

Use of Aerobic Exercise as an Adjunct to Conventional Therapy in the Management of an Older Adult with Chronic Low Back Pain in Nigeria: A Case Report

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Abstract

Treatment preferences utilized by most physical therapists on adults with LBP in Nigeria often do not adhere to global clinical practice guidelines, which include aerobic exercise. This case report describes the utilization of aerobic exercise within a conventional multimodal treatment approach in the management of chronic LBP for an older adult living in Nigeria. Baseline measures of NPRS, ODI, RPE, and lumbar range of movement were taken at the initial visit. Subsequently, the intervention combined a walking aerobic exercise both overground and, on the treadmill, with other therapies (e.g., directional preference exercises, strengthening exercises) for 16 sessions over four weeks. Following 16 sessions, clinically meaningful improvements in pain, disability, lumbar range of motion, and rate of perceived exertion were observed. The patient complied, reported no side effects, and had positive feedback regarding the intervention. The utilization of aerobic exercises within a conventional multimodal treatment approach is safe and could be useful for the management of chronic LBP in older adults.

Keywords: Aerobic exercise, Conventional management, Clinical practice guidelines, Low back pain, Physical therapy, Walking exercise.

Introduction

Low back pain (LBP) is recognized internationally as a major health problem with an estimated lifetime prevalence of 60.0% to 84.0%, giving it epidemic status worldwide [1]. Epidemiological reports indicate that 70.0% to 80.0% of people in western societies have at least one episode of LBP over their lifetime [2]. According to [3], 88.0% of Nigerians over the age of 60 have had at least one episode of LBP in their lifetime. LBP remains one of the most frequent reasons for visiting a general practitioner or physical therapist [4].

A high physical fitness level, especially muscle endurance in the back, is associated with a lower risk of back pain [5]. Ogden [4] and Patel [5] report that cardiorespiratory fitness decreases with age and is associated with a sedentary lifestyle; therefore, aerobic exercise—a type of repetitive, structured physical activity that requires the body's metabolic system to use oxygen to produce energy—has been prescribed to improve well-being in apparently healthy patient populations. Recurrent episodes are a common feature of LBP,⁶ with up to 35.0% of those with LBP developing chronic LBP [6].

Practice variation exists in the Physical Therapy (PT) management of chronic LBP across many countries [7]. Previous studies indicate treatment strategies may not always align with evidence-based practice, especially for older adults and particularly about use of aerobic exercises [8-10]. The 2021 LBP Clinical Practice Guidelines (CPGs) developed by the American Physical Therapy Association (APTA) provide recommendations for interventions delivered by PTs or studied in care settings that include PT providers [11]. The CPGs made recommendations for LBP including but not limited to risk factors, classification, examination, and interventions that incorporate physical activities. There are likely differences in factors that influence care delivery for LBP that impact the applicability of these recommendations across diverse settings. Factors such as differences in health systems, and socioeconomic determinants of health influence the application of these recommendations [11]. The APTA CPG recommended various interventions including exercise, manual and other-directed therapies, classification systems, and patient education. The exercise intervention category includes aerobic exercise, trunk muscle strengthening and endurance exercises, movement control exercises, trunk mobility and flexibility exercises, and multimodal exercise which combines two or more of these exercises [11]. Conventional management or therapy has been defined as the treatment method that is widely used and accepted by most health professionals in a particular region, locality, or setting [6, 12].

In some developing countries such as Nigeria, conventional management for LBP is mostly out of alignment with the globally established evidence-based CPG [6]. The conventional treatments that are utilized by most PTs in Nigeria likely result from the nature of their training, inadequate resources, a very limited supply of PTs for a population of more than 200 million and underfunding of the healthcare sector [9]. Most studies on the management of

LBP in Africa report the potential for adherence to good clinical practice; more than 70.0% of treatment sessions used multiple therapies and included McKenzie exercises, myofascial release, electrotherapy, and manual therapy [3, 13, 14]. Some studies showed high use of electro-physical modalities, massage, and mechanical traction (45.0-83.0%). Greater variation exists in the use of therapeutic exercises, excluding aerobics, (15.0%-83.0%) and patient education/advice (10.0-90.0%) [9]. The use of aerobic exercise (10.0-20.0%) and manual therapy was relatively low (8.0-33.0%). Consequently, the purpose of this case report was to describe the utilization of aerobic exercise within a conventional multimodal treatment approach in the management of chronic LBP for an older adult living in Nigeria.

Methods

The Head of the Physiotherapy Department at General Hospital Minna, Nigeria, authorized this case report. The patient provided informed consent to use their health information for this case report. This case report is essentially a descriptive report on the use of aerobic exercise along with other multimodal interventions in managing an older adult with chronic LBP. The methodological approach was to ascertain the medical state of the patient at the initial presentation using reliable and validated measures then subsequently institute an intervention program for a prescribed number of treatment sessions.

