



# Analysis of Differences in Effectiveness between Salt Water Bath Therapy and Ginger Water Bath Therapy on Pain Scale and its Relationship with Age, Gender, and Education Level in Gout Sufferers in the Working Area of the Mpunda Public Health Center of Bima City



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## Abstract

Background: Gouty arthritis is an inflammatory disease that affects the connective tissue of the joints, is progressive, symmetrical, and systemic, and tends to turn chronic. It has typical symptoms experienced by sufferers, such as pain in one or more joints. These symptoms can interfere with comfort in activities. Method: This study used a Quasi-Experimental design with a Two Group Pretest-Posttest approach. Sampling was done using the Quota sampling technique, resulting in 40 respondents being chosen. Data analysis in this study, to answer research questions and hypotheses, was bivariate analysis using 4 (four) types of statistical tests, namely 1) Wilcoxon test, 2) Mann-Witney test, 3) Test Gamma correlation, and 4) Chi-square test with a significant level  $\alpha$  of 0.05. Results: The results showed that the Mean Rank of the warm salt water bath group was lower, namely 18.55, while that of the warm ginger water bath group was 22.45. The statistical test results showed that the  $p$ -value was  $0.145 > 0.05$ , meaning that statistically, there was no difference in effectiveness between the two therapies on the pain scale of respondents because the value did not reach 5. The results of other bivariate analyses showed that age and gender were not related to pain level, where the relationship between age and pain level had  $p=0.114 > 0.05$ , while the relationship between sex and pain level had  $p=0.123 > 0.05$ . Conclusion: Salt water bath therapy is clinically more effective than ginger water bath therapy on the pain scale in elderly patients with gout arthritis, but, statistically, there is no difference. Age and gender had no significant relationship with pain levels in the two research treatments.

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## 1 Introduction

Gouty arthritis is an inflammatory disease that affects the connective tissue of the joints, is progressive, symmetrical, and systemic, and tends to turn chronic. It is a disorder of purine metabolism that is characterized by hyperuricemia and repeated attacks of acute synovitis. Hyperuricemia is associated with the accumulation of monosodium monohydrate urate crystals. At a more advanced stage, joint cartilage degeneration can occur. Biochemically, hyper-saturation, namely the solubility of uric acid in serum, can occur beyond the threshold. The state of hyperuricemia will be at risk of developing gouty arthritis, gouty nephropathy, or kidney stones (Sety, 2018).

Gouty arthritis has typical symptoms in its sufferers, such as pain in one or more joints. At night or in the morning, the pain will get worse, causing the joints to become swollen, the skin becomes red or purplish, and if the skin in the joints is touched, the sufferer will feel the warmth. These symptoms most commonly affect the joints at the base of the big toe, often in the soles of the feet, ankles, knees, and elbows. The other symptoms are fever and a fast heart rate (Milind et al., 2013).

The 2013 Rikesdas report showed that most diseases in the elderly were non-communicable diseases, one of which was gouty arthritis, which ranks second after hypertension (Filippucci et al., 2009; Punzi et al., 2012). In Indonesia, gouty arthritis predictably occurred in 840 out of every 100,000 people. Based on age, 32% were under 34 years old, while the remaining 68% were over that age (Infodatin, 2016). According to the World Health Organization (WHO), in 2013, among 81% of gout sufferers in Indonesia, only 24% went to the doctor, while the remaining 57% consumed over-the-counter pain relievers without consulting with the doctor (Sety, 2018).

A preliminary study conducted by researchers at the Mpunda Public Health Center in the city of Bima said that most patients with gouty arthritis aged over 45 years were women. The interview with some of them (with 10 patients) revealed that most of them consumed foods high in purines, such as meat, offal, nuts, and seafood like prawns, crabs, and others. Each of them experienced pain in one joint like the toe, knee, and ankle. Patients with gouty arthritis, to treat pain, have implemented a low-purine diet. When the pain persisted, they then did an examination or went to the Public Health Center, which, in this case, merely did counselling about gout and, when the patient experienced pain, only gave medicine without socializing and teaching non-pharmacological treatments such as salt water bath therapy (Bennett, 2001; Ware et al., 2006).

