

## Comparison between Uses of Therapeutic Exercise and Heat Application on Relieve Pain, Stiffness and Improvement of Physical Function for Patient with Knee Osteoarthritis

Wafaa I. Shereif and Amira A. Hassanin

Department of Adult Care Nursing, Faculty of Nursing, Mansoura University, Egypt.

**Abstract:** Osteoarthritis is a common chronic disease and a major worldwide problem for medical, psychosocial, and economic reasons. Osteoarthritis leads to considerable morbidity in terms of pain, functional disability, lowered quality of life, and psychological problems and affected people are mainly cared for in the community. The aim of this study was to compare between uses of therapeutic exercise and heat application on relieve pain, stiffness and improvement of physical function for patient with knee osteoarthritis. This quasi-experimental study was conducted in the out patient clinic of orthopedic at Mansoura University main hospital. The data were collected from a convenience sample of 90 osteoarthritis patients of both sex and equally divided into 3 groups (G1) received training to used heat application with pharmacological treatment to decrease symptoms of osteoarthritis, (G2) received training of physical exercise with pharmacological treatment to decrease symptoms of osteoarthritis, (G3) received a combination training from physical exercise and heat application with pharmacological treatment prescribed by physician. The main inclusion criteria was diagnosis osteoarthritis of the knee based on attendant to out patient clinic at least twice / week. Results: knee stiffness improves from {mean= (G1, G2 & G3) 9.17, 22.08 & 1.25 respectively to 66.25, 47.92 & 85 respectively} after implementing education intervention. There were statistical significant difference between the three groups of studied sample pre – post teaching phase regarding experiencing total knee stiffness score ( $P \leq 0,001$ ,  $0,001$  &  $0,001$  respectively). Conclusion: the use of a combination of therapeutic exercise and heat application together for relieving pain, stiffness and improving physical function for patient with osteoarthritis was successful

[Wafaa I. Shereif and Amira A. Hassanin, Comparison between Uses of Therapeutic Exercise and Heat Application on Relieve Pain, Stiffness and Improvement of Physical Function for Patient with Knee Osteoarthritis] Life Science Journal, 2011; 8(3): 388-396] (ISSN: 1097-8135). <http://www.lifesciencesite.com>.

**Keywords:** Knee osteoarthritis, Pain; Exercise; Heat application; Functional improvement.

### Introduction

Osteoarthritis (OA) is one of the most frequent causes of physical disability among adults. More than 27 million people in the United States have the disease. By 2030, 20 percent of Americans - about 70 million people - will have passed their 65th birthday and will be at risk for osteoarthritis. Some younger people get osteoarthritis from joint injuries, but osteoarthritis most often occurs in older people. Both men and women have the disease. Before age 45, more men than women have osteoarthritis, whereas after age 45, it is more common in women (2,3).

The knee is one of the most commonly affected joints. OA is usually a slowly progressive degenerative disease in which the joint cartilage gradually wears away. It most often affects middle-aged and older people over 50 years of age, in particular in women.(4)

It can affect either one (unilateral) or both (bilateral) sides of the knee joint however it occurs more commonly on the inner (medial) aspect of the knee.

The bones of the knees joint (the backside of the kneecap, bottom of thighbone, and top of shinbone) are coated with smooth articular cartilage. When knee osteoarthritis develops, the cartilage undergoes gradual changes - losing elasticity, hardening, and cracking, becoming more easily damaged and eroded by use or injury(5,3).

Symptoms of knee osteoarthritis are stiffness (especially morning knee stiffness), knee pain that is aggravated by going up or down stairs, limitation in range of motion, a crunching feeling in the knee, and weakness of knee. The knee may be swollen but not red and hot (2,4,6).

Osteoarthritis affects each person differently. In some people, it progresses quickly; in others, the symptoms are more serious. Scientists do not know yet what causes of the disease, but they suspect a combination of factors, including being overweight, the aging process, joint injury, and stresses on the joints from certain jobs, genetic susceptibility, lack of exercise / sedentary lifestyle, muscle Weakness - weak quadriceps (muscles of the thigh that attach to the knee), chronic overuse / overloading of knee joint (repetitive movements such as squatting/kneeling combined with heavy lifting or high impact activities such as running/jogging), skewed feet, and inappropriate footwear (high heels) (7,8). The exact causes of osteoarthritis are unknown however there are a number of factors that are commonly associated with the onset of the disease (8).

Osteoarthritis pain can be effectively managed so that it does not significantly disrupt normal daily activities. Non-pharmacological management, combining several therapies may be required to adequately manage the symptoms of knee osteoarthritis as exercise, medications, knee taping,

un-loader knee braces in some cases, heat and cold, topical creams, and complementary supplements (9,10).

