The effectiveness of an aerobic exercise program on patients with Multiple Sclerosis with decreased walking ability secondary to fatigue

Abstract

Multiple sclerosis (MS) is a progressive autoimmune disorder that affects the central nervous system (the brain and spinal cord). Current disease and modifying therapies does not prevent long-term disability and are particularly in effective for patients with progressive disease onset (type 4 MS). Exercise may represent as an alternative strategy for managing symptoms and disability by promoting safety and prevent complications of MS which cause death for people with MS rather than the disease itself.

This study focus on the most common symptom of MS which is fatigue. It is reported by majority of patients with MS during their disease course and it affects their quality of life. MS fatigue is still considered the result of multifactorial and complex consultations.

Whereas few studies have investigated the benefits of aerobic exercises for patients with multiple sclerosis. Therefor the purpose of this study was to determine the effect of short-term effects of aerobic exercises intervention for 3 patients with MS have decreased walking ability secondary to fatigue.

MS patients with mild to moderate disability were assigned to an exercise program, the intervention was consist of aerobic training (walking) in 12 sessions ,all patients were evaluated before and after the end of the sessions. The primary outcome was walking speed measured by 6MWT and the secondary outcome was fatigue and it is measured by FAS. The result showed a clinically meaningful improvement in walking speed of those patients without increasing in their fatigue.

This study determined that aerobic exercises (walking) have greater impact on patients with multiple sclerosis which they work as an alternative strategy for the management of disease complications.

Introduction
The condition recognized today as multiple sclerosis was first described in the early 19th century. Systematic clinical and pathological characterization of the disease and the name “la sclerose en plaque” were provided by French neurologist Jean Martin Charcot (1868). The name “Multiple sclerosis” comes from the multiple areas of scarring (sclerotic tissue) that characterize the disease process. Inflammatory lesions appear as distinct areas of myelin loss scattered throughout the CNS. (Darcy A Umphred, 2013).

Multiple sclerosis is a chronic condition in which the immune system attacks a fatty substance called myelin, which surrounds nerve fibers in the central nervous system. (MS international federation, 2016).

MS occurs worldwide, but is particularly common in North America, Australia and northern Europe. It affects about 80,000 people in the UK, and has a prevalence of approximately 1 in 800. (Mahinda Yogarajah, 2013). The age onset is usually between 20 and 40, MS is rare in children, as is the onset of symptoms in adults older than age 50 years. The disease is more common in women than men by ratio of 2:1 to 3:1 (international federation, 2013).

The etiology of MS is unknown, it is consider an autoimmune disorder. (Kremenchutsky M, et al., 2006). In most cases the signs and symptoms of multiple sclerosis usually develop slowly and over a period of time, although occasionally they may appear quite suddenly and be acute in nature (Roberta Weiss, 1999). The most common symptoms are double vision, fatigue, motor weakness, paresthesia, unsteady gait, and tremor and bladder/bowel dysfunction. (Kurtzke, J.F, 2005).

There are four types of MS. The majority of patients will start with the relapsing remitting type (80-90%). An attack is followed by a remission during which disability doesn’t progress. It lasts for 24 hours but usually lasts several weeks. (Eric Lim et al, 2007). The primary progressive MS characterized by continues worsening or steady progression, not interrupted by distinct relapses. The third type is secondary progressive MS which is characterized by relapsing remitting disease followed by progression with or without occasional relapse. The last type is progressive multiple sclerosis (Darcy A Umphred, 2013).

Recently two new and uncommon types were discovered, one of them called benign MS, it’s a form of the condition in which a person has MS for several years without developing any severe disability. The second type called malignant MS or Marburg MS, it’s a rapidly
progressive disease course with severe relapses within five years after diagnosis (Multiple Sclerosis Association of America, 2016).

1-2 Justification:

Multiple Sclerosis is a neurological disease that have

Most of the patients who suffer from multiple sclerosis in Sudan they focused on the medical treatment and forget completely about physical therapy because it’s a new field, so they have lack of knowledge about the role of physical therapy.

