



## Physical Therapy Modalities in Management of Fibromyalgia: a review

Gamila Saleh Tammam <sup>1\*</sup>, Omar Mohamed Elabd <sup>1</sup>

*1 Department of Physical Therapy for Musculoskeletal Disorders, Faculty of Physical Therapy, Delta University for Science and Technology, Gamasa, Egypt.*

\* **Correspondence:** Gamila Saleh Tammam, Assistant Lecturer, Orthopedic Department, Faculty of Physical Therapy, Delta University for Science and Technology, Gamasa, Egypt . E-mail: [Gamila.saleh@deltauniv.edu.eg](mailto:Gamila.saleh@deltauniv.edu.eg); [gamila.saleh04@gmail.com](mailto:gamila.saleh04@gmail.com), Tel: 01026447754.

### ABSTRACT

Fibromyalgia (FM) is a clinical syndrome commonly observed in daily medical practice and its etiology is still unclear. FM occurs at any age and is more common in females. Despite the good prognosis for this painful condition, patients with FM consume huge amounts of financial resources in public or private health care both for treatment and diagnostic investigation. **Purpose:** the aim of this review is to identify different treatment approaches for fibromyalgia and to determine the effect of these approaches on pain, tender point number, sleep problems and health related quality of life. **Methods:** the published researches that studied FM since 1990 were assessed according to CONSORT checklist. Fair to Good quality researches were included, while low quality researches were excluded. **Result:** Aerobic training is the important type of exercise therapy. Progression of the exercises was recommended minimize pain. Electrotherapy modalities as well as Alternative/complementary therapies could reduce pain as well. **Conclusion:** treatment of FM should be multidisciplinary, individualized, depending on active participation of the patient, and based on combined pharmacological and non-pharmacological modalities.

**Keywords:** Fibromyalgia, Exercise Therapy, Electrotherapy.

## 1. Introduction

Fibromyalgia (FM) is a clinical syndrome commonly observed in daily medical practice and its etiology is still unclear. As it is characterized by chronic musculoskeletal pain associated with several symptoms, FM may be confused with several other rheumatic and non-rheumatic diseases when they course with pictures of diffuse pain and chronic fatigue (**Junior et al., 2012**).

The term fibromyalgia is derived from the Latin word fibro (fibrous tissue, present in ligaments, tendons and fasciae) and from the Greek words mio (muscular tissue), algos (pain), and ia (condition) (**Junior et al., 2012**). FM occurs at any age and is more common in females (six times more than males). The American College of Rheumatology found FM prevalence is 3.4% for females and 0.5% for males, with a prevalence of 2% for both genders (**Wolfe et al., 1995**).

The American College of Rheumatology (ACR) classification criteria for FM are the most commonly used in clinical and therapeutic research and define FM as widespread pain for longer than 3 month duration, with pain on palpation with 4 kg of pressure in at least 11 of 18 specified tender points on the body (**Fig. 1**) (**Wolfe et al., 1990**).

Despite the good prognosis for this painful condition, patients with FM consume huge amounts of financial resources in public or private health care both for treatment and diagnostic investigation. The magnitude of economic and financial impact of FM on society, finding an annual cost of about €12 billion for a population of 80 million, with € 960 million (8%) representing the costs of drug therapy (**Spaeth, 2009**).

The purpose of this review is to identify different treatment approaches for fibromyalgia and to determine the effect of these approaches on pain, tender point number, sleep problems and health related quality of life.

## 2. Material and methods

### 2.1. Design of the study

Narrative review

### 2.2 Participants

The published researches that studied FM since 1990 were assessed according to CONSORT checklist. Fair to Good quality researches were included, while low quality researches were excluded.

## 3. Etiology

The etiology and pathophysiology of FM are still unclear. The current hypotheses focus on the central mechanisms of pain modulation resulting from a neurotransmitter dysfunction including either an inhibitory neurotransmitter deficiency in spinal or supraspinal levels (serotonin, enkephalin, norepinephrine, and others) or an excitatory neurotransmitter hyperactivity (substance P, glutamate, bradykinin, and other peptides). Both conditions might be present. These dysfunctions could be genetically predetermined and triggered by a nonspecific stress, such as a viral infection, psychological stress, or physical trauma (**Bradley & McKendree-Smith, 2002**).

