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Epsom Salts and Hot Water Are Compared for Their Ability to Alleviate Joint Pain in Elderly Individuals in Coimbatore

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Abstract
Degenerative joint diseases like osteoarthritis often affect older adults, leading to joint pain as the cushioning tissue wears down. These conditions develop gradually, causing pain, stiffness, and swelling. Epsom salt, rich in magnesium sulfate, can ease pain and aid detoxification, promoting healing. Many elderly individuals suffer from knee pain, impacting their quality of life. Epsom salt is affordable, easy to find, and provides various health benefits. **Aim:** ***A comparison of the effectiveness of Epsom salt and plain hot water in relieving joint pain among geriatric patients at a selected hospital, Coimbatore.*** **Methodology:** ***The purpose of the study was to compare between Epsom salts and plain application of the impact of hot water on the reduction of joint pain in geriatric patients of a selected hospital in Coimbatore. The conceptual framework employed in the research was Widenbach's Helping Art Clinical Nursing Theory, Modified (1964). Sixty respondents were chosen by means of simple random sampling. Demographic and clinical information was collected on the first day by interview, and the baseline level of joint pain had been determined using the Numerical Rating Pain Scale in both groups.The application of Epsom salt was administered to the first experimental group, twice daily, and 10 minutes per day during the 5 days, whereas the second experimental group was treated with plain application of hot water. On the 5th day, the same the Numerical Rating Pain Scale was also used to re-assess both groups pain levels as compared to the pain occurring at the joints.*** **Result:** ***The standard deviation and the mean of the pain scores were 1.9 +0.8 in the experimental group 1 and 5 +0.9 in the experimental group 2 in the post-test. An independent t-test value was 14.36 ($p < 0.001$), That cannot be regarded statistically significant difference at a p of $p = 0.005$ level.*** **Conclusion:** ***Joint pain influences the quality of life and functioning to a great extent, and it is most appropriate to discuss the strategies of pain management and enhanced mobility. The results of this research show that the application of Epsom salt proved to be an effective pain reliever of the joints among geriatric patients. This study has underscored the possibility of using Epsom salt which is a non-pharmacological intervention implies that nurses and community health workers can employ this therapy to aid in reducing joint pain.***

Keywords: Degenerative, Osteoarthritis, Detoxification, Epsom salt.

1.Introduction
Aging is a natural process that everyone experiences at their own unique time and pace. It encompasses all the changes that occur throughout life. Aging induces physiological alterations in every organ system. After the age of forty, there is typically a steady decline in bone mass, leading to osteoporosis. Many joints undergo degenerative changes, and when combined with muscle loss, it becomes challenging for elderly individuals to move around.(Health Desk News, 2023).

The process of aging is very complex as it entails physical, psychological and social changes. Although growth and physical maturation persists in the entire life, this period is characterized by radical biological changes such as the aspect of eyesight and hearing, loss of hair or greying, occurrence of wrinkles, and other biological changes(1). It is at this stage that when most people become more aware of the facts of growing old. Human aging is linked to a number of physiological changes that not only increase the chances of death but also impair proper functioning thus leaving people more vulnerable to several diseases (Theodore Ihenetu, 2022).

The World Health Organization states that ageing is a biological process that begins at conception and concludes with death, governed by dynamics far beyond human control. In many developed countries, age sixty is commonly

considered the onset of old age and the equivalent of retirement age. Ageing often brings changes in posture and gait (walking pattern) (WHO, 2020).

