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The Effect of Mulligan Mobilization with Movement Modality on Improving Joint Flexibility in Gout Arthritis Patients

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ABSTRACT

Gout arthritis is a form of joint inflammation caused by the accumulation of monosodium urate crystals, leading to reduced joint flexibility, particularly in the knees. Non-pharmacological therapies such as the Mulligan Mobilization with Movement (MWM) technique provide a safe and effective alternative to enhance joint flexibility. However, the use of this therapy among patients with gout arthritis remains limited in primary healthcare settings. This study used a quasi-experimental design with 52 respondents divided into two groups: the intervention group (MWM) and the control group (Range of Motion exercises). Joint flexibility was measured before and after the intervention using a goniometer, and data were analyzed using statistical tests with a significance level of 0.05. The intervention group showed an increase in average joint flexibility from 123.85° to 140.19° (normal ≥140°), while the control group improved from 125.19° to 136.92°. The difference between the two groups was statistically significant (p=0.034), indicating that MWM therapy was more effective in improving joint flexibility than Range of Motion (ROM) exercises. The Mulligan Mobilization with Movement technique significantly improved joint flexibility in patients with gout arthritis and is recommended as a non-invasive rehabilitation method suitable for use in primary healthcare services.

INTRODUCTION

Non-Communicable Diseases (NCDs) represent an escalating global health crisis, contributing to 74% of all deaths worldwide—equivalent to 41 million annually—and imposing a heavy economic burden, particularly in low- and middle-income countries where access to advanced care is limited (Susanti & Sir, 2023). Gout arthritis, one such NCD driven by purine metabolism disorders and urate crystal deposition in joints, leads to debilitating pain, inflammation, and mobility restrictions that severely impair quality of life and productivity, underscoring the urgent need for accessible, evidence-based interventions in resource-constrained settings like Indonesia (Nian & You, 2022). With rising prevalence—7.3% nationally per recent Indonesian Health Surveys—and limited exploration of non-pharmacological options such as Mulligan Mobilization with Movement (MWM) despite its proven benefits in similar conditions, this research gap demands targeted studies to inform primary care practices and mitigate long-term complications (Ministry of Health Republic Indonesia, 2018).

Globally, gout arthritis affected 34.2% of cases in 2021, with peaks in the United States (26.3%) and China (25.3%) (Irot et al., 2021). In Indonesia, rates remain alarmingly high at 7.3 per thousand, exacerbated in regions like Bengkulu Province (12.11%, second-highest nationally), primarily targeting knee and ankle joints with symptoms of intense pain, swelling, redness, and functional decline (Rahmawati & Kusnul, 2021).

Treatment options span pharmacological agents such as allopurinol or febuxostat for uric acid control. However, non-pharmacological approaches such as MWM are gaining traction for

their safety, minimal invasiveness, and efficacy in restoring joint function and alleviating pain (Toto & Nababan, 2023; Komalasari et al., 2023). Studies affirm MWM's value: Sari et al. (2023) reported significant pain reduction and functional gains ($p<0.05$); Nguyen et al. (2021) highlighted enhanced flexibility and ROM, and reduced stiffness; and Alkhawajah & Alshami (2019) noted improvements in knee strength.

A preliminary survey at Sawah Lebar Health Center, Bengkulu City (2024), found that 70% of 10 gout patients had restricted joint flexibility, highlighting a critical implementation gap despite MWM's success elsewhere. Thus, this study evaluates MWM's effectiveness in enhancing joint flexibility among patients with gout arthritis, providing a practical, evidence-supported alternative for primary healthcare (Jumarna & Wanti, 2021).

METHOD

This study employed a quasi-experimental design with pre-test and post-test using a control group. The intervention group received Mulligan Mobilization with Movement (MWM) therapy, consisting of anterior glide and medial rotation on the knee in weight-bearing (standing) or non-weight-bearing (sitting/supine) positions, with the therapist applying sustained glide during 3-6 active knee flexion-extension repetitions per set (3 sets total), adhering to pain-free principles to prevent gout flare-ups. Each MWM session lasted 10-15 minutes per affected knee, conducted 6 times over 2 weeks by the researcher; the control group performed standard Range of Motion (ROM) exercises with equivalent duration and frequency. The study was conducted in the Sawah Lebar Health Center area, Ratu Agung District, Bengkulu City, from February 5 to April 1, 2025.

Sampling used non-probability purposive methods based on inclusion criteria: gout arthritis diagnosis, uric acid >7mg/dL (males) or >6 mg/dL (females), and limited knee flexibility. Sample size ($n=52$; 26 per group) was calculated via the two-means difference formula. Participants continued routine pharmacological regimens (e.g., allopurinol), with baseline screening via medical records/interviews to monitor interactions or flares; sessions were paused for active inflammation, and post-session pain was assessed via Numeric Rating Scale (NRS).

