

## ROLE OF ULTRASOUND THERAPY IN OSTEOARTHRITIS KNEE

Syed Naveed Mumtaz, Syed Hussain Shah\*

Combined Military Hospital Lahore Pakistan, \*Combined Military Hospital Okara Pakistan

### ABSTRACT

**Objective:** To study the role of ultrasound therapy in osteoarthritis of knee joint.

**Study Design:** Descriptive cross-sectional study.

**Place and Duration of Study:** Combined Military Hospital, Okara for a period of 6 months, from Jul 2016 to Dec 2016.

**Material and Methods:** Sixty consecutive patients with symptomatic osteoarthritis of knee joint were included in the study.

**Results:** Out of 60 patients 34 (56.67%) patients were females while 26 (43.33%) were males. The mean age in both groups was 55 years and the age range was 42-72 years. There was significant improvement of pain from a mean Visual Analogue Score of 6 to 2 ( $p=0.001$ ). There was also improvement in stiffness and physical activity and very less analgesic requirement after ultrasound therapy of knee joint.

**Conclusion:** Ultrasound therapy of knee joint improves pain, stiffness and physical activity in patients with osteoarthritis of knee joint.

**Keywords:** Osteoarthritis, Visual analog scale (VAS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC).

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### INTRODUCTION

Osteoarthritis is a common cause of knee pain in patients older than 50 years of age. Osteoarthritis is a debilitating condition of joints and in USA only more than 27 million people have osteoarthritis<sup>1</sup>. It affects multiple joints but knee is the most commonly affected joint. The effects on knee are described in stages from stage 0 being normal to stage 4 being severe disease or simply classified mild, moderate or severe osteoarthritis<sup>2</sup>.

The most common cause of osteoarthritis is age, other risk factors include increased weight, hereditary, female gender, repetitive stress injuries, athletics, and other illnesses such as rheumatoid arthritis<sup>3</sup>. The main concern in the osteoarthritis patients is pain especially on weight bearing and limitation of the range of knee movement. As a result patients' daily activities are hampered. With increasing severity

there is stiffness of the joint, swelling around joint, abnormality of the bony contours of the joint and persistent pain.

The treatment of osteoarthritis varies and consists of simple home remedies, weight loss, application of local heat and cold packs, pharmacological therapies, physiotherapies, steroids injections in the joint, braces to reduce weight on joint, arthroscopies, osteotomies to total knee replacements<sup>4</sup>.

Ultrasound can be used a good pain relieving tool in such patients. It is non-invasive, can be repeated easily and has no side effects. The mechanism of ultrasound therapy of knee joint is described as application of high frequency sound waves cause mechanical and thermal effects which in turn result in increase in blood flow and metabolic activity, decreased inflammatory response and decreased pain<sup>5</sup>. Ultrasound therapy is proven to improve the hyaline cartilage repair and it soften the dense fibrous tissue which results in pain free movement and improvement in osteoarthritis of knee<sup>6</sup>.

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**Correspondence:** Dr Syed Hussain Shah, Dept of Rehab Medicine, CMH Okara Pakistan (Email: [drsyedhussainshah@hotmail.com](mailto:drsyedhussainshah@hotmail.com))

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This study was conducted is to demonstrate the effects of ultrasound therapy in relieving pain and increasing the mobility of knee joint in osteoarthritis knee in our local set up so as to choose the best patient therapy for knee joint osteoarthritis.

### PATIENTS AND METHODS

This descriptive cross-sectional study was conducted at the department of Rehabilitation Medicine, Combined Military Hospital, Okara. We used WHO calculator for sample size, with a prevalence of 12-35% and a confidence interval of 95%, our study included 60 patients of knee pain due to osteoarthritis. We included all these patients by simple convenient sampling and 60 consecutive patients of knee pain due to osteoarthritis were included in the study. From Rehabilitation Medicine outdoor patient clinic for a period of 6 months form July 2016 to December 2016. Ethical approval was taken from hospital ethical committee before start of the study. All patients were informed about inclusion in the study and informed consent was obtained. Patients of both gender with osteoarthritis of knee joint either unilateral or bilateral were included in the study, patients who had any kind of intervention such steroid injection or arthroscopy were also included in the study. Patients with rheumatoid arthritis, septic arthritis, cellulitis of lower limb, arterial or venous problems and patients with stroke were excluded from the study. Detailed history and examination were performed and recorded. Patients were scheduled for a period of 6 weeks ultrasound therapy with three ultrasound therapy sessions in a week. All patients were advised to discontinue any medicine they were taking for knee pain one week prior to ultrasound therapy. Ultrasound therapy was given using Multi-frequency US-750 machine using ultrasound frequency of 1-3 MHZ. All patients were given a treatment session of ten minutes with pulsed mode of ultrasound therapy. Ultrasound was applied on medial and lateral side of the knee joint. Pain was assessed by using visual analog scale (VAS) one week