## 4. Diagnosis

Diagnosis of FM is based on physical examination finding of multiple tender points, fatigue severe enough to limit daily activities, muscle stiffness, skin sensitivity, pain after exertion, sleep disturbances, balance problems and increased fall frequency. Symptoms of depression, anxiety, memory deficit, inattention, tension headache or migraine, dizziness, vertigo, tingling, irritable bowel syndrome are also characteristics of FM (**Helpfenstein & Feldman, 2002**).

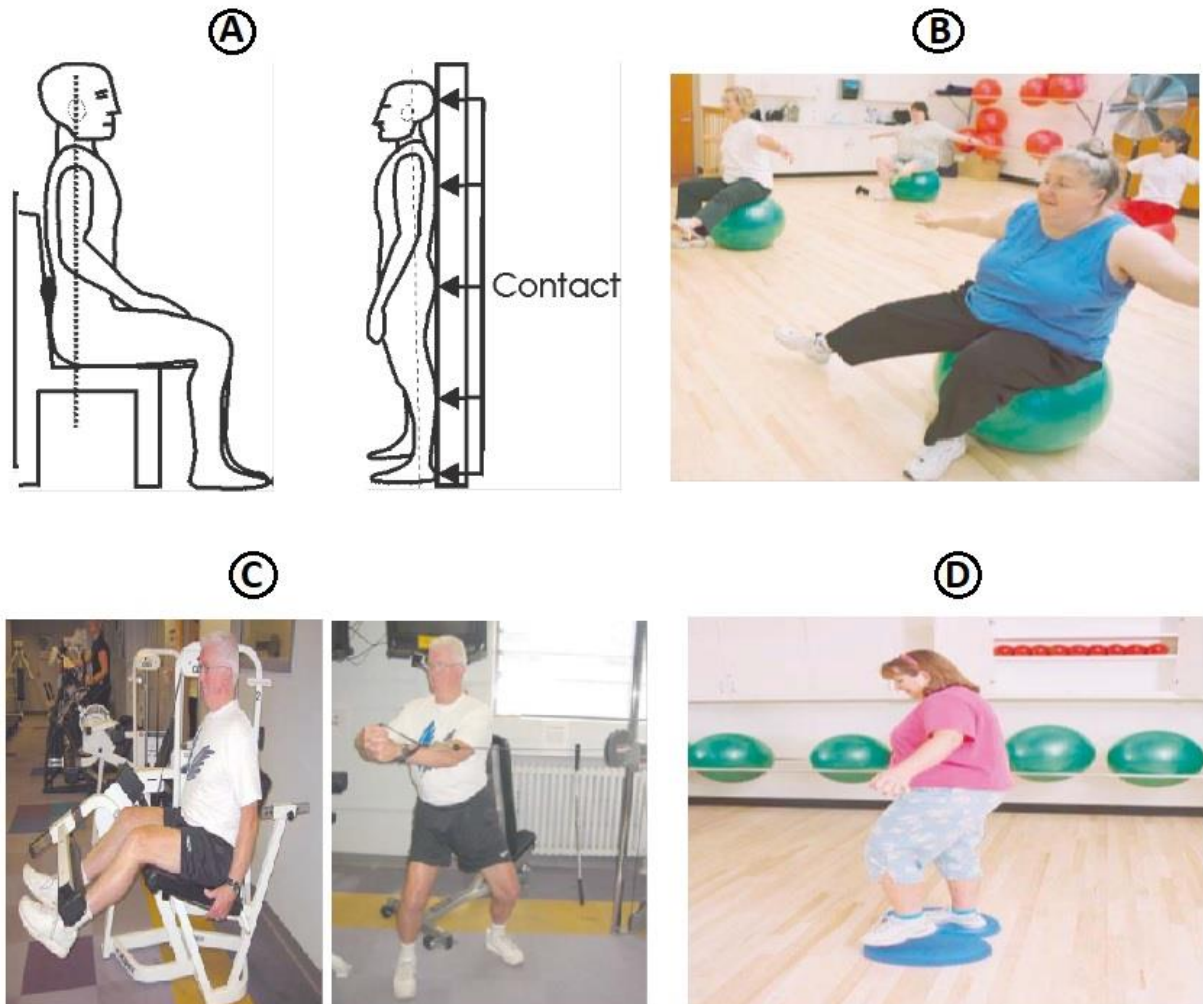
## 5. Management

### 5.1 Exercise Therapy

#### 5.1.1 Exercises design:

Aerobic training is the important type of exercise therapy in FM patients but it does occur last in the daily program. OHSU Fibromyalgia Treatment Team (**Jones & Hoffman, 2006**) recommends exercise progression to minimize pain, exercise must be progressive: muscle relaxation, flexibility, resistance training and then aerobic, as follows: (**Fig. 1**).