Joint flexibility was measured pre- and post-intervention using a goniometer. Data analysis comprised univariate (age, gender, education, BMI) and bivariate tests: Shapiro-Wilk/Kolmogorov-Smirnov for normality, paired t-test/Wilcoxon (intra-group), independent t-test/Mann-Whitney (inter-group), at $\alpha=0.05$. Ethical approval was granted by Bengkulu Health Polytechnic's Ethics Committee (No. KEPK.BKL/011/01/2025).

RESULTS

Table 1 presents the baseline characteristics of respondents. The average age of participants in the intervention group was 56.12 years, while in the control group it was 57.69 years. Most respondents in both groups were female, with 57% in the intervention group and 65.4% in the control group. Education levels were predominantly elementary school, reported by 46.2% of the intervention group and 30.8% of the control group. The majority of respondents in both groups were classified as obese based on BMI, each with 65.4%. The mean uric acid level was 9.16 mg/dL in the intervention group and 9.04 mg/dL in the control group. Regarding medication use, 84.6% of the intervention group and 65.4% of the control group reported taking medication. Equality testing showed no significant differences in age, gender, education, or BMI between the two groups ($p > 0.05$), indicating that the groups were comparable.

Table 1. Overview of respondent characteristics: age, gender, education, BMI, uric acid levels, and medication use

Variable	Group		p-value
	Intervention(n=26)	Control (n=26)	
Age			
Mean	56.12	57.69	0.451
Median	57.00	57.00	
Min	50	49	
Max	67	70	
SD	4.926	6.329	
CI 95%	54.13-58.11	55.14-58.11	
Gender			
Male	11 (42.3%)	9 (34.6%)	0.569
Female	15 (57.7%)	17 (65.4%)	
Education			
SD	12 (46.2%)	8 (30.8%)	0.595
SMP	5 (19.2%)	6 (23.1%)	
SMA	6 (23.1%)	6 (23.1%)	
PT	3 (11.5%)	6 (23.1%)	
BMI			
Obesity (>30)	17 (65.4%)	17 (65.4%)	0.16
Overweight (25-29,9)	7 (26.9%)	7 (26.9%)	
Normal (18.5-24.9)	2 (7.7%)	2 (7.7%)	
Uric Acid			
Mean	9.16	9.04	0.970
Median	9.00	9.00	
Min	7	7	
Max	13	12	
SD	1.642	1.509	
CI 95%	8.49-9.82	8.43-9.65	
Medication			
Yes	22 (84.6%)	17 (65.4)	0.109
No	4 (15.4%)	9 (34.6)	

Table 2. Overview of mean joint flexibility scores before intervention in the intervention and control groups

Variable	Group		p-value
	Intervention	Control	
Joint flexibility score			
Mean	123.85	125.19	0.342*
Min	115	115	
Max	135	135	
SD	5.159	5.741	
CI95%	121.76-125.93	122.87-127.51	

** Mann-Whitney Test*

Table 2 shows that before the intervention, the mean joint flexibility in the intervention group was 123.85° (classified as abnormal, <140°), with a standard deviation of 5.159 and a 95% confidence interval of 121.76° to 125.93°. Meanwhile, the control group had a mean joint flexibility score of 125.19° (also abnormal, <140°), with a standard deviation of 5.741 and a 95% confidence interval of 122.87° to 127.51°. Both groups demonstrated joint flexibility values that remained abnormal prior to therapy.

Table 3. Overview of mean joint flexibility scores after intervention in the intervention and control groups

Variable	Group	
	Intervention	Control
Joint flexibility score		
Mean	140.19	136.92
Min	130	115
Max	145	145
SD	3.600	7.494
CI95%	138.74-141.65	133.90-139.95

**Mann-Whitney Test*

Table 3 shows that after therapy, the mean joint flexibility in the intervention group increased to 140.19° (considered normal if ≥140), with a standard deviation (SD) of 3.600 and a 95% confidence interval of 138.74° to 141.65°. In contrast, the control group had a mean of 136.92° (considered abnormal if <140), with an SD of 7.494 and a 95% confidence interval between 133.90° and 139.95°. These results indicate a more significant improvement in the intervention group.

Table 4. Difference in mean joint flexibility scores before and after treatment in the intervention and control groups

	N	Median (Min-Max)	Z	p-value
Joint flexibility score intervention group				
Before intervention	26	125.00 (115-135)	-4.508	0.001***
After intervention	26	140.00 (130-145)		
Joint flexibility score control group				
Before intervention	26	125.00 (115-135)	-4.212	0.001***
After intervention	26	140.00 (115-145)		

**** Wilcoxon Test*

Table 4 shows that the Wilcoxon Signed Rank Test yielded a p-value of 0.001 in both the intervention and control groups (≤α 0.05), indicating a significant difference in joint flexibility scores before and after the intervention. Therefore, it can be concluded that joint flexibility improved in both the intervention and control groups following the treatment.