Those patients who comes to physical therapy clinics, they get treatment from physical therapist that focus on strengthening, balance and coordination exercises mainly, and the aerobic exercises are neglected. Which have an impact on decreasing fatigue that considered as the main complain of most of Multiple Sclerosis patients (60%-90%). (National MS society, 2016). Fatigue affect MS patient’s normal life and decrease his/her physical activity as well as decrease their ability to walk for long distance.

This study will give better understanding and high light the effect of aerobic exercises in patients with multiple sclerosis with main compliant of decreasing walking ability secondary to fatigue.

1-3 Research Question:

Does aerobic exercise significantly increase walking ability secondary to fatigue in patients with Multiple Sclerosis?

1-4 General objective:

To determine the effectiveness of aerobic exercises program in patients with Multiple Sclerosis with main compliant of decreasing walking ability secondary to fatigue.

1-5 Specific objectives:

To examine the improvement on walking ability of patients with multiple sclerosis to be independent in their daily activities and to improve their lifestyle by decreasing the fatigue that associated with multiple sclerosis and increasing their physical fitness.
2-1 Definition of Multiple Sclerosis:

Multiple sclerosis (MS) is an inflammatory condition affecting the myelin sheath of CNS but not peripheral neurons. Axons are probably spared, at least in the early course of the disease. MS may present as benign disease, follow a relapsing and remitting course or show inexorable progression from the outset (John S. Axford, 2004). It is also known as disseminated sclerosis due to disseminated spot of demyelination in the brain and spinal cord (Julie A. Pauls., 2004).

2-1-1 Pathology:

Areas of demyelination are found in the white matter of the brain and spinal cord. These are called plaques. The lesions lie in close relationship to post-capillary venules (prevenular). There is myelin destruction with relative preservation of axons. An inflammatory infiltrate containing mononuclear cells and lymphocytes is found. The most common sites of plaques are in the grey-white boundary in the cerebrum, the periventricular regions of the cerebral hemispheres, cerebellar white matter, optic nerves and cervical cord of the spinal cord and brain stem, but the disease can involve any part of the CNS (Herndon.R, 2003). Active lesions may have an associated inflammatory response and edema. In more chronic lesions, the edema and inflammation has resolved and there is demarcated area of gliotic scarring, with atrophy and axonal loss (Geraint Fuller, Mark Manford, 2010).

2-1-2 Pathophysiology of MS:

The area of demyelination disrupts the conduction of a nerve impulse, this initially blocks conduction, but with recovery conduction is slowed and the refractory period is prolonged. Conduction along such segment is particularly sensitive to temperature changes and may fail if temperature rises (Geraint Fuller et al., 2010).

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cervical cord of the spinal cord and brain stem, but the disease can involve any part of the CNS (Mahinda Yogarajah, 2013).

2-1-3 Epidemiology:

The onset of MS usually between 20-40 years, the average onset of condition being at 30 years of age. Onset before adolescence or after 60 years is very rare (ERIC LIM et al., 2007). The disease is more common in women than in men by a ratio of 2:1 to 3:1 (Mahinda Yogarajah, 2013). While MS is present in all regions of the world, its prevalence varies greatly, being highest in North America and Europe (140 and 108 per 100,000 respectively) and lowest in Sub-Saharan Africa and East Asia, at 2.1 and 2.2 per 100,000 respectively. (Multiple sclerosis international federation, 2016). It is incidence ranging from 2 to 10 cases/100,000 persons/year, a north-south gradient was found, lower incidence being closer to equator, 5 in 100,000 in the UK. (Livia Candelise, 2007). Scotland has the highest incidence of MS in the world (12 per 100,000). (ERIC LIM et al., 2007). There are also ethnic differences. MS mainly affects white people, especially those of Nordic origin. It is very rare with black and Asian populations (Nicholas A.Boon et al., 2006). Regarding to the genes 15% of MS patients in the UK have an affected first degree relative, and people with MS have a 1% chance of developing the disease. Concordance rates are 25% for monozygotic compared with 3% for dizygotic twins (Nicholas A.Boon et al., 2006).