History

The patient was a 68-year-old male retired middle school principal and owner of a poultry farm. He presented to Physical therapy (PT) with a diagnosis of LBP and a referral from an orthopedic surgeon at a private facility.

Signs and Symptoms

At the initial PT evaluation, the patient was presented with a three-year history of LBP which had started insidiously after sitting and presiding over several school management

meetings, lasting more than 3 hours. The patient rated his pain as 9/10 at its worst and 6/10 at its best using the Numeric Pain Rating Scale (NPRS). The pain in his back was the highest when he woke up, sat for more than 30 minutes, or after bending on the poultry farm to pick eggs. The patient reported easy fatiguability and LBP during multiple active movements, which suggested poor cardiorespiratory fitness.

Medical History

The patient's medical history included cervical osteoarthritis, painful shoulder syndrome, and benign prostate hyperplasia. He had normal glycemic control and no high blood

pressure. Upon his initial visit, a systems review was performed by the attending PT. There were no abnormal findings in the nervous, cardiovascular, or integumentary systems. He had normal sensation globally, normal superficial (planter) reflex, and hyporeflexia on deep (knee-jerk) reflex. On palpation, he had pain (5/10) along L3-L5 and reduced lumbar range of motion. His magnetic resonance imaging of the lumbar spine without contrast indicated mild multilevel (L3/4, L4/5) changes of lumbar spondylosis with no high-grade compressive discopathy at any level. Table 1 describes the results obtained from the systems review.

Table 1. Systems Review

System	Observation
Cardiovascular / Pulmonary	BP 130/80 (mmHg); HR 76(bpm); RR 24 (cpm) with normal chest excursion
Neuro-musculoskeletal	Symmetry: Patient stands with a lateral shift. Weight shifted to the left lower extremity.
	Gross muscle power: 5/5 globally.
	ROM: Full and pain-free globally but reduced in lumbar flexion and right lateral flexion
	Sensation intact globally
	Reflex: 1+ knee jerk; 2+ ankle jerk
	Walked with an antalgic gait pattern with a slight left thoracic tilt;
	Slightly increased muscle tone of the lumbar paraspinals.
	Pain with palpation L3-L5 spinous and transverse processes
Integumentary	Unremarkable
Cognition, Language, Communication	Not impaired. PT demonstrated no barriers to learning and was fluent and meaningful in speech.

Note: Blood pressure (BP), Heart rate (HR), Cycles per minute, Range of motion (ROM), Lumbar (L).

Medications and Prior Treatments

An orthopedic surgeon had prescribed the intermittent use of a lumbosacral corset to help with his pain. The patient's medication regime at the initiation of PT included Celecoxib (200mg, two times a day), Tizanidine (2mg, two times a day), and acetaminophen (1g, three times a day). He had no serious hobbies and appeared to have a mostly sedentary lifestyle.

Clinical Impression 1

The patient's sedentary lifestyle increased his likelihood of developing heart disease and Type 2 Diabetes in association with his diagnosis of chronic LBP. Possible differential diagnoses included strains or sprains of his lower back muscles and ligaments, spondylolisthesis of the lumbar vertebrae, a postural syndrome, a dysfunction or derangement syndrome, a

herniated disc, lumbar stenosis, and/or sacroiliac joint pathology.

The examination plan was to assess the patient using the McKenzie, straight leg raise, vertical oscillatory pressure, lower limb strength testing, sensation testing, joint range of motion, pain rating using the NPRS, and the Oswestry Disability Index. The patient was a good candidate for the case report because he did not have any serious co-morbidities that would preclude the performance of aerobic and other exercises.

Examination and Evaluation

The patient was observed walking with a slightly antalgic gait pattern and had a mild left lateral shift of the trunk. His vitals were: blood pressure 130/80 (mmHg); heart rate of 76(bpm); and respiratory rate 24 (CPM) with normal chest excursion. The patient was alert and oriented to person, place, and time. He reported right LBP while seated. He described the pain as “burning” and rated it at 8/10 on the NPRS.

Tests and Measures

Tests and measures were assessed at the initial visit, after 10 treatment sessions, and at the end of the four-week treatment plan before discharge.

The first part of the examination took place during the initial visit (i.e., the first treatment day) and was based on Mechanical Diagnosis and Therapy (MDT). The patient was asked to perform forward flexions, left and right lateral flexions, and extensions of the lumbar spine while standing. Right lateral flexion and forward flexion produced his comparable sign [15].

Vertical Oscillatory Pressure (VOP)

The VOP is a derivative of manual therapy and applies a vertical manipulative gentle thrust on the vertebrae for both diagnosis and treatment of LBP [16]. It serves as a diagnostic provocative spring test for identifying trigger points along the vertebral column. The patient was asked to lie prone on the treatment plinth. He received VOP on each vertebra from the first

lumbar to the last sacrum. An NPRS of 8/10 was reported at L3-5. There was also tenderness on palpation along the lumbar paraspinal muscles, which were worse on the right side.