Exercise adherence improves long-term patient outcome for patients with knee osteoarthritis, because it strengthens leg muscles, supports the knee and absorbs shock before it gets to the knee. Exercising the quad muscles increase circulation in the knee joint and has been shown to stimulate beneficial biochemical changes in the joint fluid of the knee, improving its lubricating properties (11, 13). Exercise also improves the range of motion of the knee. Exercise should be a core treatment for people with osteoarthritis, irrespective of age, co-morbidity, pain severity or disability. Exercise should include: Local muscle strengthening, and General aerobic fitness (12).

Also, heat application to the knee joint reduces stiffness and pain by increasing blood flow. The heat is also a comforting distraction from the knee pain. Do not apply heat to an inflamed joint. Usually, inflammation is not present in the early stages of knee osteoarthritis. Apply heat for 20 - 30 minutes at a time every day (13,15,31).

Nurses are responsible to empower the patient and family with teaching knowledge and skills necessary to reach optimal safe performance to manage pain and disability of osteoarthritis (14).

### **Aim of the study**

The aim of this study was to compare between uses of therapeutic exercise and heat application on relieve pain, stiffness and improvement of physical function for patient with knee osteoarthritis.

## **2. Material and Methods**

### **Research design:**

A quasi experimental design used in this study

### **Setting:**

This study conducted in the out patient clinic of Orthopedic and Rheumatology Clinic at El Mansoura University main hospital.

### **Subjects:**

A convenient sample of 90 osteoarthritis patients from both sex this number all available patients came to out patient during 6 months and divided into three equal groups, (G1) received training to used heat application with pharmacological treatment to decrease symptoms of osteoarthritis, (G2) received training of physical exercise with pharmacological treatment to decrease symptoms of osteoarthritis, (G3) received a combination of training from physical exercise and heat application with pharmacological treatment prescribed by physician. The main inclusion criteria was diagnosis osteoarthritis of the knee without deformities based on attendant to out patient clinic at least twice / week and accept to

participate in the study. Exclusion criteria: patients with chest pain, dyspnea, orthopnea, and sever inflammation in knee.

### **Tools:**

Two tools were used in this study for data collection.

I-Patient' assessment sheet include the following: Socio-demographic characteristics of patients such as sex, age, marital status, educational level, occupation, and part two included on medical profile such as, body weight, time of complain from osteoarthritis, which knee complain of osteoarthritis.

II- Knee injury and osteoarthritis outcome score (KOOS) this tool was developed by (31), The KOOS is a knee-specific instrument, developed to assess the patients' opinion about their knee and associated problems. The KOOS evaluates both short-term and long-term consequences of knee injury. It holds 42 items in 5 separately scored subscales; Pain, other Symptoms and stiffness, Function in daily living (ADL), Function in Sport and Recreation (Sport/Rec.), and knee-related Quality of Life (QOL). but the researchers of this study didn't used the final two items after carried out the pilot study on 10% of knee osteoarthritis patients before starting data collection and take the opinion of expert because this items away from the objective of this study.

Pain: It contains 9 items and used to assess amount of knee pain during the following activities (twisting/ pivoting on knee, straightening knee fully, bending knee fully, walking in flat surface, going up or down stairs, at night while in bed, sitting or lying and standing upright).

Symptoms it contains 7 items and used to assess amount of joint stiffness after first a wakening in the morning and after static poison and knee symptoms including ; grinding, hanging up, swelling, straightening, and bending knee fully.

Function, daily living: It contains 17 items and used to assess degree of difficulty during the following activities ( descending and ascending stairs, rising from sitting, standing, bending to floor/ pick up an object, walking on flat surface, getting in/ out of care, going shopping, putting on socks, rising from bed, taking off socks, lying in bed ( turning over, maintaining knee position) getting in / out of bath, sitting, getting on / off toilet, heavy domestic duties and light domestic duties.

Function, sports and recreational activities: It contains 5 items and used to assess degree of difficulty during the following activities (squatting, running, jumping, twisting, on the knee and kneeling).

Quality of life: It contains 4 items and used to assess knee related quality of life.

Standardized answer for knee injury and osteoarthritis outcome score (KOOS). Each question gets score from 0 to 4. A normalized score (100 indicated no symptoms and 0 indicated extreme symptoms) is calculated for each subscale. Traditionally in orthopedics, 100 indicates no problem and 0 indicates extreme problems. The normalized score is transformed to meet this standard by using formulas provided for each subscale:

$$1- \text{Pain } 100 - \frac{\text{total score (p1- P9)} \times 100}{100 - \text{-----}} = 36$$

$$2- \text{Symptoms and stiffness } 100 - \frac{\text{total score (S1-S7)} \times 100}{100 - \text{-----}} = 28$$

$$3- \text{Function, ADL } 100 - \frac{\text{total score (p1- P9)} \times 100}{100 - \text{-----}} = 68$$

Total score for each subscale will be categorized into  
 < 100 – 66 Mild  
 < 66- 33 Moderate  
 < 33- 0 Extreme

#### Methods:

An official letter was issued from the faculty of Nursing, Mansoura University to the Director of El-Mansoura University Hospital to obtain his approval in order to collect the necessary data from the out patient clinic of orthopedic and rheumatology clinic at El Mansoura university main hospital

Tools of data collection were designed by the researcher after reviewing the recent related literature.