postultrasound therapy<sup>7</sup>. Improvement in pain was also compared on VAS and WOMAC index score<sup>8</sup>. Patients physical activity and rigidity was assessed by WOMAC index scoring<sup>9</sup>. Number of patients' needing analgesia was recorded although patients were taught to take analgesia only if pain was unbearable. Improvement in knee joint pain after completing the therapy was compared. All data was recorded on a proforma. Data was analyzed using SPSS version 17. Data were represented as mean and  $\pm$  SD. Paired t-tests was used to compare pre- and post-treatment changes in each group. The results were considered to be statistically significant at  $p < 0.05$ .

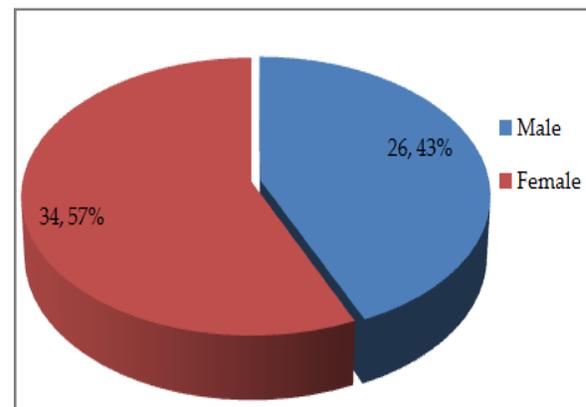


Figure-1: Gender distribution (n=60).

### RESULTS

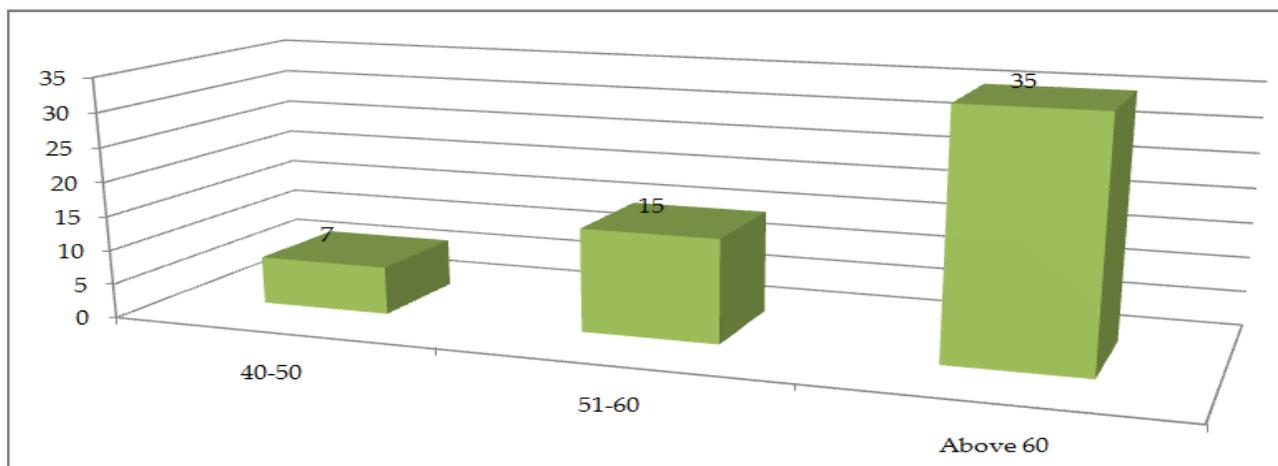
Out of 60 patients, 34 (56.67%) were females while 26 (43.33%) were males (fig-1). The female to male ratio was 1.3:1. The mean age in both groups was 55 years and the age range was 42-72 years (SD =  $5.2 \pm 2$ ) (fig-2). Family history was positive in 40 (66.67%) patients. Bilateral knee was involved in 27 (45%) patients, right knee was involved in 15 (25%) patients and left knee was involved in 18 (30%) patients.

