

The effect of aquatherapy on pain intensity and performance in patients with osteoarthritis

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ABSTRACT

Introduction and Aim: Osteoarthritis (OA) is a noninflammatory joint disease. If OA of the knee causes pain, decreased muscle strength and joint stiffness, exercise therapy is one of the most effective treatments for the disease. The aim of the present study was to evaluate the effect of aquatherapy on pain intensity and performance in women with OA with the assumption that it causes weightlessness. **Methods:** This is a quasiexperimental study. The sample size included 60 people who were randomly divided into experimental and control groups. The visual analogue scale was used to assess pain and timed up and go test (TUG), 30 Second Sit to Stand Test (30-S-CS), and 40-meter fast-paced walk test (40 MW) were used to assess performance. Data analysis was carried out using SPSS ver. 22. **Results:** The results of the present study showed a decrease in pain intensity from moderate to mild intensity. Also, physical performance dimensions in patients with OA were improved, so that the average TUG increased from 14.06 to 8.8 s. The average S-CS frequency increased from 4.86 to 8.4 s and 90 MW decreased from the average 93.43 to 72.66 s. **Discussion and Conclusion:** Lower limb muscle strength, and physical performance can be improved and pain intensity can be reduced in patients with OA by performing aquatherapy three times a week for 8 weeks.

Keywords: Aquatherapy, osteoarthritis, pain, physical performance

Introduction and Aim

Osteoarthritis (OA) is a noninflammatory joint disease that occurs in mobile joints due to the destruction of articular cartilage along with new ossification at the surface and periphery of the affected joints and is a cause of disability in a large population of adults.^[1] The knee is a common site of OA, and the clinical symptoms of knee OA include decreased balance, decreased performance, pain, muscle weakness, decreased range of motion, and joint instability.^[2] OA occurs at different severity and weakness rates in various people. It develops earlier or more severely in some people, and others experience it less frequently.

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Factors such as being overweight and certain physical activities can accelerate this process.^[3]

This musculoskeletal disorder often affects the elderly and is the main cause of pain and disability, impaired mobility, performance, and balance.^[4] The disease process not only affects the articular cartilage but also affects the joint shape, including the subchondral bone, joint capsule, synovial membrane, and muscles around the joint. Thinning of articular cartilage may cause changes in the subchondral bone, including the formation, cyst, and bony bump.^[5] OA risk factors are numerous, including dysplasia, blackening of the femoral head (necrosis), improper healing of bone fractures, injuries caused by articular cartilage trauma, excessive obesity, mechanical risk factors for the calcium deposition-related disease, and joint infection.^[6] If knee OA causes pain, and decreased muscle strength, and joint stiffness, these symptoms will lead to limited motor activity and reduced quality of life.^[7] There is currently no definitive cure for OA,

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and therapists are working to slow the disease progression and help patients reach their full potential in life. If the disease complications and the subsequent functional limitations and disability are reduced, they can have a dynamic life and stop being a burden on their relatives. Also, the disease control strategies are currently used pharmacologically, nonpharmacologically and surgically, each of which has its own effects and side effects.^[8] Exercise therapy is one of the most effective methods in the treatment of OA disease and studies have shown that nonaquatherapy due to imposing weight, pressure, and pain on the affected joints reduce motivation among patients to accomplish it.^[9] The aim of the present study was to evaluate the effect of aquatherapy on pain intensity and performance in women with OA with the assumption that it causes weightlessness.

Methods

This is a quasiexperimental study. The research environment was one of the equipped pools in Kermanshah province and the research population included all OA women who referred to this pool. The sample size was 60 women who were randomly selected using a simple number table and were randomly divided into experimental and control groups. Inclusion criteria included age over 18 years, confirmed OA, ability to perform water exercises, having pain, and decreased clinical performance. Exclusion criteria also included knee joint surgery, having other physical diseases, and failure to attend training sessions. After participant grouping, a briefing session was held for the participants of the experimental group to explain to them the study's aim and the procedure, and obtain their informed consent. To assess pain intensity, the visual analogue scale was used. This instrument is graded from 0 to 10 (0 = no pain, 1–3 = mild pain, 4–6 = moderate pain, 7–9 = severe pain, and 10 = very severe pain). To evaluate the performance, 30 Second Sit to Stand Test (30-S-CS), and 40-meter fast-paced walk test (40 MW) were used.

TUG (timed up and go test) test requires the participant sits on a chair and walks up to 3 m away from the chair and then returns. This test is evaluated based on the time of performing the task (30,31, Etesami).

30-S-CS requires the participant to sit on a chair for 30 s and stand up. The number of sits and stands during 30 s is considered as points (30, 31).

According to the opinion of the coach, water sports were also performed for the participants [Table 1].

40 MW: A person travels 10 m four times and obtains a score based on the duration of completion of this exercise. The tests are approved by Osteoarthritis Research Society International (30). These exercises lasted for two months and three sessions every week. Data analysis was carried out using descriptive statistics in SPSS ver. 22. Approval from the ethic committee: IR.KUMS.REC.1398.774. Date of the approval: 5-11-2019.

Results

The results of the present study showed that the mean age of both experimental and control groups was 54 years. Body mass index (BMI) of both groups was in the 30–34 kg/m² range in most cases [Table 2].

Results of TUG showed that the performance status of the experimental group was 14.06 ± 1.31 s before the intervention and decreased to 8.8 ± 0.805 after the intervention, but no significant change was observed in the control group [Table 3].

Results of 30-S-CS showed a significant difference between the experimental and control groups ($P = 0.0001$), and 40 MW also revealed a significant difference between the experimental and control groups ($P = 0.0001$) [Table 3].