A theory explains that gouty arthritis can be affected by several factors, namely age, gender, genetics, obesity, joint injury, and occupation. It can interfere with comfort in activities due to joint pain and, in addition, cause a high risk of complications, such as acute uric acid nephropathy, kidney stones, and hypertension. For the various effects it may cause, it requires proper and safe treatments both pharmacologically and non-pharmacologically (Vagedes et al., 2018). Pharmacological treatment is usually done with anti-pain medication. In Indonesia, 57% of gout sufferers only consume over-the-counter painkillers, which can lead to dependence and even contraindications when used without the supervision of a doctor. Non-pharmacological therapy can be a treatment to relieve pain in patients with gout in various ways, like relaxation, increasing fluid (water) intake, warm compresses, a low-purine diet by adjusting the life pattern and food intake by reducing foods that contain high purines, and salt water bath and ginger water bath therapies (Nuyridayanti, 2017).

Warm water therapy or hydrotherapy gives a warm sensation to the body to reduce symptoms of acute and chronic pain (Ahmadet al., 2021). This simple therapy can effectively reduce pain, inflammation, and muscle spasms. It also helps improve blood circulation by widening blood vessels to supply more oxygen to the swollen tissues. Improved blood circulation also facilitates lymph circulation to clean the body of toxins. For people suffering from various ailments such as rheumatism, arthritis, sciatica, back pain, insomnia, fatigue, stress, poor blood circulation (hypertension), and muscle aches, cramps, and stiffness, warm water therapy (hydrotherapy) is beneficial (Vaghasloo et al., 2020; Ozdemir & Can, 2021; Emine & Gulbeyaz, 2022). Various methods commonly used in hydrotherapy are bathing, Sitz bath, water massage, wrapping with a wet cloth, compressing, and bathing the feet (Wulandari & Kostania, 2021).

Salt water bath therapy and ginger water bath therapy are also helpful in relieving joint pain in gout sufferers. Epsom salt contains chemical compounds with sodium chloride (NaCl) as the constituent with the highest amount

and other ingredients, including calcium sulfate ( $\text{CaSO}_4$ ), magnesium sulfate ( $\text{MgSO}_4$ ), and magnesium chloride ( $\text{MgCl}_2$ ) (Arwiyah et al., 2015). According to research by Amilia & Hendarsih (2013), compress therapy with salt can effectively reduce joint pain in patients with arthritis because salt has anti-inflammatory and analgesic potential to reduce pain. Epsom salt contains a lot of magnesium, which plays a role in inhibiting pain stimulation from nociceptors.

Combining bath therapy with other herbal ingredients, like red ginger, is possible. Red ginger is higher than other gingers in volatile oil content (Setyaningrum & Saparinto, 2013). It contains fat, protein, starch, oleoresin (gingerol), and essential oil. Its hot and spicy aroma comes from volatile oils and oleoresin compounds (gingerol). Such hotness can widen blood vessels and let the blood flow smoothly. Oleoresin (gingerol) has high anti-inflammatory, analgesic, and antioxidant potentials and can inhibit prostaglandin synthesis, thereby reducing pain (Dewi & Kudmasa, 2016).

## 2 Materials and Methods

This study used a Quasi-Experimental design with a Two Group-Pretest-Posttest approach. Sampling was conducted using the Quota Sampling technique, resulting in 40 patients with gouty arthritis who were divided into 2 (two) groups, namely 20 respondents for the warm salt water bath treatment group and 20 respondents for the warm ginger water bath treatment group. The data in this study, to answer research questions and hypotheses, were analyzed under bivariate analysis using 4 (four) types of statistical tests, namely 1) Wilcoxon test, 2) Mann-Witney test, 3) Gamma correlation test, and 4) Chi-square test with a significant level of 0.05. The homogeneity test (Kolmogorov–Smirnov test) yielded values of 1.095 ( $p>0.05$ ) and 1.486 ( $p>0.05$ ) for the pre-test the post-test, respectively, meaning the data was homogeneous. The sample criteria used in this study were as follows:

- a) Inclusion criteria: elderly people with gout with mild and moderate pain based on the results of the initial examination and each has an SPMSQ score scale, namely an incorrect score of not more than 5.
- b) Exclusion criteria: elderly people with severe gout or showing high uric acid levels, have other diseases besides gout and have wounds on the legs.