- **Step 1:** maintain good posture against pain, learn deep breath, take 15 min progressive muscle relaxation (**Fig. 1A**).
- **Step 2:** begin by range of motion flexibility exercises, later add static holds for correction of postural imbalance, gradually work up to 30 s holds as tolerated (**Fig. 1B**).
- **Step 3:** resistance training: when starting to strength, begin with the core muscles (for stabilization). Work upper body resistance in a seated position and then use standing balance techniques to provide lower body muscles strengthening. Frequency 2 times/ week then progress to 3 times (**Fig. 1C**).
- **Step 4:** aerobic endurance training: an acceptable starting point for deconditioned patients is 2–3 daily exercise sessions of 3–5 min duration. The final aim is to maintain 60–70% of the maximal heart rate for 20–30 min using combined aerobic techniques such as outdoor or treadmill walking, reclining stationary cycles and water therapy (**Fig. 1D**).



**Figure 1:** Exercise therapy; (A) Maintaining good posture; (B) Flexibility training; (C) Strength training; and (D) Aerobic endurance training.

### 5.1.2 Indication:

The indications for exercise therapy could be summarized as **(Thomas & Blotman, 2010)**:

- Individualize prescription to patient's baseline physical function and severity of pain.
- Enhance adherence with programs begun at low intensity, then gradually increase according to patient's tolerance to exercise-induced pain.
- Aerobic exercises, adapted to patient's initial capacity improve physical fitness, pain threshold and well-being.
- Pool exercise can have additional and independent effects on FM symptoms.
- Exercises must be supervised, at least at the beginning, and clinician should be aware of possible postexertional pain to adequately modify prescriptions.
- In case of FM symptoms flare, exercise intensity should be decreased but frequency has to be kept on.
- Regular exercising at low to moderate-high intensity levels two to three times a week may improve FM symptoms, psychological distress, and physical capacity in sedentary patients.
- Increases in self-efficacy can be reached through educational programs coupled to exercise.

However, clinically, exercise most often is delivered in conjunction with other treatments designed to manage symptoms in people with fibromyalgia, including medications, self-management education programs, stress-management strategies, relaxation training, and electro-myographic biofeedback **(Busch et al., 2011)**.

### 5.1.3 Benefits:

The benefits of exercise training could be summarized as:

- 1- Aerobic training such as (cycling, dance or whole body exercise) improves peak oxygen uptake and decreases pain intensity and fatigue **(Dinler et al., 2009)**.
- 2- Strength training reduces severity of fibromyalgia symptoms **(Kingsley et al., 2010)**.
- 3- Aquatic exercise is associated with improvements in pain, HRQOL, physical function, muscle strength, emotional and mental health, and vitality **(Mannerkorpi et al., 2009; Tomas-Carus et al., 2009)**.

- 4- Multidisciplinary programs (pool and land-based exercise and psycho- educational sessions) improve tenderness severity and lower-body flexibility, but not physical fitness (**Carbonell-Baeza et al., 2011; Sanudo et al., 2010**).
- 5- Vibration and Nordic Walking: Whole-body vibration represents new exercise alternative for people with fibromyalgia.
- 6- **Gusi** and his co-workers (**2010**) reported that after 12 weeks, women with fibromyalgia who performed squats while standing on a vibration platform (six partial squats held 45–60 s, three times per week; vibration parameters: 12.5 Hz, vertical amplitude 3 mm) demonstrated improvements in dynamic balance, as assessed on the Biodex Balance System. While Nordic Walkers demonstrated significant improvements in the 6-min walk test and FIQ physical scores.
- 7- Tai Chi, Yoga, Breathing Exercises, and Pilates: Mind–body forms of exercise are considered holistic, encompassing physical, psychosocial, emotional, spiritual, and behavioral elements, which may be especially beneficial for those with fibromyalgia (**Busch et al., 2011**). It showed improvements in HRQOL (as measured by the Fibromyalgia Impact Questionnaire [FIQ] and Short Form–36 health survey questionnaire [SF-36]) (**Wang et al., 2010**).
- 8- Lifestyle physical activity: improve exercise adherence by encouraging increased home-based daily physical activity (**Fontaine et al., 2010**).