2. Need for the Study

- The World Health Organization estimates that the number of people who are 60 years and above of age will increase to 2 billion by 2050, as compared to 900 million in 2015. Most of the population will live past the age of 60 years. The population of people aged 80 years and above will grow by 125 million in China in the year 2050 compared to the current number of 434 million people worldwide. Within the next 2050, the majority of the aging population of 80 will live in low and middle income countries (WHO, 2022).
- By the year 2030, one out of every six individuals around the globe will be 60 years and above. By 2050, the world will have 2.1 billion people of 60 and above years old as compared to 1 billion people in present times. Moreover, the population that is 80 and above is expected to triple and hit 426 million in 2050 (WHO, 2022)(2).
- As of 2022, it was projected that the number of individuals aged 60 and above constitute 1.1 billion (13.9% of the global population of 7.9 billion). This number will increase to 2.1 billion by the year 2050. The percentage of the older population is estimated to go up by 34 of the population by 2050 as compared to 26 in 2022 in developed nations. Conversely, the population of the elderly in developing countries will increase more than twice, expanding between 772 million in 2022 and 1.7 billion in 2050 (India Ageing Report, 2023).
- The worldwide population is getting older and experiencing longer lifespans. One of the most significant socioeconomic concerns of the twenty-first century is this demographic transition. India has both the largest youth population and the fastest ageing rate. By 2050, the number of older individuals (those 60 and over) in India will increase from the current 153 million to 347 million. This change in demographics indicates a significant societal change with far-reaching consequences **(India's ageing population, 2023).**

3.Problem Statement

A comparative research to determine the effectiveness of Epsom salt use versus the use of plain hot water use in alleviating joint pain among geriatric patients in a chosen hospital in Coimbatore.

Objectives

- To compare the pre-experimental levels of joint pain in geriatric patients in both experimental group 1 and group experimental 2.
- To determine the effect of the Implementation of Epsom salt on the intensity of joint pain among the geriatric patients in experimental group 1.
- To determine the impact of the plain hot water on the intensity of the joint pain in elderly people in the second group experimental(3).
- To ascertain the relative efficacy of applying Epsom salts versus just hot water in lowering the degree of joint pain in elderly patients in experimental groups 1 and 2.
- To examine the relationship between the selected clinical and demographic characteristics and the degree of joint pain in elderly patients in experimental groups 1 and 2.

Hypotheses

- **H1:** There is a strong difference in the impact of Epsol salt application versus hot water application to the pain of the joints in geriatric patients.
- **H2:** Geriatric patients show a strong difference in the effectiveness of Epsom salt application and plain hot water application in respect to the joint pain.
- **H 3:** No significant relationship exists between using Epsol salt and plain hot water over the joint pain in geriatric patients in the light of their chosen demographic and clinical characteristics.

4.Conceptual Structure

A conceptual framework is a systematic interpretation of the phenomenon being studied and is an expression of the assumptions made and philosophical views behind the study. It is constructed on the basis of major concepts and their correlations. This study is grounded in the conceptual framework of the General System Theory (GST), developed by biologist Ludwig von Bertalanffy in 1967. Bertalanffy described a system as a collection of interconnected components.