2-1-4 Etiology:

A combination of a genetic predisposition and environmental factors appear to be important in the etiology of MS. There is an association HLA-DR2 in the most northern European countries.

There is increased immunological activity in the CNS (CSF lymphocytosis, synthesis of monoclonal antibodies producing oligoclonal IgG bands in the CSF, raised CSF protein and reduced suppressor T cells during a relapse) but the cause of this is not known (National multiple sclerosis society, 2016).

2-1-5 Multiple sclerosis’s prognosis:

The overall life expectancy of patients with MS is shortened by 5-7 years, however, the disease process is very variable and ranges from no disability and few relapses to frequent relapses, rapid progression of disability and early death (ERIC LIM et al., 2007).

The main indicator of a poor prognosis is the onset of the progressive phase of disease. Other indicators include frequent relapses in the first 2 years, short intervals between attacks and female sex (ERIC LIM et al., 2007).

Mortality as a direct consequence of MS is uncommon, although it has been estimated that the 25 years survival is only 85% of expected. Death can occur during an acute MS attack, although this is rare. More common death occur as a complications of MS as well as from suicide (Srephan L.Hauser, 2006).

2-2 Signs and symptoms of MS:


• Walking (gait) difficulties: Related to several factors including weakness, spasticity, loss of balance, sensory deficit and fatigue. Gait and balance impairments increase the risk of falls and fall injury. Approximately half of patients with MS report recent falls. (Thompson AJ et al., 2000).

• Fatigue: it present in up to 90% of MS patients and 40% of patients consider it their most common symptom. It can significantly interfere with ability to function at home and work, and may be the most prominent symptom in a person who otherwise has minimal activity limitations (Susan B.O’Sullivan et al., 2014).

2-3 Multiple sclerosis and fatigue:

Fatigue is a subjective lack of physical and/or mental energy that is perceived by the individual or caregiver to interfere with usual and desired activities (Fisk et al., 1994). It is recognized as the most common symptom of MS (Schwid SR, 2002). Surveys and case control studies indicate that 75 to 95 %of individuals with MS experience fatigue and 50 to 60 % report fatigue as one of their worst problems (Freal et al., 1984; Murray, 1985). In fact, fatigue is one of the two major reasons for unemployment among people with MS. The Social Security Administration responded in 1986 by adding fatigue to the list of causes of MS-
related disability in the code for disability impairments (Edgley et al., 1991; Jackson et al., 1991). The cause of fatigue is currently unknown (Freial et al., 1984).

**Types of fatigue in MS:**

**Normal muscular fatigue:**
Is to be expected after any physical/muscular exertion, but arises more rapidly for people with MS. A person with MS consumes more energy during a normal activity such as walking compared with a healthy person. Therefore it is important to find a balance between physical activity, rest and daily events (Olgati R et al., 1988).

**Compensatory fatigue:**
With MS, the stronger muscles compensate for the weaker muscles by taking more of the physical strain. This extra muscular work can lead to overexertion and tiredness (Zetterberg L et al., 2000).

**Fatigue due to depression:**
A loss of energy, desire and motivation is manifest problem of depression. These feelings add to general physical tiredness, usually leading to reduced physical activity and increased fatigue (Bakshi R., 2000).

**Cognitive fatigue:**
Half of those with MS are cognitively affected. Tiredness may affect the cognitive function for persons with MS. This is often referred to as cognitive fatigue. A short rest usually alleviates the problem (Krupp LB, 2004).

**Cardiovascular fatigue:**
Reduced fitness owing to inactivity leads to tiredness/reduced endurance. Swimming, water exercises, cycling and walks will boot endurance and reduce tiredness (Mostert S et al., 2002).

**MS related muscular fatigue:**
Individuals with MS require a longer period of recovery following exertion. Consequently, it is important to know one’s personal limits. Sub-maximum effort is recommended. Persons with MS must allow themselves short breaks to gain new strength. For a person with MS to be able to continue working, it may even be necessary to reduce the number of working hours to allow time for physical activity and exercise (Johansson S et al., 2007).