## 5.2 Electrotherapy modalities:

### 5.2.1 Ultrasound:

Ultrasound therapy has achieved recognition as a suitable method in physical medicine in treatment of acute and chronic musculoskeletal disorders (**Gam et al., 1998**). **Almeida** and his co-workers (**2003**) suggested that combined therapy with pulsed ultrasound and interferential current, acting as an electro-diagnostic tool and as modality of physical therapy, provides an effective pain treatment, with consequent sleep improvement in FM.

### 5.2.2 Transcutaneous electrical nerve stimulation (tens):

The TENS is the most common example of electrically based analgesia (**Gur, 2006**). **Almeida** and his co-workers (**2003**) suggested that the use of combined therapy with pulsed ultrasound and interferential current proved to be a valid therapeutic option to FM improving not only pain manifestations but also the sleep pattern in a subjective and objective evaluation.

### 5.2.3 Acupuncture and electro acupuncture:

Acupuncture may be useful as an adjunct or alternative treatment for FM or it may be included in a comprehensive management program for patients with FM (**Consensus, 2006**). Some randomized controlled trials reported beneficial effects of Acupuncture in FM: decreasing pain level and number of pathological tender points, increasing pain threshold and improvement in sleep quality (**Deluze et al., 1992**).

### 5.2.4 Laser therapy:

Laser therapy is effective on pain, muscle spasm, morning stiffness and total tender point number in FM. So it is a safe and effective way of treatment in the cases with FM (**Gur, 2006**).

### 5.2.5 Electromagnetic field and magnetotherapy:

PEMF therapy reduces stress and pain, improves blood circulation, which helps eliminate toxins (**Gur, 2006**). Low-frequency PEMF therapy may improve pain, function, fatigue and global status in FM patients and may offer a potential therapeutic adjunct to current FM therapies in the future (**Sutbeyaz et al., 2009**).

### 5.2.6 Electromyographic biofeedback training:

EMG biofeedback training has been considered beneficial in patients with FM (**Gur, 2006**). **Buckelew** and his co-workers (**1998**) demonstrated that biofeedback training for 6 weeks produce short and long term benefits in self-efficacy, disease severity and physical activity in 119 FM patients.

## 5.3 Alternative/complementary therapies:

### 5.3.1 Transcranial direct current stimulation (tDCS):

It is a non-invasive brain stimulation technique that has potential to modulate the cortical excitability. The application of anodal tDCS over primary motor cortex (M1) can be the choice of stimulation for reducing pain in fibromyalgia patients. However, effectiveness of tDCS over other areas of stimulation must be explored so that a precise site for better management of pain in fibromyalgia patients can be recommended (**Chaturvedi et al., 2018**).

### 5.3.2 Extracorporeal shockwave treatment (ESWT):

It is considered a new and promising treatment for muscular disorders (myofascial pain syndrome). The effects of ESWT: increase perfusion, promote angiogenesis and alter the pain signaling in ischaemic tissues caused by the influx of calcium, degenerate free nerve endings, break-up the Actin-Myosin links, as they are propagating perpendicularly to the sarcomere contractions.

Therefore, ESWT appears to be a safe and effective early adjunctive therapy in patients suffering from FM. ESWT should be accompanied by a comprehensive supervised exercise program (**Roman et al., 2015**).

### 5.3.3 Hyperbaric oxygen Therapy (HBOT):

The intermittent breathing of 100% oxygen in a pressurized chamber where the pressure is higher than 1 atmosphere absolute (ATA) has been utilized. HBOT exhibits a significant anti-inflammatory effect through reducing production of glial cells and inflammatory mediators which results in pain alleviation in different chronic pain conditions. HBOT can also influence neuroplasticity and affects the mitochondrial mechanisms resulting in functional brain changes.

In addition to that, HBOT stimulates nitric oxide (NO) synthesis which helps in alleviating hyperalgesia and NO dependent release of endogenous opioids, So HBOT is considered a promising method for treating fibromyalgia (Kunbaz et al., 2019).

#### **5.3.4 Stanger bath, Hay bath, Whole-body hyperthermia, and Balneotherapy:**

They are all considered adjuvant therapies in the management of fibromyalgia that improve pain, tenderness and HRQL immediately after treatment in the short and medium term (Yuan, 2013).