The tools were tested for validity and reliability by five experts in the field of nursing staff.

A pilot study will be carried out on 10% of the subjects in order to assess the clarity, feasibility and applicability of the tool. Any necessary modifications will be done accordingly.

According to the schedule of work in the out patient clinic of orthopedic, two visits were done weekly on Sunday and Tuesday from 8AM to 2PM afternoon.

Each patient was interviewed individually in the out patient clinic of orthopedic and in the rheumatology clinic and obtained verbally consent to participate in the study.

Group 1 trained to compliance heat application on affected knee for 20-30 minutes at least from 2 to 3 times /day in the morning and before sleep along four weeks beside pharmacological treatment prescribed by physician. After that data were collected post educational intervention to know the level of complains of patient from pain and stiffness.

Group 2 trained to commit physical exercise activity especially the side of affected knee, the exercise made for five to ten minutes from 3 to 4 times /day along four weeks beside pharmacological treatment prescribed by physician. After that data were collected after educational intervention to measure the level of patient's complains from pain and stiffness and improvement of physical function occurred or not. The information and training for exercise contained stretching exercises such as (standing calf stretch, prone quadriceps stretch, and range of motion exercises) strengthening exercises such as (quadriceps strengthening exercise, and standing terminal knee extension).

Group 3 apply heat application and physical exercise activity together beside pharmacological treatment prescribed by physician. After four weeks, data were collected after educational intervention to measure the level of pain, stiffness and physical function according to KOOS scale.

Compare between three groups' findings to evaluate the better methods used for improvement health status of patient with osteoarthritis.

The time taken to instruct and training the patient about uses of heat application or training for made physical exercise was 20 to 30 minutes.

Data collection covered a period of 6 months starting from August 2010 to June 2011.

#### Statistical analysis

Data was analyzed using SPSS (Statistical Package for Social Sciences) version 15. Qualitative data was presented as number and percent. Comparison between groups was done by Chi-Square test. Data was presented as mean  $\pm$  SD. Student t-test was used for comparison between groups. Wilcoxon Signed Ranks test used for comparison within group.  $P < 0.05$  was considered to be statistically significant.

#### 3. Results

Table (1) reveals that about two third in groups (G1, G2, and G3) 76.7%, 63.3% and 70% respectively were female. Regarding age, the majority of G1, G2 (60%, 60%) were within 40- 50 years, respectively, while in G3 only 36.7% were at the same age. Concerning level of education nearly half of three groups (G1, G2, G3) of patients were university education (36.7%, 40% and 50% respectively). In relation to patients' occupation, 36.7%, 20% and 26.7% not works, respectively. The majority of three groups were married (90%, 80% and 86.7%) respectively. About two third patients of each groups were over weight (63.3%, 63.3%, 76.7%) respectively. Regarding when patient experiencing osteoarthritic pain, above half patients of three groups were complain within year (76.7%, 60%, 80%) respectively. Mostly of the studied

sample (G1, G2, G3) were complains in right knee ( 46.7%, 43.3%, 76.7%) respectively.

Table 2 clarify that, with respect to symptoms, on pre educational intervention above half of G 1 (whom applied heat application) and G2 (whom applied exercise application) 60% and 70%, respectively complains *often* from symptoms, while only 40% and 26.7% of G1 and G2 complains *sometimes* and this percent increased after

educational intervention to 93.3% and 40% respectively. Also a positive influence occurred to G3, whom applied both methods, as 90% complained *often* from symptoms during pre educational phase changed to 70% complained *sometimes* and only 30% *rarely* on the post educational phase. No statistical significant differences were found between three groups

**Table (1): Distribution of the studied patients according to their socio-demographic characteristics and health status**