The intervention ran for 14 days. During the first 7-day treatment, the first group was treated in salt water, while the second was in ginger water. The process took place at the Mpunda Public Health Center and continued at the homes of each respondent under the researchers' assistance. The intervention of the salt water bath group was done by using 30 grams of salt mixed with 3 litres of water at a temperature of 37-42°C. The patients' feet are immersed up to  $\pm 5$  cm above the ankles for 20 minutes. Meanwhile, the others from the other group were immersed in ginger water where 20 grams had been crushed and then boiled with 1 litre of water. The ginger boiled water was then mixed with 2 litres of plain water at a temperature of 37-42°, into which the feet were then immersed until  $\pm 5$  cm above the ankles for 20 minutes.

## 3 Results and Discussions

This univariate analysis describes the circumstances of various conditions and the characteristics of the respondents as follows:

Table 1  
Distribution of respondents based on the age of gout sufferers who experience pain in the Mpunda Public Health Center of Bima City

No.	Classification of Elderly	Frequency (f)	Percentage (%)
1	45-59 years (middle age)	19	47.5
2	60-74 years (elderly)	19	47.5
3	75-90 years (old)	2	5.0
4	>90 years (very old)	0	0.0
TOTAL		40	100.0

Table 1 above shows that from 40 elderly respondents with gout who experienced pain in the Mpunda Public Health Center area in Bima City, by age, the respondents in this study were categorized as elderly (60-74 years old), namely 19 respondents (47.5%), middle age (45-59 years old), namely 19 respondents (47.5%), and old (75-90 years old), namely 2 respondents (5.0%)

Table 2  
Distribution of respondents by gender, education, and income in the MPunda Public Health Center in Bima City

No	Characteristics	Frequency (f)	Percentage (%)
1.	Gender		
	- Male	15	37.5
	- Female	25	62.5
	Total	40	100.0
2.	Education		
	- Primary school	3	7.5
	- Junior High School	4	10.0
	- Senior High School	19	47.5
	- Higher education	14	35.0
	Total	40	100.0
3.	Income/month		
	- < 2 million	4	10
	- 2 – 3 million	14	35.0
	- > 3 million	22	55.0
	Total	40	100.0

Based on gender, in Table 2 above, most of the respondents who participated in this study were women, namely 25 people or 62.5%. Based on education, most had high school education (SMA), namely 19 people (47.5%). Based on income, the majority, namely 22 people (55%), had a respective income of > 3 million.

Table 3  
The results of the Wilcoxon test analysis of the effect of salt water bath therapy on pain in the elderly with gout in the Mpunda Public Health Center in Bima City

Variable	N	Mean Rank	Z	Sig.
Pretest – Posttest of using Salt Water	40	6.50	-3.464	.001

Table 3 which illustrates the results of the Wilcoxon test analysis using SPSS got a  $Z_{count}$  of -3.464 with an Asymp. Sig value of 0.001 in the group treated with salt water bath therapy. This value was smaller than alpha, or ( $p < 0.05$ ), meaning that H1 was accepted. It also means that there was a difference between the results of the pain scales in the pre-test and post-test of salt water bath therapy. So it can be concluded that there was an effect of salt water bath therapy to reduce the gout pain scale.

Table 4  
Wilcoxon test analysis results on the effect of ginger water bath therapy on pain in the elderly with gout in the Mpunda Public Health Center in Bima City

Variable	N	Mean Rank	Z	Sig.
Pretest – Posttest of using Ginger Water	40	3.50	-3.333	.020

Table 4 shows the results of the Wilcoxon test analysis using SPSS, where  $Z_{count}$  was -3.333 with an Asymp. Sig value of .020 in the group treated with ginger water bath therapy. This value was smaller than alpha or ( $p < 0.05$ ), then the hypothesis H1 was accepted. It means there was a difference between the pain scales for the pre-test and post-test

of using ginger water bath therapy. So, it can be concluded that there was an effect of ginger water bath therapy to reduce the gout pain scale.

