONCLUSION

This study found a significant relationship between the duration of desk-related activities and the risk of De Quervain's tenosynovitis among construction workers in the Gianyar District, with a p-value of 0.018 and a correlation coefficient of 0.251. Construction workers are advised to effectively manage their desk-related activity durations, especially those working more than 4 hours per day, by taking sufficient breaks and performing regular stretching exercises to prevent the risk of De Quervain's tenosynovitis. Workers experiencing pain are encouraged to follow the physiotherapy management procedures recommended in this study. These research findings are expected to inspire and provide valuable information for preventing the risk of De Quervain's tenosynovitis. It is recommended that stricter control over the study participants' activities be exercised to avoid bias and enhance the validity of the research results.

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