	Heat applications (n = 30)		Exercise (n = 30)		Heat and Exercise (n = 30)		P value
	No	%	No	%	No	%	
<b>Sex</b>							
◆ Male	7	23.3	11	36.7	9	30	0.530
◆ Female	23	76.7	19	63.3	21	70	
<b>Age</b>							
◆ 20 – 30y	0	0	1	3.3	0	0	0.014*
◆ 30 – 40y	4	13.3	11	36.7	12	40	
◆ 40 – 50y	18	60	18	60	11	36.7	
◆ 50 – 60y	8	26.7	0	0	7	23.3	
<b>Education</b>							
◆ Illiterate	10	33.3	6	20	4	13.3	0.417
◆ Secondary	9	30	12	40	11	36.7	
◆ University	11	36.7	12	40	15	50	
<b>Occupation</b>							
◆ Manual	5	16.7	9	30	0	0	0.014*
◆ Employed	14	46.7	15	50	22	73.3	
◆ Not work	11	36.7	6	20	8	26.7	
<b>Marital status</b>							
◆ Single	0	0	1	3.3	2	6.7	0.206
◆ Married	27	90	24	80	26	86.7	
◆ Widowed	3	10	2	6.7	2	6.7	
◆ Divorced	0	0	3	10	0	0	
<b>Weight</b>							
◆ Normal	8	26.7	10	33.3	5	16.7	0.529
◆ Under	3	10	1	3.3	2	6.7	
◆ Over	19	63.3	19	63.3	23	76.7	
<b>When</b>							
◆ 6 – 12 m	23	76.7	18	60	24	80	0.180
◆ < 12 m	7	23.3	12	40	6	20	
<b>Which</b>							
◆ Right	14	46.7	13	43.3	23	76.7	0.028*
◆ Left	4	13.3	8	26.7	4	13.3	
◆ Both	12	40	9	30	3	10	

In addition, with respect to pain the table 2, shows that G1 and G2 patient's pain relieved and improved from complains often (50%, 33.3%), respectively to complain sometimes (70%, 76.7 %,respectively), while G3 recovered from 50% complain sometimes

and 50% complain almost to 93.3% complain rarely.

Moreover the data illustrate that G1 and G2 (80% and 40 %, respectively) were complained *Always* from stiffness on the pre educational phase,

improved post educational phase to 0.0% and 6.7% respectively.

On the other hand G3 whom complained from stiffness *Always* relived from 83% on pre educational phase to 0.0% on post educational phase.

Finally, with referred to the disability of functional activity, table 2 described that 63.3% , 76.7% and 90% from G1 , G2 and G3 respectively were have *Always* disability of functional activity before educational phase. Post educational phase the percent of those had *Always* disability of functional

activity improved to 3.0%, 6.7% and 0.0% on the G3.

There are statistical significant differences in all variables between pre and post educational phase, in three groups ( $P= 0,001$ ). Also the table illustrate that no statistical significant differences pre educational phase between three groups in mostly variables , but post educational phase highly statistical significant differences between three groups ( $P=0,001$ ).

**Table (2) Number and Percent distribution of the studied sample according to factors of patients'' complains**

Items	Heat applications				Exercise				Heat and Exercise				P value	
	Pre		post		Pre		Post		Pre		post			
	No	%	No	%	No	%	No	%	No	%	No	%	Pre	Post
<b>Symptoms</b>														
- Never	0	0	0	0	0	0	0	0	0	0	0	0	0.056	<0.001
- Rarely	0	0	0	0	0	0	0	0	0	0	9	30		
- Sometimes	12	40	28	93.3	8	26.7	12	40	3	10	21	70		
- Often	18	60	2	6.7	21	70	18	60	27	90	0	0		
- Always	0	0	0	0	1	3.3	0	0	0	0	0	0		
<b>P value (Pre versus Post)</b>	<0.001				<0.001				<0.001					
<b>Pain</b>														
- Never	0	0	0	0	0	0	0	0	0	0	1	3.3	0.341	<0.001
- Rarely	0	0	9	30	0	0	0	0	0	0	28	93.3		
- Sometimes	1	3.3	21	70	0	0	23	76.7	0	0	1	3.3		
- Often	15	50	0	0	10	33.3	5	16.7	15	50	0	0		
- Always	14	46.7	0	0	20	66.7	2	6.7	15	50	0	0		
<b>P value (Pre versus Post)</b>	<0.001				<0.001				<0.001					
<b>Stiffness</b>														
- Never	0	0	0	0	0	0	0	0	0	0	1	3.3	<0.001	<0.001
- Rarely	0	0	15	50	0	0	4	13.3	0	0	28	93.3		
- Sometimes	0	0	15	50	5	16.7	17	56.7	2	7	1	3.3		
- Often	6	20	0	0	13	43.3	7	23.3	3	10	0	0		
- Always	24	80	0	0	12	40	2	6.7	25	83	0	0		
<b>P value (Pre versus Post)</b>	<0.001				<0.001				<0.001					
<b>Disability of functional activity</b>														
- Never	0	0	0	0	0	0	0	0	0	0	2	6.7	0.081	<0.001
- Rarely	0	0	8	26.7	0	0	0	0	0	0	27	90		
- Sometimes	0	0	22	73.3	1	3.3	22	73.3	0	0	1	3.3		
- Often	11	36.7	0	0	6	20	6	20	3	10	0	0		
- Always	19	63.3	0	0	23	76.7	2	6.7	27	90	0	0		
<b>P value (Pre versus Post)</b>	<0.001				<0.001				<0.001					

Regarding symptoms which patients complains it, table (3) reflects that in pre educational intervention mean of G1,G2&G3 improve from 45.17, 41.67& 40.0, respectively to 59.83, 45.5& 66, respectively. Also there is statistical significant difference between the three groups of studied sample post teaching phase regarding experiencing symptoms score ( $P \leq 0.001$ ). Moreover, when compare between teaching phase pre - and post there were statistical significant difference to all groups ( $P \leq 0.001$ , 0.026& 0,001 respectively).