- Stanger bath is a whole-body, hydroelectric bath that administers low-frequency currents (diadynamic current), and the water temperature is kept at 37° and 0.2%–0.5% NaCl is added to increase conductivity (Yuan, 2013).
- Hay bath also called phytothermotherapy (PTT) is a singular treatment consisting of immersing oneself in pools of fermenting alpine grass, to exploit its heat and rich aromatic components (Tenti et al., 2013).
- Whole body hyperthermia consists of a heating up phase (until 38.1°C body core temperature) and a heat retention phase of 15 min, the overall treatment duration did not exceed 1 h (Yuan, 2013).
- Balneotherapy consists of thermal pool baths of 20 min at 37°C–38°C in acratothermal water (Yuan, 2013).

#### **Limitation of the study:**

The duration of the interventions was 4 weeks to find the short term effects. No follow up was done to know the long lasting effect and recurrence of symptoms. Another important limitation may be heterogeneity related to the etiology of MND.

#### **Conclusion:**

Treatment of FM should be multidisciplinary, individualized, depending on active participation of the patient, and based on combined pharmacological and non-pharmacological modalities (Junior et al., 2012). Furthermore, explanations of the nature of the syndrome, relaxation, education in self-management of symptoms to prevent inactivity, improve coping and decrease feelings of anxiety and helplessness. Exercise may have a central role in the multidisciplinary management of FM patients as it enhances health, function and independence (Thomas & Blotman, 2010).

#### **Acknowledgements:**

The authors thank all staff members of the orthopedic department, faculty of physical therapy for their support in the conduction of this study.

#### **Funding support**

This research received no specific grant from any funding agency in the public, commercial, or medical for-profit sectors.

#### **Conflict of Interest:**

The Authors declare that there is no conflict of interest.