Table 5. The effect of mulligan mobilization with movement therapy on improving joint flexibility in gout arthritis patients

	N	Median (Min-Max)	U	p-value
Degree of Joint Flexibility				
Intervention	26	15.00 (10-25)	209.500	0.014**
Control	26	15.00 (0-25)		

***Mann-Whitney Test*

Table 5 presents the results of the Mann-Whitney statistical test, which showed a p-value of 0.014≤α 0.05. This indicates a significant difference in the average joint flexibility degree between the intervention and control groups. Therefore, it can be concluded that the mulligan mobilization with movement modality improves joint flexibility in patients with gout arthritis.

DISCUSSION

Respondent characteristics

The average age of respondents in the intervention group was 56.12 years, while in the control group it was 57.69 years. Yusantari (2022) also noted that most gout cases occur in

individuals over 45 due to high purine intake. The majority of respondents were female in both groups (57.7% in the intervention group and 65.4% in the control group). This supports the findings of Salmiyati & Asnindari (2020), who reported that reduced estrogen levels after menopause decrease uricosuric function, increasing the risk of gout arthritis.

Most respondents had only a primary education, which is linked to lower health literacy and awareness of dietary management for gout arthritis (Fauziah et al., 2019). A high proportion of respondents (65.4%) were obese, a known risk factor for hyperuricemia. Obesity is associated with elevated blood uric acid levels and joint urate crystal formation (Salmiyati & Asnindari, 2020). The average uric acid levels were 9.16mg/dL (intervention) and 9.04mg/dL (control), exceeding the normal range (3.5–7.0mg/dL for men and 2.6–6.0 mg/dL for women) (Madyaningrum et al., 2020). Most respondents in both groups were taking uric acid-lowering medications. Widyanto (2019) noted that diuretics may worsen hyperuricemia.

Differences in average joint flexibility scores before and after therapy in the intervention and control groups

This study applied Mulligan Mobilization with Movement (MWM) therapy to the intervention group and Range of Motion (ROM) exercises to the control group, both for 6 days. The results showed a statistically significant difference in joint flexibility scores before and after treatment in both groups, measured using a goniometer. A flexibility score below 140° is considered abnormal, while a score of 140° or above is classified as normal.

Both groups experienced improvements in joint flexibility after the intervention. The mean increase in the intervention group was 13.50, which was greater than the control group's increase of 11.50. The Wilcoxon Signed Rank Test showed significant results in both the intervention and control groups with p-values of 0.001 (<α 0.05), indicating a meaningful difference before and after the intervention.

These findings align with the study by Sari et al. (2023), which reported a mean improvement of 12.2 in joint flexibility following MWM therapy, with a statistically significant p-value of 0.001. Similarly, Nguyen et al. (2021) also found significant improvements in pain perception and joint flexibility, reporting a mean difference of 10.95 and a p-value of 0.001 (<α 0.05).

Effect of mulligan mobilization with movement therapy on joint flexibility

Statistical analysis showed a significant difference in joint flexibility improvement between the two groups, supporting the hypothesis that mulligan mobilization with movement (MWM) therapy significantly improves joint flexibility in patients with gout arthritis in Sawah Lebar, Bengkulu. This result is consistent with Sari et al. (2023), who found a significant improvement in joint range of motion following MWM (p=0.001). Alkhawajah & Alshami (2019) also found significant improvements in joint flexibility post-MWM therapy using Wilcoxon tests (p<0.05).

An additional benefit of MWM is improved muscle activation and postural stability. Research shows that MWM of the hip joint enhances muscle activity and postural control in stroke patients with hemiplegia, improving both functional and dynamic balance (Arabzadeh et al., 2023), thereby enabling patients to perform daily activities more efficiently.

CONCLUSION

Mulligan Mobilization with Movement (MWM) therapy proved more effective than standard Range of Motion (ROM) exercises in enhancing joint flexibility among gout arthritis patients, directly achieving the study's objective of evaluating non-pharmacological interventions suitable for primary healthcare settings. This research offers practical benefits by validating MWM as a safe, non-invasive technique that can be implemented by trained researchers in resource-limited environments like Puskesmas Sawah Lebar, potentially reducing mobility limitations and

improving patient quality of life without relying solely on pharmacological options. Future studies should explore additional outcomes, such as pain intensity, functional capacity, and long-term adherence, to broaden the understanding of MWM's holistic impact on gout management.

AUTHOR'S DECLARATION

Authors' contributions and responsibilities

DS: Writing original draft, visualization, conceptualization, initial data analysis, manuscript revision; **EB**: Supervision (lead), validation, manuscript review and editing, methodology contribution; **PE:** Validation, data collection, assistance in data analysis and interpretation.

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Availability of data and materials

All data are available from the authors.

Competing interests

The authors declare no competing interests.

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