Table 5

The results of the Mann-Whitney test analysis to determine the difference in the effectiveness of salt water bath therapy and ginger water bath therapy on the pain scale in elderly people with gout in the Mpunda Public Health Center in Bima City

Group	N	Ranks	
		Mean Rank	Sum of Ranks
1 (Salt water bath)	20	18.45	371.00
2 (Ginger water bath)	20	22.45	449.00
Total	40		

Statistics <sup>a</sup>	
	Post salt and ginger
Mann-Whitney U	161.000
Wilcoxon W	371.000
Z	-1.059
Asymp Sig (2.-tailed)	.031

Table 5 above states the results of the SPSS calculation based on the Mann-Whitney test. The mean rank of the salt water bath group was 18.45, lower than that of the ginger water bath group, which was 22.45. It means the salt water bath group decreased the pain scale more significantly than the ginger water bath group did. The pain scale in the salt water and ginger water groups resulted in a Z value of -1.059 and an Asymp Sig value of .031, which was smaller than alpha ( $p < 0.05$ ), then H1 was accepted. It means that there was a difference in the effectiveness of salt water bath therapy and ginger water bath therapy on changes in pain scale in gouty arthritis.

Table 6  
Relationship of Gender with Pain Level after research intervention

### Crosstabs

#### Case Processing Summary

	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
Jenis Kelamin Responden Jahe * Selisih Jahe	20	100.0%	0	0.0%	20	100.0%

#### Jenis Kelamin Responden Jahe \* Selisih Jahe Crosstabulation

Count

		Selisih Jahe			Total
		Rendah	Sedang	Tinggi	
Jenis Kelamin Responden Jahe	Laki-laki	6	1	1	8
	Perepuan	12	0	0	12
Total		18	1	1	20

#### Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.333 <sup>a</sup>	2	.189
Likelihood Ratio	4.006	2	.135
Linear-by-Linear Association	2.819	1	.093
N of Valid Cases	20		

a. 4 cells (66,7%) have expected count less than 5. The minimum expected count is ,40.

The table above shows that the highest significance of the change was of the warm ginger water treatment, which occurred in the elderly age group (60-74 years old). Out of 10 respondents, 1 got a high level of change, 1 got a medium level, and 8 got a low level of change. The result of the statistical analysis was  $p=0.135 > 0.05$ , showing that the level of pain that occurred did not correlate with gender.

Table 7  
The relationship between age and pain level after the research intervention

		Rendah	Sedang	Tinggi	Total
Usia Responden Jahe	45-59 (middle age)	10	0	0	10
	60-74 (elderly)	8	1	1	10
Total		18	1	1	20

#### Directional Measures

			Value	Asymptotic Standard Error <sup>a</sup>	Approximate T <sup>b</sup>	Approximate Significance
Ordinal by Ordinal	Somers' d	Symmetric	.292	.104	1.581	.114
		Usia Responden Jahe Dependent	.541	.114	1.581	.114
		Selisih Jahe Dependent	.200	.126	1.581	.114

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

#### Symmetric Measures

		Value	Asymptotic Standard Error <sup>a</sup>	Approximate T <sup>b</sup>	Approximate Significance
Ordinal by Ordinal	Gamma	1.000	.000	1.581	.114
	Spearman Correlation	.333	.121	1.498	.152 <sup>c</sup>
Interval by Interval	Pearson's R	.314	.114	1.406	.177 <sup>c</sup>
N of Valid Cases		20			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

c. Based on normal approximation.

The table above shows that the most significant change was in the warm ginger bath treatment in the elderly age group (60-74 years old). Out of 10 respondents, 1 got a high level of change, 1 got a medium level, and 8 got a low level of change. The result of the Gamma statistic test was  $P = 0.114 > 0.05$ , indicating that the level of pain did not correlate with age.

## Discussion

### *The effect of salt water bath therapy on pain scale in elderly patients with gout*

Salt water bath therapy can reduce pain scale in elderly people with gout (Rockwood & Mitnitski, 2006; Bressler & Bahl, 2003). This statement is in line with research conducted by Sari & Syamsiah (2015), showing the effect of warm salt water compresses on joint pain in the elderly, with average results before the intervention of 5.83 and after the intervention of 4.02. Nuyridayanti (2017), also stated that salt water bath therapy could reduce pain levels in gout sufferers. A total of 13 respondents (65%) experienced a decrease in pain levels.

According to Permady (2015), the warm water bath is a conduction-based treatment technique to cause vasodilation of blood vessels, increase capillary permeability, increase cellular metabolism, relax muscles, and increase blood flow to an area of pain. In addition, bathing in warm water added with salt can also accelerate pain healing because the salt content, namely magnesium, can suppress the release of prostaglandins and sodium, which functions for nerve transmission and muscle work (Kushayati, 2011).