-Also the table demonstrated that regarding knee stiffness the mean among G1, G2 & G3 improved from 9.17, 22.08& 1.25 respectively to

66.25, 47.92& 85 respectively after implementing education intervention. There were statistical significant difference between the three groups of studied sample pre – post teaching phase regarding experiencing total knee stiffness score ( $P \leq 0,001$ , 0,001& 0,001 respectively). Also the table shows that statistical significant difference in compare with each others ( $P \leq 0.001$ & 0.001).

Table 4 demonstrates that the studied sample whom experiencing pain have improved from pre to post therapeutic education for three groups (23.8, 21.11&25.74 to 69.81, 53.89& 92.5, respectively. In comparison of complain from knee pain among three groups there were statistical significant

difference ( $P < 0.001$ ). No statistical significant pre educational phase between three groups

In relation to the function status it have the ability to make normal function after educational intervention especially in G3 than G1 and G2 in which clear by mean (G1,G2 & G3) pre educational intervention(18.07, 21.15& 16.98 respectively) and improved post educational intervention to 70.94, 54.11&92.6, respectively).

Also, table 5 illustrates that relation between studied groups pre and post compliance to therapeutic non pharmacological treatment and comparison with function of knee there were statistical significant difference ( $P < 0.001$ ,  $< 0.001$  &  $< 0.001$  respectively). There were statistical significant difference ( $P < 0.001$ ) in compared the phase of pre of three groups.

**Table (3) comparison between pre and post symptoms and knee stiffness of three groups (Presented by Mean  $\pm$  Standard Deviation) for KOOS scale total score.**

Symptoms		Heat applications (n = 30)	Exercise (n = 30)	Exercise & compresses (n = 30)	P value
Pre	Mean	45.17	41.67	40	0.076
	SD	9.05	11.09	5.57	
Post	Mean	59.83	45.5	66	< 0.001*
	SD	7.25	9.59	4.98	
<b>P value</b>		< 0.001*	0.026*	< 0.001*	
<b>Stiffness</b>					
Pre	Mean	9.17	22.08	1.25	< 0.001*
	SD	10.85	18.18	3.81	
Post	Mean	66.25	47.92	85	< 0.001*
	SD	10.96	19.72	6.89	
<b>P value</b>		< 0.001*	< 0.001*	< 0.001*	

**Table (4) Comparison between pre and post teaching intervention regarding pain for three groups (Presented by Mean  $\pm$  Standard Deviation) for KOOS scale total score.**

Pain		Heat applications (n = 30)	Exercise (n = 30)	Exercise & compresses (n = 30)	P value
Pre	Mean	23.8	21.11	25.74	0.220
	SD	12.11	11.36	6.31	
	Min	0	0	16.67	
	Max	50	47.22	38.89	
Post	Mean	69.81	53.89	92.5	< 0.001*
	SD	6.43	14.66	6.11	
	Min	52.78	11.11	69.44	
	Max	80.56	72.22	100	
<b>P value</b>		< 0.001*	< 0.001*	< 0.001*	

**Table (5) Comparison between three groups of studied sample pre and post teaching intervention according to function status (Presented by Mean  $\pm$  Standard Deviation) for KOOS scale total score**

Function		Compresses (n = 30)	Exercise (n = 30)	Exercise & compresses (n = 30)	P value
Pre	Mean	18.07	21.15	16.98	0.271
	SD	12.33	10.71	7.08	
	Min	0	4.69	1.56	
	Max	37.5	53.13	35.94	
Post	Mean	70.94	54.11	92.6	< 0.001*
	SD	4.92	14.98	6.6	
	Min	57.81	14.06	71.88	
	Max	79.69	71.88	100	
<b>P value</b>		< 0.001*	< 0.001*	< 0.001*	

#### 4. Discussion

Osteoarthritis (OA) is one of the oldest and most common forms of arthritis. Known as the "wear-and-tear" kind of arthritis, OA is a chronic condition characterized by the breakdown of the

joint's cartilage (16). Cartilage is the part of the joint that cushions the ends of the bones and allows easy movement of joints (17,18). The breakdown of cartilage causes the knee bones to rub against each other, causing stiffness, pain and loss of movement.