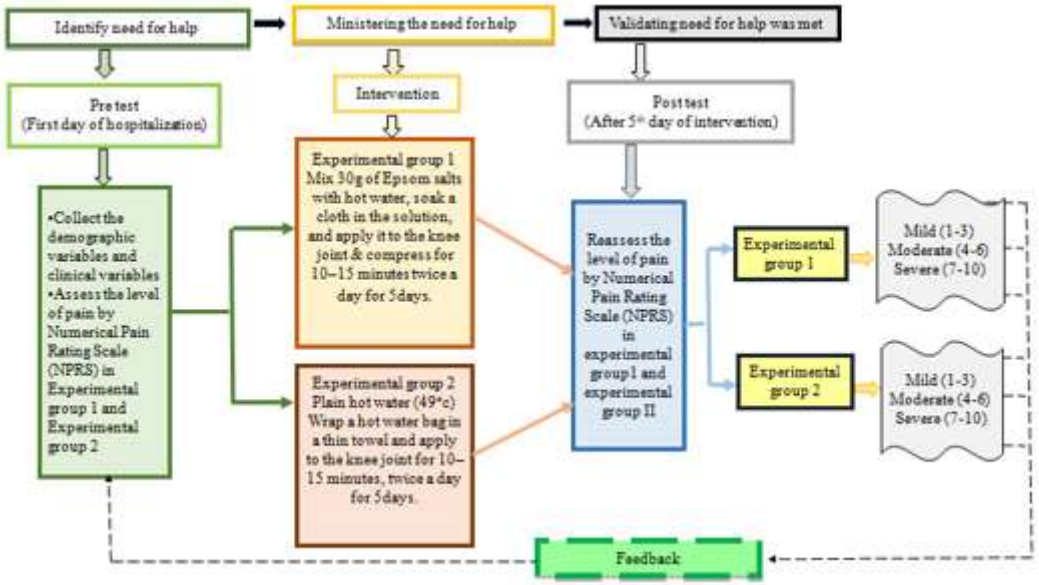

FIGURE 1 Conceptional frame work on Wiedenbach's Clinical Nursing Helping Art

5.Methodology

Research Approach : Quantitative research approach.
Research Design : Two-group pre-test and post-test research design.
Setting : Ashwin Hospital, Coimbatore, General ward.
Population : The population of the target group in this study was geriatric patients who had a minimum of 60 years of age and experienced joint pain
Sample : Male and female patients who fit the sampling criteria in the adult group.
Sample Size :60 respondents (30 in Experimental Group 1 and 30 in Experimental Group 2)
Sampling Technique : The formula sampling technique by Mahajan.

5.1 Data collection tools and instruments

Section A:

Demographic factors such as age, sex, religion, matrimonial status, education level, occupation, monthly earnings, type of family, nutrition and habits.

Section B:

Clinical variables that include height, weight, BMI, co-morbidities, time of joint pain and prior hospitalization.

Section C:

Numerical Pain Rating Scale (NPRS) is used on a scale of 0 -10, with 0 meaning no pain and 10 its maximum value. The participants were requested to choose a number ranging between 0-10 to represent the level of pain(4).

Validity

The subject matter experts such as nursing professors and medical guides validated the tool. These professionals were consulted to go through the tool in terms of its relevance, appropriateness, accuracy, and overall suitability to the objectives of the study. It was also found to be highly content valid based on their feedback and recommendations which were built into the tool.

Reliability

Reliability is associated with the consistency and reliability of the data collection process as a steady hand that produces a similar result each time. Numerical Pain Rating Scale (NPRS) is a well known subjective measure of pain that has good test-retest reliability (r = 0.8). In research, it has been applied in determining pre and post treatment pain perception and examining the pressure applied according to a predefined pain level. The possibility of the tool to be reliable was found statistically significant.

Degree of discomfort	**Range of score**
Absence of pain	0
Mild discomfort	1 – 3
Pain that is moderate	4 – 6
Extreme discomfort	7 – 10

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Ethical Considerations

The institutional ethics committee was satisfied with the study. The informed consent of all the participants was obtained by way of writing, and the study was conducted after the participants were fully informed of the purpose of the study. All the responses were kept confidential during the research.

5.2 Techniques of Data Analysis & Interpretation

- The distribution of clinical and demographic data was assessed using descriptive statistics (mean, standard deviation, frequency, and percentage).
- Inferential statistics were employed, including the chi-square test, paired t-test, and unpaired t-test. The effectiveness of applying Epsom salts and hot water naked in experimental groups 1 and 2 was examined using the paired t-test.
- The efficacy of Epsom salts and plain hot water applications on experimental groups 1 and 2 was compared using the unpaired t-test.

5.3 Data Analysis & Interpretation

The data acquired concerning the levels of joint pain among geriatric patients was arranged, analyzed and represented in the following sections:

Section I: Frequency and percent distribution of demographics and clinical variables of experimental group 1 and 2 respectively(6).

Section II: Frequency and percentage distribution of pre- and post-test pain levels in experimental groups 1 and 2.

Section III: Comparison of the elderly patients in experimental groups 1 and 2's joint pain levels before and after the test**.**

Section IV: Relationship between a few clinical and demographic factors in experimental groups 1 and 2 and the pre-test level of joint discomfort**.**

TABLE 1 Comparison of senior patients' joint pain levels before and after tests in experimental groups 1 and 2.