Regarding pain intensity, the mean \pm SD of pain in the experimental group was 7.56 ± 1.19 and decreased to 3.4 ± 1.03 after the intervention, but there was no significant difference in the pain intensity before and after the intervention in the control group [Table 3].

Discussion

The results of the present study showed that aquatherapy has a significant effect on the performance of OA patients. Results showed that the average TUG decreased from 14.06 to 8.8 s after two months of aquatherapy. The average S-CS frequency increased from 4.86 to 8.4 s and average 90 MW decreased from 93.43 to 72.66 s. Lau *et al.* (2014)^[10] concluded that aquatherapy improves the physical performance and range of motion of OA patients. Yáziđi *et al.* (2013)^[11] also concluded that TUG and 30-S-CS improved in OA patients during a one-month aquatherapy period.^[11] Etesami *et al.* (2022) also concluded that eight-week aquatherapy was able to improve TUG, 40 MW, and 30-S-CS in elderly OA women. The present study also showed a reduction in pain intensity in the experimental group. The knee pain intensity in the experimental group was between 7.56 ± 1.19 before the intervention, which indicates severe pain, and this pain decreased to 3.4 ± 1.3 after aquatherapy, but no change was observed in the control group.

One of the characteristics and benefits of the aquatic environment is its buoyancy. Archimedes' principle, a body at rest in a fluid is acted upon by a force pushing upward called the buoyant force, which is equal to the weight of the fluid that the body displaces. Water support allows for easy movements and can reduce pressure on the joints. The aquatic environment can also allow exercises to be performed in situations that are not possible on land due to lack of adequate support and pain intensity.^[12] Water provides a unique environment for great physical activities. The water buoyancy helps support weak or damaged muscles. Water removes pressure (load) from the joints and can actually reduce the pain that is exerted against gravity. The heat from the jacuzzi and pool water potentially increases blood circulation to the affected

Table 1: Hydrotherapy exercises in the experimental group

Exercises	Levels
Initial Start (1–3 Sets)	Walk Forward
	Walking Backwards
	Walking Sideways
	March In Place
	Took A Step
Length Increase 1–3	Hamstring
	Twins And Horseshoes
Activation 1–4 Sets	Thigh Adaptation And Abduction
	Thigh Flexion And Extension
	Rhythmic Hamstring
	Rhythmic Crown Step
	Rhythmic Side Centre
Cohesion Is 1–3	Scott
	Scott Single Foot With Wall
	Launch Forward
	Launch Side

Table 2: Average weight and absolute frequency and relative body mass index

Variables	Test	Control
Age (M±SD)	54.3 6.79	54.83 6.93
BMI n (%)		
<25	3 (10)	2 (6.7)
25–30	6 (20)	7 (23.3)
30–34	15 (50)	14 (46.7)
>34	6 (20)	7 (23.3)

Table 3: Mean and standard deviation of pain and physical performance

Variables	Test		Control		P
	Before	After	Before	After	
TUG	1.31±0.805	8.8±0.805	14.05±1.43	14.43±0.97	0.0001
		<i>P</i> =0.0001		<i>P</i> =0.0001	
30–S–CS	4.86±0.93	8.4±1.13	4.7±1.14	4.6±0.89	0.0001
		<i>P</i> =0.0001		<i>P</i> =0.0001	
40 MW	93.43±4.08	72.66±2.32	93.83±4.78	94.41±4.1	0.0001
		<i>P</i> =0.0001		<i>P</i> =0.0001	
PAIN	7.56±1.19	3.4±1.03	7.33±1.49	7.39±1.16	0.0001
		<i>P</i> =0.0001		<i>P</i> =0.0001	

joints, relaxes the muscles, and temporarily reduces pain.^[13] Besides, water activity, in addition to facilitating blood flow and muscle relaxation, increases muscle and bone flexibility and, thus, reduces musculoskeletal spasms.^[14] Buoyancy-related hydrostatic pressure also helps produce circulatory physiological responses. The resulting hydrostatic pressure pushes blood from the lower limbs to the abdomen and trunk, and as a result, it increases the stroke volume and the rate of cardiac output and blood supply to the limbs by increasing the venous return.^[15] These exercises can also improve the quality of life considering the fact that the quality of life and physical, psychological, mental, and social factors are interdependent^[6], and the improvement in each of

these factors can affect the quality of life and sports activity (in any environment) affects any of the physical, psychological, and social factors. These exercises improve the quality of life through some psychological mechanisms that include increasing self-efficacy, self-confidence and improving distress, and physiological mechanisms that include increasing norepinephrine, and changes in the serotonin and endorphin synthesis and metabolism.^[17]

Aquatherapy also improves mental health and quality of life by increasing comfort and vitality^[18] and promoting life expectancy.^[19] Factors such as retirement, loneliness, feelings of futility, and inability to fill leisure time lead to depression and anxiety. Part of the older adults' leisure time can be filled by holding physical activity sessions, and as a result, reduce their loneliness, which in turn leads to a change in the elderly attitude toward life, a better sense of cooperation, a good feeling, and increased self-confidence. Therefore, they will experience lower depression and anxiety levels.^[20] The aquatic environment itself induces a certain peace of mind considering its characteristics; aquatherapy can be very comfortable, enjoyable, and fun as it reduces the pressure on the joints and, thus, provides a good environment. Buoyancy can be effective on mental health problems by creating a kind of mental vacuum and reducing stress and to some extent reducing the epinephrine secretion. Since many studies have shown a positive relationship between physical activity and mental health, aquatherapy can be a step toward improving the quality of life of the elderly.^[21] Therefore, it can be stated that aquatherapy is a suitable and noninvasive method to reduce OA-related complications such as pain and decreased physical performance.

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Conflicts of interest

There are no conflicts of interest.

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