The treatment depends on the joint but often includes medication and exercise. There is no special osteoarthritis diet, but heat application and weight loss may improve symptoms of osteoarthritis (19,20). Although the design was quasi-experimental and three study groups were comparable in terms of marital status, job status and body weight, with some differences in age, and educational level. These factors are important since they could play the role of confounders in the causation of knee osteoarthritis.

The aim of this study was to: Compare between uses of therapeutic exercise and heat application on improvement of functional status for patient with knee osteoarthritis.

According to the present study, the results reveals that about two third of groups G1, G2, and G3 were female (76.7%, 63.3% and 70%, respectively). Regarding age, the majority of G1, G2 (60%, 60 %, respectively) were within 40- 50 years, while in G3 only 40% were between 30 to 40 years old. Also the present result come on accordance with Lawrence *et al.* (24) and Moss *et al.* (21) who supported this study by found that, osteoarthritis usually occurs in any age and age exemplifies one of the most important risk factors for osteoarthritis. Evidence of joint changes occurs at approximately age 40 and changes continue to occur to the extent that the majority of elderly persons reveal joint changes indicative of osteoarthritis and occurs more often in women than in men, (although more men are affected when osteoarthritis occurs in people younger than age 45) (22).

In the current study, the results showed that, about two third patients of all groups were overweight (63.3%, 63.3%, 76.7, respectively). This finding goes in line with Christensen (26) and Sharma (23). Excess weight places increased stress on the joints of the body; hence, many people suffering from osteoarthritis are overweight. And found correlations between osteoarthritis and being overweight: Osteoarthritis affects women more often than men and women have a greater tendency to be overweight. Excess weight stresses the joints, which intensifies pain and interferes with exercise which may deter overweight individuals with osteoarthritis from exercising, thus making it more difficult to lose weight. Also, this finding agree with Messier *et al.*(25). Who found the strongest link between overweight or obesity and knee OA and found a 9- to 13-percent increased risk for the development of the disease with each kilogram increase in body weight. That means that gaining 10 pounds would result in an increased risk of 40 to 59 percent. Being overweight during the early adult years can also increase the risk of developing the disease later on.

In relation to present study, Table 2 clarify that, with respect to symptoms, on pre educational

intervention above half of G 1 (whom applied heat application) and G2 (whom applied exercise application) 60% and 70% respectively complains *often* from symptoms, while only 40% and 26.7% of G1 and G2 complains sometimes and this percent increased after educational intervention to 93.3% and 40%, respectively. Also a positive influence occurred to G3, whom applied both methods, as 90% complained *often* from symptoms during pre educational intervention changed to 70% complained *sometimes* and only 30% *rarely* on the post educational intervention. Regarding symptoms, table 3, showed total score of KOOS scale, found statistical significant difference ( $p < 0.001$ ) between pre and post-educational intervention in relation to symptoms. These findings come in consistent with The Centers for Disease Control and Prevention, (CDC 2010)(27) finding the onset of osteoarthritis symptoms develop slowly and may be stable for many years. Osteoarthritis symptoms may occur in any joint; however, the joints most often affected are the knees, hips, hands, and spine. And joints need motion to stay healthy. Long periods of inactivity cause the arthritic joint to stiffen and the adjoining tissue to atrophy (waste away). A moderate exercise program that includes low-impact aerobics, power and strength training has benefits for patients with osteoarthritis. And when combination between physical therapy and uses of heat application they can relieve osteoarthritis symptom for long period.

Concerning pain, table 2 showed that G1 and G2 patient's pain relieved and improved from complains *often* (50% & 33.3 %, respectively), to complain *sometimes* (70%, 76.7%, respectively), while G3 recovered from 50% complain *sometimes* and 50% complain *almost* to 93.3% complain *rarely*. In comparison of complain from knee pain among three groups regarding pain in table 4 there were statistical significant difference all of them ( $P < 0.001$ ). These finding are agreement with Sharma (23) and Nefyn *et al.*(29) who revealed that the uses of heat application is time honored technique for relieving pain, stiffness and associated swelling that can result from osteoarthritis. This finding in the present study also come in accordance with Nefyn *et al.*(29) who concluded that, exercise helps patients with mild to moderate osteoarthritis in the hip or in the knee, and many patients who embark on an aerobic or resistance exercise program report less disability and pain and are better able to perform daily chores and remain independent than their inactive peers.

National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) Information (28) stressed that there is no cure for osteoarthritis, the therapeutic exercise can help to reduce the joint pain and improve flexibility and mobility of joints and most successful treatment programs involve a combination of treatments

tailored to the patient's needs, and health. Most programs include ways to manage pain and improve function. These can involve exercise, pain relief techniques, medications and heat application.