S. No	Group	Pre test		Posttest		Mean difference	df	p-value *
		Mean	SD	Mean	SD			
1	Experimental Group 1 (n=30)	5.5	0.9	1.9	0.8	3.6	29	<0.001 **(S)**
2	Experimental Group 2 (n=30)	5.4	0.8	5	0.9	0.47	29	0.004 (NS)

Table 1 Explains how the joint pain levels of elderly patients in experimental groups 1 and 2 were analyzed before and after the tests.

The experimental group 1 had an average and the standard deviation of pain levels in both the pre-test and post-test of 5.5 + 0.9, and 1.9 + 0.8 respectively. Paired t-value was 27.23 ($p < 0.001$), which showed the notable distinction between the pain level in the experimental groups 1 before and after the test. Conversely, the average and the standard deviation of the experimental group 2 during pre-test and post-test were 5.4 0.8 and 5 0.9 respectively(7). The t-value of the paired samples was 3.12 ($p = 0.004$) which did not demonstrate any significant difference between the pre-test and the post test pain scores in experimental group 2. The outcome shows that there was a high decrease in pain in the experimental group 1, and no significant difference was recorded in the experimental group 2.

TABLE 2 Post-test joint pain scores of elderly patients in experimental groups 1 and 2 are compared.

n=60

S. No	Assessment	Experimental Group 1		Experimental Group 2		Mean difference	Df	p-value*
		Post-test		Post-test				
		Mean	SD	Mean	SD			
1	Level of Jointpain	1.9	0.8	5	0.9	3.07	58	<0.001 **(S)**

***pvalue:<0.001 Significant

Table 2 Presents a comparison of the post-test joint pain levels in geriatric patients between experimental group 1 and experimental group 2.

In the post-test, the average and the standard deviation of the experimental group 1's level of pain score were 1.9+0.8, while experimental group 2's score was 5 +0.9. At the $p<0.005$ level, the independent t value of 14.36 ($p<0.001$) was significant.

TABLE 3 TABLE 3 shows the relationship between the selected clinical factors of experimental group 1 and the baseline degree of joint pain.

n=60

S.No	Clinical Variables	ExperimentalGroup1(n =30)				p-value*
		Moderate pain(n=27)		Severe pain(n=3)		
		F	%	f	%	
1	Weight					
	40to50kg	2	7.4	0	0	

	51to60kg	8	29.6	1	33.3	0.449 (NS)
	61to70kg	12	44.4	1	33.3	
	71to80kg	4	14.8	0	0	
	81to90kg	1	3.7	1	33.3	
2	Height					
	140to150cm	5	18.5	1	33.3	0.891 (NS)
	151to160cm	6	22.2	1	33.3	
	161to170cm	7	25.9	0	0	
	171to180cm	8	29.6	1	33.3	
	181cmand above	1	3.7	0	0	
3	BMI					
	18.5to24.9 mÂ²	19	70.4	1	33.3	0.251 (NS)
	25to29.9mÂ²	8	29.6	2	66.7	
Co morbid condition						
	Yes	15	55.6	3	100	0.255 (NS)
	No	12	44.4	0	0	
	HTN					
	Yes	16	59.3	2	66.7	1 (NS)
	No	11	40.7	1	33.3	
	Arthritis					
	Yes	6	22.2	0	0	1

S.No	**ClinicalVariables**	**ExperimentalGroup1(n =30)**				**p-value***
		Moderate pain(n=27)		**Severe pain(n=3)**		
		f	**%**	**f**	**%**	
	CAD					
	Yes	2	7.4	0	0	
	No	25	92.6	3	100	1 (NS)
	Hypothyroidism					
	Yes	1	3.7	0	0	1