### *Effect of ginger water bath on pain scale in elderly patients with gout*

Soaking ginger water can reduce pain scale in elderly people with gout. This is in line with the research conducted by Damaiyanti & Siska (2014), which showed that warm ginger water compresses could decrease the intensity of rheumatoid arthritis pain in the elderly with average results before and after the intervention of 4.79 and 2.58, respectively. The results of the research by Dewi & Kudmasa (2016), also stated that ginger compresses affected joint pain in the elderly, in 11 people (85%) with moderate pain before ginger compress and 12 people (92%) with mild pain thereafter.

Herliana (2013), stated that ginger water bath therapy is useful for reducing joint pain because ginger contains gingerdion, 6-gingerol, and zingerol, which function to suppress prostaglandins through inhibition of COX-2 activity which inhibits the production of PGE<sub>2</sub>, leukotrienes, TNF- $\alpha$  in synoviocytes and human joints. Ginger bath therapy also aims to improve blood circulation and provide a sense of relaxation in the body. The pharmacological effect of ginger is a feeling of heat or warmth so that it functions to help improve blood circulation, reduce pain, and stimulate nerves so that stimuli will be delivered through nerve fibres and activate inhibitory neurons and projection neurons. Inhibitor neurons prevent the projection ones from signalling the brain, so the door is closed and no perception of pain exists.

#### *Differences in the effectiveness of salt water bath therapy and ginger water bath therapy on the pain scale in patients with gout*

Salt water bath therapy, done once a day for 7 days, is more effective in reducing the gout pain scale because of the salt content that can suppress the release of prostaglandins and help nerve transmission and muscle work. This finding is supported by research conducted by Amilia & Hendarsih (2013), who stated that Epsom salt is anti-inflammatory and analgesic, which is helpful to cure pain and has few side effects as long as it is applied correctly. It is in contrast to ginger water bath therapy, where ginger only inhibits the release of prostaglandins and creates warmth in the area soaked in ginger water. Ginger is often used as a pain medication because it contains gingerol. The sensation of warmth it causes makes blood vessels open and facilitates blood circulation (Zuriati, 2017).

In line with research conducted by Nuyridayanti (2017), who stated that giving salt water bath therapy can reduce pain levels in gout sufferers, salt water can improve blood flow and reduce uric acid clots in the joints. Sodium in salt is very critical to regulating the balance of fluids in the body. It is also responsible for nerve transmission and muscle work. Ruth Benita (2016), also said that Epsom salt contains more magnesium, which can inhibit the production of prostaglandins and the release of acetylcholine so that it can reduce gout pain.

The mechanism of action of salt in overcoming gout pain involves magnesium in salt that can suppress the release of prostaglandins and inhibit the release of acetylcholine to inhibit pain impulses from nociceptors. For this reason, the gate is closed, and pain stimuli will not be transmitted to the brain so that patients will not feel pain or feel more comfortable. Sodium in salt regulates fluids in the body, transmits nerves, relaxes muscles, and increases blood circulation.

Researchers argued that salt water has a relaxing effect on the body with the presence of sodium and magnesium so that it can reduce the pain experience. Observation of 11 respondents treated with salt water bath therapy found that most of them experienced a decrease in the gout pain scale. After soaking in salt water, four respondents with a moderate level of pain experienced a decrease to mild; 3 felt a decrease in their pain scale from mild to no pain after soaking in salt water, and 4 with a mild pain scale did not experience a change in their pain scale.

In this study, some respondents took uric acid drugs (allopurinol) but did not during the study, because the pain they felt did not interfere with their activities. 13 respondents consumed high-purine foods, such as offal, beef, eggs, nuts, spinach, cassava, papaya. Consuming high purines can increase the production of uric acid in the blood, which will lead to the accumulation of urate crystals in the joints and cause pain.

## **4 Conclusion**

Salt water bath therapy is clinically more effective than ginger water bath therapy on the pain scale in elderly patients with gouty arthritis. But, statistically, there is no difference between the two. Age and gender did not have a significant relationship with pain levels from the two research treatments. This study's results are expected to apply to the elderly with gouty arthritis to treat pain by applying salt warm water bath therapy and ginger warm water bath therapy as non-pharmacological treatments.



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*Conflict of interest statement*

The authors declared that they have no competing interests.

*Statement of authorship*

The authors have a responsibility for the conception and design of the study. The authors have approved the final article.

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