In relation of the function of knee it have the ability to make normal function after educational intervention especially in G3 than G1 and G2 in which clear by mean (G1, G2 & G3) pre educational intervention (18.07, 21.15& 16.98, respectively) and improved post educational intervention (70.94, 54.11& 92.6, respectively). This finding come in line with Martijn *et al.* (30). Who showed individuals with OA of the hip or knee experience pain, reduced muscle strength, decreased range of joint motion, and joint instability? According to the World Health Organization (WHO) OA is one of the ten most disabling diseases in developed countries. Further WHO estimates that 80% of those with OA have limitations in movement, and 25% cannot perform major daily life activities. Often OA patients are referred to physical therapy in order to reduce impairments and improve overall physical function to meet demands of daily living.

### Conclusion and Recommendations

Based on the main study findings, it could be concluded that, the implementation of methods ( heat application , therapeutic exercise, and ) uses for relieve pain, pain and improvement of physical function had positive effect on relieve pain , stiffness and improvement physical function on two groups ( G1, G2) of the studied sample but when combination between therapeutic exercises and heat application on group 3 of studied sample had a strong positive effect on relieve pain , stiffness and improvement in physical function so found in relation to the disability of functional activity, about 63.3% , 76.7% and 90% from G1 , G2 and G3 respectively were have *always* disability of functional activity before educational training and Post educational training the percent of those had always disability of functional activity improved to 3.0% , 6.7% and 0.0% on the G3. Therefore, it is recommended the following:

- 1- Use a combination of therapeutic exercise and heat application together as a methods of treatment to relieve pain, stiffness and improvement of physical function for patient with osteoarthritis when medications was contraindicated for those patients.
- 2- A simple manual of guidelines of uses heat application and therapeutic exercises for patients with osteoarthritis available in all out patient orthopedic clinic and rheumatology clinic to be provided to newly admitted patients.
- 3- The effect of uses heat applications and therapeutic exercises need to be explored more fully with a larger sample with osteoarthritis.

### Corresponding author

Amira A. Hassanin

Department of Adult Care Nursing, Faculty of Nursing, Mansoura University, Egypt.

### References:

1. Zhang, W., Moskowitz, R.W., Nuki, G., Abramson, S., Altman, R.D., Arden, N., Bierma-Zeinstra, S., Brandt, K.D., Croft, P., Doherty, M., Dougados, M., Hochberg, M., Hunter, D.J., Kwoh, K., Lohmander, L.S., Tugwell, P. (2008): OARSI recommendations for the management of hip and knee osteoarthritis, Part II: OARSI evidence-based, expert consensus guidelines. *Osteoarthritis & Cartilage*; 16:137-162.
2. Rattanachaiyanont, M., & Kuptniratsaikul, V.( 2008): No additional benefit of shortwave diathermy over exercise program for knee osteoarthritis in peri-/post-menopausal women: an equivalence trial. *Pub-med journal* 16: 823-828.
3. Laufer, Y., Zilberman, R., Porat, R., Nahir, A.M.(2005) Effect of pulsed short-wave diathermy on pain and function of subjects with osteoarthritis of the knee: a placebo-controlled double-blind clinical trial. *Clinical Rehabilitation*; 19: 255-263.
4. Welch, V., Brosseau, L., Peterson, J., Shea, B., Tugwell, P., Wells, G.(2001): Therapeutic ultrasound for osteoarthritis of the knee. *Cochrane Database Systematic Reviews*; 3:132.
5. Brosseau, L., Yonge, K.A., Robinson, V., Marchand, S., Judd, M., Wells, G., Tugwell, P.(2003): Theramotherapy for treatment of Osteoarthritis. *Cochrane Database of Systematic Reviews*, 4: 522.
6. Silva, A.L.P., Imoto, D.M., Croci, A.T.( 2007): Comparison of cryotherapy, exercise and short waves in knee osteoarthritis treatment. *Acta Ortopedica Brasileria*; 15: 204-209.
7. Durmus, D., Alayh, G.,( 2007): Canturk, F. Effects of quadriceps stimulation program on clinical parameters in the patients with knee osteoarthritis. *Clinical Rheumatology*; 26: 674-678.
8. Gaines, J.M., Metter, E.J., Talbot, L.A.(2004): The effect of neuromuscular electrical stimulation on arthritis knee pain in older adults with osteoarthritis of the knee. *Applied Nursing Research*; 17: 201-206.
9. Fary R.E., Carroll, G.J., Briffa, T.G., Gupta, R., Briffa, N.K.(2008): The effectiveness of pulsed electrical stimulation in the management of osteoarthritis of the knee: a protocol for a randomised controlled trial. *BMC Musculoskeletal Disorders*; 9: 18.
10. American Physical Therapy Association. *Guide to Physical Therapist Practice*. (2001): 2nd Edition. *Physical Therapy*; 81: 9-744.