	No	26	96.3	3	100	(NS)
5	Jointpain					
	Yes	0	0	1	33.3	0.1 (NS)
	No	27	100	2	66.7	
6	Durationofjointpain					
	Lessthan1year	6	22.2	1	33.3	0.819 (NS)
	1 to3years	14	51.9	1	33.3	
	4 to5years	4	14.8	1	33.3	
	Morethan5years	3	11.1	0	0	
7	Previous hospitalization					
	Yes	12	44.4	1	33.3	1 (NS)
	No	15	55.6	2	66.7	

***p<0.05,**p<0.01Significant,NS:Non significant**

Table 3 Demonstrates the correlation between the initial pre-test state level of joint pain, and the chosen clinical factors in experimental group 1.

The chi-square and Fisher exact tests were used to analyze the association between pre-test pain levels and such clinical variables as height, weight, BMI, co-morbidities, and past history of hospitalization. These findings revealed that no significant variation existed between the pre-test pain level and clinical variables, such as, hypertension, arthritis, coronary artery disease (CAD), hypothyroidism, duration of joint pain, and previous history of hospitalization(8). There was also no other significant association with height, weight, BMI, co-morbidities, marital status and monthly income.

TABLE 4 Correlation between the pretest score of the joint pain and the chosen clinical variables in the experimental group 2

n=60

S. No.	**Clinical Variables**	**ExperimentalGroup2 (n =30)**				**p-value***
		Moderate pain(n=27)		**Severe pain(n=3)**		
		f	**%**	**f**	**%**	
1	Weight					
	40to50kg	1	3.7	0	0	0.461 (NS)
	51to60kg	8	29.6	0	0	
	61to70kg	12	44.4	3	100	
	71to80kg	6	22.2	0	0	
2	Height					
	140to150cm	3	11.1	1	33.3	
	151to160cm	6	22.2	1	33.3	0.421 (NS)
	161to170cm	8	29.6	1	33.3	
	171to180cm	10	37	0	0	
3	BMI					
	18.5to24.9 m^2	21	77.8	0	0	

	25to29.9m²	5	18.5	3	100	0.021 (S)
	30m²and above	1	3.7	0	0	
Comorbid condition						
4	DM					
	Yes	21	77.8	3	100	1 (NS)
	No	6	22.2	0	0	
	HTN					
	Yes	22	81.5	1	33.3	0.128 (NS)
	No	5	18.5	2	66.7	
	Arthritis					
	Yes	2	7.4	0	0	1 (NS)
	No	25	92.6	3	100	
	CAD					
	Yes	5	18.5	1	33.3	0.501 (NS)
	No	22	81.5	2	66.7	
	Hypothyroidism					
	Yes	2	7.4	0	0	1 (NS)
	No	25	92.6	3	100	
	Jointpain					
	Yes	3	11.1	1	33.3	0.36 (NS)
	No	24	88.9	2	66.7	

S. No.	**ClinicalVariables**	**ExperimentalGroup2 (n =30)**				**p-value***
		Moderate pain(n=27)		**Severe pain(n=3)**		
		f	**%**	**f**	**%**	
5	Durationofjointpain					
	Lessthan1year	3	11.1	1	33.3	0.39 (NS)
	1 to3years	9	33.3	0	0	
	4 to5years	9	33.3	2	66.7	
	Morethan5years	6	22.2	0	0	
6	Previoushospitalization					
	Yes	16	59.3	2	66.7	1 (NS)
	No	11	40.7	1	33.3	

***p<0.05,**p<0.01Significant,NS:Non significant**

Table 4 Demonstrates the relationship between the selected clinical factors in experimental group 2 and the baseline level of joint pain. The chi-square and Fisher exact tests were used to analyze the relationship between the pre-test pain levels and clinical variables like the height, weight, BMI, co-morbidities, and past history of hospitalization. The findings showed that there was no any significant correlation between the pre-test pain level and such clinical variables as hypertension, arthritis, coronary artery disease (CAD), hypothyroidism, duration of joint pain, previous history of hospitalization, height, weight, BMI, co-morbidities, marital status or monthly income

6. Findings related to pre and post-test levels of joint pain among geriatric patients

The average and standard deviation of the pain rating in the post test were 1.9 = -0.8 5 = -0.9 in experiment group 2 and in experimental group 1. The value of the t 14.36 was significant at the p 0.05 level (p 0.001).