## References

- Almeida TF, Roizenblatt S, Benedito-Silva AA, Tufik S.** The effect of combined therapy (ultrasound and interferential current) on pain and sleep in fibromyalgia. *Pain*. 2003 Aug 1; 104(3): 665-72.
- Bradley LA, McKendree-Smith NL.** Central nervous system mechanisms of pain in fibromyalgia and other musculoskeletal disorders: behavioral and psychologic treatment approaches. *Current Opinion in rheumatology*. 2002 Jan 1; 14(1): 45-51.
- Buckelew SP, Conway R, Parker J, Deuser WE, Read J, Witty TE, et al.** Biofeedback/relaxation training and exercise interventions for fibromyalgia: a prospective trial. *Arthritis & Rheumatism: Official Journal of the American College of Rheumatology*. 1998 Jun; 11(3): 196-209.
- Busch AJ, Webber SC, Bidonde J et al.** Exercise Therapy for Fibromyalgia. *Curr Pain Headache Rep*. 2011; 15(1): 358–67.
- Carbonell-Baeza A, Aparicio VA, Ortega FB, Cuevas AM, Alvarez IC, et al.** Does a 3-month multidisciplinary intervention improve pain, body composition and physical fitness in women with fibromyalgia? *Br J Sports Med*. 2011 Dec 1; 45(15): 1189-95.
- Chaturvedi R, Malik M, Joshi S, Kulandaivelan S.** Effect of transcranial direct current stimulation (TDCS) on pain in fibromyalgia-systematic review based on Prisma guidelines. *Pain*. 2018; 10(11): 12
- Consensus NI.** Conference. Acupuncture. *JAMA*. 1998; 280(17): 1518-24.
- Deluze C, Bosia L, Zirbs A, Chantraine A, Vischer TL.** Electroacupuncture in fibromyalgia: results of a controlled trial. *Bmj*. 1992 Nov 21; 305(6864): 1249-52.
- Dinler M, Diracoglu D, Kasikcioglu E, Sayli O, Akin A et al.** Effect of aerobic exercise training on oxygen uptake and kinetics in patients with fibromyalgia. *Rheumatology International*. 2009 Dec 1; 30(2): 281–4.
- Fontaine KR, Conn L, Clauw DJ.** Effects of lifestyle physical activity on perceived symptoms and physical function in adults with fibromyalgia: results of a randomized trial. *Arthritis research & therapy*. 2010 Apr; 12(2): R55.
- Gam AN, Warming S, Larsen LH, Jensen B, Hoydalsmo O, Allon I, et al.** Treatment of myofascial trigger points with ultrasound combined with massage and exercise- a randomized controlled trial. *Pain*. 1998 Jul 1; 77(1): 73-9.
- Gur A.** Physical Therapy Modalities in Management of Fibromyalgia. *Current Pharmaceutical Design*. 2006 Jan 1; 12(1): 29-35.
- Gusi N, Parraca JA, Olivares PR, Leal A, Adsuar JC.** Tilt vibratory exercise and the dynamic balance in fibromyalgia: a randomized controlled trial. *Arthritis care & research*. 2010 Aug; 62(8):1072–8.
- Helfenstein M, Feldman D.** Fibromyalgia syndrome: clinical features and associations with other dysfunctional syndromes. *Rev Bras Reumatol*. 2002; 42 (1): 8-14.
- Jones K, Hoffman J.** Functional fitness; Exercise and chronic pain. 2006; 4(1): 1-21.
- Junior MH, Goldenfum MA, Siena CA.** Fibromyalgia: clinical and occupational aspects. *Rev Assoc Med Bras*. 2012 May 1; 58(3): 358-65.
- Kingsley JD, McMillan V, Figueroa A.** The effects of 12 weeks of resistance exercise training on disease severity and autonomic modulation at rest and after acute leg resistance exercise in women with fibromyalgia. *Archives of Physical Medicine and Rehabilitation*. 2010 Oct 1; 91(10):1551–7.
- Kunbaza A, Gad M, Saad AM, Sammour YM, Al-Husseini MJ.** Hyperbaric oxygen and aerobic exercise in the long-term treatment of fibromyalgia: A narrative review. *Biomedicine & Pharmacotherapy*. 2019 Jan 1; 109: 629-38.
- Mannerkorpi K, Nordeman L, Ericsson A, Arndorw M, GAU Study Group.** Pool exercise for patients with fibromyalgia or chronic widespread pain: a randomized controlled trial and subgroup analyses. *Journal of rehabilitation medicine*. 2009 Sep 5; 41(9):751–60.
- Ramon S, Gleitz M, Hernandez L, Romero LD.** Update on the efficacy of extracorporeal shockwave treatment for myofascial pain syndrome and fibromyalgia. *International Journal of Surgery*. 2015 Dec 1; 24: 201-6.
- Sanudo B, De Hoyo M, Carrasco L, McVeigh JG, Corral J, et al.** The effect of 6-week exercise programme and whole body vibration on strength and quality of life in women with fibromyalgia: a randomised study. *Clin Exp Rheumatol*. 2010 Dec 20; 28(6 Suppl 63): S40–5.
- Spaeth M.** Epidemiology, costs, and the economic burden of fibromyalgia. *Arthritis Res Ther*. 2009; 11:117-21.
- Sutbeyaz ST, Sezer N, Koseoglu F, Kibar S.** Low-frequency Pulsed Electromagnetic Field Therapy in Fibromyalgia: A randomized, double-blind, sham-controlled clinical study. *The Clinical Journal of Pain*. 2009 Oct 1; 25(8): 722-8.

- Tenti S, Manica P, Galeazzi M, Fioravanti A.** Phytothermotherapy in fibromyalgia and osteoarthritis: Between tradition and modern medicine. *European journal of integrative medicine.* 2013 Jun 1; 5(3): 248-53.
- Thomas EN, Blotman F.** Aerobic exercise in fibromyalgia: a practical review. *Rheumatology International.*2010 Jul 1;30 (9):1143–50.
- Tomas-Carus P, Gusi N, Hakkinen A, Hakkinen K, Raimundo A, et al.** Improvements of muscle strength predicted benefits in HRQOL and postural balance in women with fibromyalgia: an 8-month randomized controlled trial. *Rheumatology.* 2009 Jul 14; 48(9):1147–51.
- Wang C, Schmid CH, Rones R, Kalish R, Yinh J, et al.** A randomized trial of tai chi for fibromyalgia. *New England Journal of Medicine.* 2010 Aug 19; 363(8): 743–54.
- Wolfe F, Ross K, Anderson J, Russell IJ, Herbert L.** The prevalence and characteristics of fibromyalgia in the general population. *Arthritis & Rheumatism: Official Journal of the American College of Rheumatology.* 1995 Jan; 38:19-28.
- Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C et al.** The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. *Arthritis & Rheumatism: Official Journal of the American College of Rheumatology.*1990 Feb; 33(2):160–72.
- Yuan SL.** Electrotherapy, thermotherapy and phototherapy modalities in fibromyalgia: A critical review of the literature. *OA Musculoskeletal Medicine.* 2013; 1: 18.