**General fatigue with or without drowsiness:**
Individual with MS often have an increased need for sleep and may feel extremely tired despite having had a good night’s sleep. In addition, those with MS often describe a feeling of mental and physical fatigue that is quite different from normal drowsiness (Romberg A et al., 2007).

2-4 Multiple sclerosis subtypes and clinical disease course:

2-4-1 Relapsing –remitting MS (RRMS):

RRMS is the most common disease course, approximately 85% of people with MS are initially diagnosed with RRMS (Susan B.O’Sullivan et al., 2014). An attack (relapse) is followed by a remission during which disability does not progress. A relapse lasts for 24 hours but usually lasts several hours and the recovery can be partial or complete (Confavreux,C, 2000).

2-4-2 Primary progressive MS (PPMS):

Is a form of MS with no history of relapse or remissions and a slow and insidious course (ERIC LIM et al., 2007). It occurs in approximately 10% of people with MS (Liblin.F, 1996).

2-4-3 Secondary progressive MS (SPMS):

SPMS follows an initial relapsing- remitting course. Followed by a change in clinical course with progression to steady and irreversible decline with or without continued acute attacks. It occurs approximately 15% of people with MS are diagnosed with SPMS (Susan B.O’Sullivan et al., 2014).

2-4-4 Progressive Relapsing MS (PRMS):

It is characterized by steadily progressing disease from the beginning and occasional exacerbations along the way. People with this form of MS may or may not experience some recovery following these attacks (Swedish organization, 2016).

2-4-5 Malignant MS:

Is an extremely aggressive form of MS and its consider very rare, this type of MS develops swiftly and initiates a relatively quick decline toward significant disability within weeks or months after an initial attack (Disability Benefits Center organization, 2017).

2-4-6 Benign MS:
People who diagnosed with MS they can say they have a benign type after they have gone 15 years or so without symptoms and they have little or no disability. A diagnosis with benign MS doesn’t guarantee that those people will be free from problems, they might still have fatigue or problems in thinking and memory (MS society, 2016).

2-5 Differential diagnosis:

The differential diagnosis of MS includes:


Other lesions affecting a single site in the CNS that may relapse and/or remit: tumour, arteriovenous malformation of the brain, brainstem or spinal cord, cervical spondylosis. (Bernadette kalman et al., 2008).

2-5-1 Initial investigations:

Patients who present with gradually progressive neurological symptoms may have a surgically treatable lesion, and it is important to exclude this before confirming the diagnosis of MS, so the investigation includes haematology, diagnostic MRI of the brain and spinal cord, CSF examination and Urodynamic, cystoscopy as well as renal and bladder ultrasound (Christonpher haslett et al., 1999).

2-6 Management of multiple sclerosis (MS):

2-6-1 Medical management:

There is no cure for MS and treatment is aimed at relieving symptoms, preventing relapses and delaying disease progression (Stuart Porter, 2008). Generally there are drugs used to reduce the duration of relapse such as methylprednisolone (oral or intravenous) and IFN (intramuscular injection). Other modifying agents can be used to treat the symptoms include as examples: Diazepam for spasticity, Modafinil for fatigue, Hycosamine sulfate for bladder dysfunction, amitriptyline for pain, Amitriptyline for depression, myosoline for tremor, Sildenafil for erectile dysfunction and laxative drugs to treat constipation (Srephan L.Hauser, 2006).

2-6-2 Physical therapy intervention:
The key to any successful intervention is a comprehensive and ongoing assessment of the person’s difficulties and needs (Ko Ko, 1999). A coordinated interdisciplinary approach is also crucial is the condition is to be managed effectively. The main aims of any physiotherapy intervention must be to keep the individual as functionally independent as possible (Motl RW et al., 2005). In order to do this, often in the face of potential increasing loss of function, it’s vitally important that the physiotherapist works with the person on a psychological, as well as a physical level (B.S.Oken, M.Hass et al., 2004).