11. Kisner, C. Colby, L.(2002): Therapeutic Exercise: Foundations & Techniques. 4<sup>th</sup> Edition. Philadelphia: 644.
12. Wrightson, J.D., & Malanga, G.A. (2001): Strengthening and other therapeutic exercises in the treatment of osteoarthritis. *Physical Medicine & Rehabilitation: State of Art Reviews*; 15: 43-56.
13. Bashaw, R.T., & Teingstad, E.M.(2005): Rehabilitation of the osteoarthritic patient: focus on the knee. *Clinical Sports Medicine*; 24: 101-131.
14. Simkin, P.A., de Lateur, B.J., Alquist, A.D., Questad, K.A., Beardsley, R.M.,(2002): Esselman, P.C. Continuous passive motion of osteoarthritis of the hip: a pilot study. *Journal of Rheumatology*; 26: 1487-1491.
15. Oddis, C.V.( 1996): New perspectives on Osteoarthritis. *American Journal of Medicine*; 100: 10S-15S.
16. Baker, K., McAlindon, T.( 2003): Exercise for knee osteoarthritis. *Current Opinion in Rheumatology*; 12: 456-463.
17. Leroux, M.A., Cheung H.S., Bau, J.L., Wang, J.Y., Howell, D.S., Setton, L.A.(2004): Altered mechanics and histomorphometry of canine tibial cartilage followinf joint immobilization. *Osteoarthritis & Cartilage*; 9: 633-640.
18. Fontaine, K.R., Heo, M., Bathon, J.(2004): Are US adults with arthritis meeting public health recommendations for physical activity? *Arthritis & Rheumatism*; 50: 624-628.
19. Stuart, M.J., Meglan, D.A., Lutz, G.E., Growney, E.S., An, K.N. (2005): Comparison of intersegmental tibiofemoral joint forces and muscle activity during various closed kinetic exercises. *American Journal of Sports Medicine*; 24: 792-799.
20. Suraj & Sudhir Kumar.(2006): Effect of knee complex mobilization on pain and active range of motion arc in osteoarthritis knee joint. *Physical Therapy in Sport*; 7: 176.
21. Moss, P., Sluka, K., Wright, A.(2007): The initial effects of knee mobilization on osteoarthritic hyperalgesia. *Manual Therapy*; 12: 109-118.
22. Fransen, M., Nairn, L., Winstanley, J., Lam, P., Edmonds, J. (2007): Physical activity for osteoarthritis management: A randomized controlled clinical trial evaluating hydrotherapy and tai chi classes. *Arthritis & Rheumatism*; 57: 407-414.
23. Sharma L (2003). Examination of exercise effects on knee osteoarthritis outcomes: Why should the local mechanical environment is considered? *Arthritis and Rheumatism*, 49: 255–260.
24. Lawrence, R. C., Helmick, C. G., Arnett, F. C., *et al.* (2006). Estimates of the prevalence of arthritis and selected musculoskeletal disorders in the United States. *Arthritis and Rheumatism*, 65: 60-66 .
25. Messier SP, Loeser RF, Miller GD, Morgan TM, Rejeski WJ, Sevick MA, Ettinger WH, Paho M, Williamson JD. ( 2008): Exercise and dietary weight loss in overweight and obese older adults with knee osteoarthritis: the Arthritis, Diet, and Activity Promotion Trial. *Arthritis Rheum.* ;50:1501-1510.
26. Christensen R, Astrup A, Bliddal H. (2005): Weight loss: the treatment of choice for knee osteoarthritis? A randomized trial. *Osteoarthritis Cartilage.* ;13:20-27.
27. The Centers for Disease Control and Prevention, (2010): "Osteoarthritis and you <http://www.cdc.gov/Features/OsteoarthritisPlan/> . Accessed February
28. National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS), (2010): Information Clearinghouse National Institutes of Health, Publication Date: July.
29. Nefyn H Williams, Elvis Amoakwa, Kim Burton, Maggie Hendry, John Belcher, Ruth Lewis, Kerenza Hood, *et al.*(2009):Activity Increase Despite Arthritis (AIDA): design of a Phase II randomised controlled trial evaluating an active management booklet for hip and knee osteoarthritis, September 4. doi: 10.1186/1471-2296-10-62.
30. Martijn F Pisters, Cindy Veenhof, François G Schellevis, Jos WR Twisk, Joost Dekker, Dinny H De Bakker (2010): Exercise adherence improves long-term patient outcome in patients with osteoarthritis of the hip and/or knee. *Arthritis Care & Research*; volume 3: page,324-332 DOI: 10.1002/.20182.
31. Eaa,M. Roos and Stefan, Lohmander (2003):The knee injury and osteoarthritis outcome scor (KOOS): from joint injury healthqual life outcome journal. Volume.1 page. 64

8/12/2011