During the pre-test, most of the participants (66.66%) stated they had severe pain, whereas 33.33% stated extreme pain. Following the intervention, the level of the pain among the older adults was lower with 47 participants (78.33) reporting mild and 13 participants (21.66) reporting moderate pain.

The results align with those of a quasi-experimental study that employed a two-group pre-test-post-test non-randomized control design. The 60 old people used in different old age homes in Dehradun were selected using a purposive sampling method, to gather the required data about 60 aged people. The researchers have discovered a t-value of 30.077 indicates a highly significant difference in pain intensity after using Epsom salt and hot water at p = 0.001. The mean - SD in the experimental group was 6.23 -1.135, and the level of significant value was at the p = 0.05 level(9).

The comparison between experimental and control group was conducted through an independent t -test in the post-test where the experimental group had a high mean score (3.40 ± 1.44). The t-value obtained was 2.346 significant at p = 0.022, which means that the experimental group had a higher level of improvement. The researchers came to the conclusion that the Epsom salt and hot water therapy can be used successfully in the treatment of knee joint pain (Ram Kumar Sharma, 2023).

H1- which states that there is a substantial difference between the effect of the use of Epsom salt and the use of hot water on the joint pain among geriatric patients, was accepted.

Summary

This research was aimed at comparing this is the efficacy of Epsom salt in comparison to simple hot water use in relieving joint pain in geriatric patients of a chosen hospital in Coimbatore. The study and design adopted in this research It was a true experimental study using a two-group pre-test post-test design.

Using the basic random sample technique, sixty participants were chosen. On the first day, the researcher conducted interviews to collect demographic and clinical data, and both experimental groups 1 and 2 had their pre-test levels of joint pain assessed using the Numerical Rating Pain Scale.

After the pre-test, experimental group 1 was subjected to the application of Epsom salt of 10 minutes twice a day over a period of 5 days whereas experimental group 2 was subjected to plain application of hot water during the same time. On the fifth day, the same Numerical Rating Pain Scale was used in the post-test measure of the level of joint pain of the two groups.

Recommendation for Further the Study

- A similar study can be conducted using a true experimental design.
- The study can be replicated using qualitative research methods.
- A larger sample size could be used in a similar study to enhance the ability to generalize the findings.
- A comparable study could examine elderly individuals living in urban versus rural areas who suffer from knee joint pain.
- A similar study could be carried out specifically for arthritis patients.
- Similar research could be carried out in various healthcare settings.

7.Conclusion

The study's findings showed that the experimental groups 1 and 2 of geriatric patients experienced significantly different levels of pain. On the first day of the trial, the researcher interviewed each participant to gather clinical and demographic information. The pre-test degree of joint pain in both groups was then assessed using the Numerical Rating Pain Scale.

After the pre-test tests, the groups were given different interventions. The experimental group 1 was subjected to the application of an Epsom salt to their joints in 10 minutes twice a day over 5 days and experimental group 2 was exposed to plain hot water application on their joints during the same time period. On the fifth day, the researcher re-measured both the groups in terms of the joint pain by the same Numerical Rating Pain Scale that was used in the pre-test.

Comparison of the pre-test and post-test outcomes showed that there was a major decrease in joint pains, which shows that these interventions were effective. In particular, geriatric patients who were exposed to the application

of the Epsom salt in the experimental group 1 > and had the joint pain reduced comparatively more than patients in experimental group 2 who had the treatment of plain hot water. The study design was able to compare two pain relief techniques controlled, which implied that Epsom salt application may be better to decrease the pain at the joints of geriatric patients than plain hot water application.

Acknowledgement: Nil

Conflicts of interest

The authors have no conflicts of interest to declare

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