**Treatment/Management**

- Provide sensory retraining for a client with diminished sensation. Techniques may include vigorous rubbing, tapping, or use of alternate sensory systems to provide feedback. E.g., biofeedback can provide alternate visual or auditory feedback.
- Treat spasticity with use of therapeutic exercise, modalities, and positioning. Modalities can include cold therapy, provide stretching and ROM on land or in water. Relaxation techniques, selected proprioceptive neuromuscular facilitation (PNF) techniques like rhythmic initiation, neurodevelopment key point of control or other techniques can be used to reduce tone. Positioning should include the use of postures that reduce tone, facilitate the antagonist of the spastic muscle.
- Functional electrical stimulation and biofeedback procedure can also be use to inhibit spasticity or treat lack of muscle tone and treat musculoskeletal pain (Julie A.Pauls et al., 2004).
- Exercise prescriptions will vary with each clients individual needs and can include resistive training and with progressive resistance exercise or isokinetic. Tone reduction activities are more appropriate if spasticity overrides.
- Instruct the client in energy conservation techniques, offer a low stimulation environment.
- Gait training: strengthen weakened areas, such as quadriceps; prescribe assistive device and orthosis as needed, such as ankle-foot orthosis, rocker shoes, or modified Danish clogs, canes, crutches, or walkers.

**Managing of fatigue:**

2-6-2
Therapists are faced with balancing act on one hand prescribing exercise, while on the other hand avoiding overwork and development of fatigue (Yvonne C.Learmonth et al., 2014). Aerobic exercise training and energy effectiveness strategies (this can include modifying the task or modifying the environment to ensure successful completion of daily activities) are central to any intervention plan to lessen fatigue (Erin M.Snook et al., 2008). During exercise prescription and physical therapy sessions, it’s imperative that skilled therapist recognize the difference between MS-related fatigue and expected exercise related fatigue (Krupp et al., 1988). Aerobic exercise has an affective role on the treatment of fatigue in multiple sclerosis patients (Shandrea Hubbs, 2012).

2-6-2-1 Aerobic exercise training:

Aerobic exercise training or conditioning is augmentation of the energy utilization of the muscle by mean of exercise program (Dr Jack H.Petajan et al., 1996). The improvement of the muscle’s ability to use energy is a direct result of increased levels of oxidative enzymes in the muscles, increased mitochondrial density, size and increased muscle fiber capillary supply (Carolyn Kisner, Lynn Allen Colby, 2012). Training is dependent on exercise of sufficient frequency, intensity, and time. It produces cardiovascular and/or muscular adaption and is reflected in an individual’s endurance as well as Training for a particular sport or event is dependent on the specificity principle that is, the individual improve in the exercise task used for training and may not improve in other tasks. For example, treadmill running may enhance one’s performance in running events but may not improve one’s performance in swimming (M Van den Berg,H Dawes et al., 2006).

Chapter Three

1. Methodology

3-1 Study design:
Prospective non-randomized Case study

3-2 Area:
Physical Therapy Department gem, Ahfad University for Women, Omdurman, Khartoum, Sudan.

3-3 Study Population:
3-3-1 Inclusion criteria
- Patients with MS
- Age between (30-50)
- Males or females
- Able to walk

3-3-2 Exclusion criteria
- Patients who have fracture.
- Bed ridden patients.
- Patients with musculoskeletal disorders.

3-4 Sample size:
Three patients

3-5 Data collection method:
3-5-1 Procedure:
The patients went through an aerobic exercise program for 12 sessions in a period of one month. The aerobic exercise program was walking, its intensity and duration was individually adjusted according to each patient with warm up period of 10 minutes and 15 minutes cool down.
Six minutes walk test and fatigue assessment scale were used to assess the patients in the first and last session to get the result.

3-6 Data collection techniques:
3-6-1 Primary:
3-6-1-1 Six Minutes’ Walk test:
6MWT is one of the most popular clinical exercise tests, it’s a practical simple test that requires a 100-fit hallway but no exercise equipment or advanced training for technicians. The test should be performed indoors, a long, flat, straight, enclosed corridor with a hard surface that is seldom traveled. If the weather is comfortable, the test may be performed outdoors. The walking course must be 30 m in length and its duration is 6 minutes. It’s a useful measure of functional capacity. (Ild care foundation, 2014).