Visual analogue score was used to estimate the pain in patients. Mean pain before start of ultrasound therapy was 6 with a standard deviation of  $\pm 2$ . The lowest pain score was 3 and highest score was 8. Post therapy the mean pain score was 2 with a standard deviation of  $\pm 0.75$ . The highest score was 3.

Before commencing treatment all 60 (100%) patients were taking some form of analgesic. After completion of ultrasound therapy it was noted that only 9 (15%) of the patients were taking analgesia.

Pre ultrasound therapy and post ultrasound

an incidence rates for knee osteoarthritis was 6.5 per 1000<sup>13</sup>. Multiple joint involvement is common in osteoarthritis particularly hip and foot involvement<sup>14</sup>. The factors responsible for osteoarthritis are categorized as person level and joint level. The risk factors at person level include age, sex, obesity, genetics, race and diet<sup>15</sup>.



**Figure-II: Age distribution (n=60).**

therapy comparison in terms of pain, rigidity, functional, and analgesia requirement is shown in table. There was no mortality in our study.

## DISCUSSION

Osteoarthritis is a disabling condition and a leading cause of pain in adults<sup>10</sup>. In a 2010 study of Global Burden of Diseases of 300 health conditions osteoarthritis was 11th highest

The risk factors at joint level include malalignment, disproportion in leg lengths and abnormal weight effect on joints<sup>16</sup>.

Any treatment of osteoarthritis is for relief of patients symptoms such as pain, stiffness, decrease in physical activity and swelling. The treatment modalities may be pharmacological and non pharmacological or combination of

**Table: Pre therapy and post therapy comparison (n=60).**

Variables	Before treatment	Standard Deviation	After Treatment	Standard Deviation	p-value
Pain (VAS) (Mean)	6	2	2	0.75	0.001
Pain (WOMAC)	65	1.75	10	0.25	0.0001
Stiffness (WOMAC)	55	2.1	15	1.2	0.0001
Physical activity (WOMAC)	60	3.5	20	1.5	0.0001
Analgesia requirement (percentage of patients)	100%	1.8	15%	0.2	0.002

contributor to disability<sup>11</sup>. The reported incidence of osteoarthritis is 12% to 35% in general population. Different countries reported different incidence of osteoarthritis. A Canadian study showed incidence rate of osteoarthritis of 14.6 per 1000 person-years<sup>12</sup>. A Spanish study showed

both<sup>17</sup>. Pharmacological options include using topical, oral or injectable analgesics, calcium or other bone supplements and intraarticular injections<sup>18</sup>. The non pharmacological treatment options for patients are home remedies, patient education, strengthening exercises, local appli-

cation of heat and cold, physiotherapy and surgery<sup>19</sup>.

Physiotherapy is one of the important non pharmacological treatment options in patients with osteoarthritis of knee<sup>20</sup>. Ultrasound is used commonly in physiotherapy practice for painful knee joints. In ultrasound therapy the application of high frequency sound waves are implied to intended area of body which results in mechanical or thermal effects<sup>21</sup>. These mechanical and thermal effects increase blood flow and metabolic activity which enhance soft tissue healing and decrease inflammatory response which reduces the pain<sup>22</sup>.

Studies have proven that ultrasound therapy for osteoarthritis of knee joint promotes repair of full-thickness articular cartilage defects, formation of hyaline cartilage and helps in repairing tissue at the sites of defects. Ultrasound waves also soften and dissipated condensed fibrous connective tissue and delay progression of early osteoarthritis of knee<sup>23,24</sup>.

In our study we applied ultrasound in pulsed manner because this mode is effective for both pain and for physical activity while continuous mode works for pain only because it provides local warming effects. Our study showed significant improvement in knee joint pain, rigidity and physical activity of the patients. This result is statistically significant. Such results are reported by Abdalbary who used the water mineral water instead of gel during ultrasound of knee<sup>25</sup>. Yang *et al* compared the ultrasound therapy of knee with placebo group and reported that ultrasound therapy not only improve the pain of the knee joint it also improved the swelling of joint and improve the physical activity of the patients<sup>26</sup>.

Our study also showed an overall improvement in knee joint and physical function and decrease in joint rigidity.

The limitation of our study was that it was conducted on small number of patients and we compared the pre ultrasound therapy pain, physical activity and rigidity with post ultra-

sound therapy and did not compare it with other treatment options. We intend to conduct a study on a larger sample and will compare it with other current treatment modalities.

## CONCLUSION

Ultrasound therapy of knee joint improves pain, stiffness and physical activity in patients with osteoarthritis of knee joint.

## CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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