3-6-1-2 Fatigue assessment scale:
It’s for the assessment of fatigue, it consist of 10 statement that the patient circle one of the five options that follow each statement the options are (Thoracic organization, 2002).

1= Never  2=Sometimes  3=regularly  4=often  5=always

(Appendix No.4)

3-6-2 Secondary:

PubMed library, Pedro website and relevant books.

3-7 Data analysis:

By using SPSS and Excel software.

3-8 Time frame:

The study was conducted in a period from August 2016 till February 2017.

3-9 Ethical consideration:

Ethical clearance for the study was granted by approval from Ahfad University for Women research committee. A written inform consent given to the participants and signed by themselves or their caregivers. (Appendix NO.5)

Chapter Four

4. Result

Non-randomized case study involved 3 patients with multiple sclerosis one female and two males, their age ranged between (30 -50) they went throw an aerobic exercise program to increase their walking ability.
Figure (1): general information about patient’s gender

General information about patients gender are showed in figure (1), as 66.6% of patients were males, where as 33.3% of patients were females.

Figure (2): general information about patient’s age.
The general information patient’s age in this study is showed in figure (2) as 66.6% of patients age between (30-40), whereas 33.3% of patients age between (40-50).

Figure (3): fatigue assessment scale results for the three patients.

- Result of fatigue assessment scale for the three patients before and after the 12 sessions of aerobic training where there fatigue decreased as showed in figure (3), the first patient was 60 and decreased up to 25, the second patient was 62.5 and decreased up to 17.5 and the last patient was 55.5 and decreased up to 32.5.
Figure (4): percentage of improvement of Fatigue Assessment Scale for the three patients.

- The percentage of patients improvement in fatigue assessment scale for the three patients increased in the first patient was 58% where as the second patient was 72% and for the last patient was 42% as showed in figure (4).

Figure (5): Six Minutes Walk Test result for the three patients before and after the 12 sessions.

- Result of Six Minutes Test for the three patients before and after the 12 sessions of aerobic training, where there walking ability increased as showed in figure (5), the first
patient was 280 and increased up to 340, the second patient was 400 and increased up to 420 and the last patient was 440 and increased up to 460.

Figure (6): percentage of improvement of Six Minutes walk Test results for the three patients.

- The percentage of the patient’s improvement in 6MWT for the three patients increased, in the first patient was 21% where as in the second patient was 5% and for the last patient was 4% as showed in figure (6)
Table (1): Fatigue assessment scale and six minute walk test results before and after the treatment for the whole group.

<table>
<thead>
<tr>
<th>Assessment</th>
<th>mean</th>
<th>STD</th>
<th>Sig =.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>fatigue assessment scale before treatment</td>
<td>34.1667</td>
<td>11.27312</td>
<td>6.50854</td>
</tr>
<tr>
<td>fatigue assessment scale after treatment</td>
<td></td>
<td></td>
<td>.034</td>
</tr>
<tr>
<td>six mint walk test before treatment</td>
<td>-</td>
<td>11.54701</td>
<td>6.66667</td>
</tr>
<tr>
<td>six mint walk test after treatment</td>
<td>33.3333</td>
<td></td>
<td>0.038</td>
</tr>
</tbody>
</table>

STD: standard deviation
Sig: significant

Comparison for six minute walk test and fatigue assessment scale results for the whole group before and after the treatment as presented in table (1) and, there was a significant improvement in six minute walk test with P value 0.34 and fatigue assessment scale with P value 0.38.

5. Discussion

Multiple sclerosis is potentially disabling disease of the brain and spinal cord (CNS). In MS the immune system attacks the protective sheath (myelin) that covers nerve fibers and cause communication problem between the brain and the rest of the body. (Mayoclinic organization, 2015).

This study was conducted in Ahfad University for women in 3 patients with multiple sclerosis were chosen non-randomly and they went through an aerobic exercise program.

Demographic characteristics of patients in the current study show that predominance of male when compared to females with ratio of 2:1 (66.6 versus 33.3%). But difference findings were reported by several studies showed that MS is most common in females more than males, in the current study the reasons might be due to psychological, financial & cultural issues because 4 females patients refused to join in the study due to same previous reasons.
as well as most of them were in adult age; 66.6 of them had age of 30-40 years, followed by patients in the age of 40-50 years who represented 33.3%.

Fatigue and walking ability were assessed to the all patients before start of treatment, and significant difference was reported in general (P value > 0.05). Outcome of treatment (an aerobic exercise) in all patients showed an obvious improvement which was revealed by significant difference before and after treatment.

Regarding walking ability which assessed by Six Minutes Walk Test showed a significant improvement with P value (0.038) for the whole group. The first patient walking ability improved in 6MWT from 280 up to 340 which is 21% of improvement, the second patient improved in 6MWT from 400 up to 420 and his improvement was 5%, the last patient improvement was from 420 up to 460 which considered 4%. Similar findings was reported by (Kileff J, Ashburn A, 2005) who investigated the effect of aerobic exercise on people with moderate disability MS, they involved 8 patients with multiple sclerosis for a period of 12 weeks that revealed a significant improvement in 6MWT (P value =0.046).

On the other hand Fatigue was assessed by Fatigue assessment Scale which showed a significant result regarding decreasing patients fatigue with p value (0.034) for the whole group, the first patient fatigue decreased from 60 to 25 which is 58% of improvement, the fatigue of the second patients was decreased from 62.5 to 17.5 which is 72% of the improvement and the third patient fatigue was decreased from 55-32.5 which is 42% of the improvement. this results is supported by randomized control trail study done by (Dr Jack) showed that aerobic training has a positive impact in improving fitness and other factors related to quality of life for patients with multiple sclerosis (Dr Jack H.Petajan, et al.,1996).

The results of the current study are farther supported by (Shandrea) in randomized control trail study about the Effectiveness of an aerobic exercise program as measured by the six minute walk test and subjective fatigue scales in patients with multiple sclerosis with a primary complaint of decreased walking ability secondary to fatigue which involved 15 patients with multiple sclerosis for a period of 12 weeks (Shandrea Hubbs, 2012).

Our study adds important data on exercise responses in MS. Previously, two randomized studies have examined the effects of regular exercise in MS patients (B.S.Oken et al., 2004). Like our study, one of them used aerobic training under supervision as an intervention but their exercise period was longer than ours (M Van den Berg,H Dawes,et al,2006 ).
Chapter Five

5. Conclusion and recommendation

5-1 Conclusion

The results of this non-randomized case study show that short-term exercise lead to significant and clinically meaningful changes in the walking speed of patients with mild to moderate MS. This was accompanied by significant improvements in fatigue assessment scale and six minutes’ walk test. The result confirm that aerobic exercises are effective and must be recommended for patients with MS.

5-2 Recommendations:

Furthermore studies must be done to:

1- Study the prevalence of Multiple Sclerosis in Sudan.
2- Increase patient’s awareness about multiple sclerosis.
3- Increase physicians and patients awareness about the role of physical therapy for patients with multiple sclerosis.

5-3 Limitations:

The first idea for the type of the research was a randomized control trial so we can compare between two groups those who receive physical therapy treatment and those who don’t receive physical therapy treatment, and then we changed the type of research to a case study because there was a lack of patients with the condition.

We went to a lot of hospitals, we found in some and didn’t find in others and these hospitals are Police Hospital, Military Hospital, Ebrahim Malik Hospital, Bashir Hospital, Omdurman Hospital, Zain Medical Center and Modern Medical Center.

Limitations for case1:

The patient was obese so she faced difficulties in walking and get fatigue easily in addition to Multiple Sclerosis associated fatigue.

Limitations for case2:

There was a difficulty in communication with this patient because he has difficulty in speech
References


56- Swedish organization, 2016. Subtypes of MS
58- Thoracic Organization, 2002. 6MWT