The Straight Leg Raise (SLR) Test

SLR is a commonly used test to identify impairment in disc pathology or nerve root irritation [17]. The SLR was performed with the patient in a supine position without a pillow under his head. The patient’s leg was gently raised by flexing the hip with the knee in extension. The additional maneuver of concomitant ankle dorsiflexion was introduced.³⁹ At 90 degrees of hip flexion, there was no tightness, comparable sign, or any irritation reported. The test was repeated actively by the patient and remained negative [17].

Manual Muscle Tests (MMT)

The patient’s muscle strength was 5/5 for all extremities. Additionally, all joint ranges of motion were within normal limits, except lumbar flexion and right-side flexion. There were no impairments in general sensation for light or deep touch, pain, or proprioception globally. Deep tendon reflex of the patient’s lower extremities was assessed. The quadriceps knee jerk (L4) showed bilateral hyporeflexia (1+).

Oswestry Disability Index (ODI)

This patient self-report questionnaire gives a percentage score for the level of function or disability for those with LBP. The ODI paper form was filled out by the patient. He reported the following scores: pain intensity (3), personal care (1), lifting (2), walking (2), sitting (3), standing (2), sleeping (0), sex life (1), social life (3), and traveling (3). His total score at the initiation of PT was 20 out of a possible 50 (40.0%) putting him in the moderate disability category [18]. Body Mass Index (BMI): The patient weighed 82kg and was 1.7m tall, putting him in the overweight range for BMI (28.7kg/m²). The patient’s prognosis was good. The patient’s short- and long-term goals for management are highlighted in Table 2.

Table 2. Short- and Long-Term Patient Goals

Time Frame	Goals
Short Term	Patient should get a lower score on the ODI as treatment progressed.
	Patient should be able to stand, walk and sit for as long as possible without any pain
	The patient will become independent in his HEP within 2 weeks, including self-management techniques, to reduce his pain at home and improve his ability to perform ADL.
	Wake up from sleep without pain
Long Term	He should have a low back with 0/10 on the NPRS and feel healthy and pain-free in all his ADL.
	He wanted a normal gait pattern without movement restrictions.
	Patients should be able to sit to stand without pain. Walk for >2hrs pain-free

Note: Oswestry Disability Index (ODI), Activities of daily living (ADL), Home exercise program (HEP)

Intervention

The PT intervention selected for the patient was the use of aerobic exercise in combination with multimodal LBP treatment preferences for PTs in Nigeria [9]. The intervention plan included 30 minutes of aerobic exercise (i.e., walking) five days a week, based on the recommendations of the “gold standard” Physical Activity Guidelines for Americans [19]. Other interventions included conventional multimodal intervention for chronic LBP: McKenzie Method, therapeutic exercises, soft tissue massage, electrotherapy (interferential current or IFC) to promote healing and decrease pain, and a home exercise program (HEP). The period of aerobic exercise on the treadmill was supervised by the PT or the nurse aid attached to the unit. During other therapeutic exercises, the PT was always present to instruct and provide cues.

Aerobic Exercise: Walking

Walking is a rhythmic, dynamic, aerobic activity of large skeletal muscles that confer multifarious benefits of health with minimal adverse effects [20]. Some spinal muscles also act in the lower back and actuate walking by providing vertical support and forward

progression of the mass center. Walking regularly in sufficient quantity and faster than customary develops and sustains physical fitness, cardiovascular capacity, and endurance (i.e., stamina) for bodily work and movement in everyday life.

The patient in this case report was educated on how to execute an overground walking exercise program. He started with an initial five-minute warm-up by walking slowly at a pace of about 2 miles per hour followed by some gentle stretches, including a standing hamstring stretch, quadriceps stretch, back extension, and shoulder and neck roll [21]. This was followed by a sustained brisk walk at 3-4 miles per hour, for a total of 30 minutes [21]. Each session during the weekday commenced with this 30-minute walk in the park, which he performed between 7 am and 8 am. He was educated in comfortable exercise clothing and appropriate exercise footwear. He reported bilateral quadriceps and right hamstring soreness after the first walking session, which later resolved. He then visited the hospital outpatient physio-gymnasium at 9 am for 30 minutes of in-clinic treatment consisting of four categories of interventions: MDT, manual therapy, including soft tissue massage; therapeutic exercises; and IFC. The in-clinic treatment is described below.

During the weekend clinic, each session lasted 60 minutes and consisted of 30 minutes on the treadmill. The treadmill was set at 2 miles per hour for a normal walking pace for five minutes to warm up; then the patient performed some stretches.

He continued the treadmill without any inclination at a speed of four miles per hour for 15 minutes. At the end of the treadmill session, he commenced a 30-minute in-clinic treatment session consisting of four categories of interventions: MDT, manual therapy including soft tissue massage, therapeutic exercises, and IFC.

Home Exercise Program (HEP)

The patient was educated on a short session of exercises to be performed at home in the presence of his wife.

1. Jogging in place for five minutes to warm up and three minutes to cool down.
2. McKenzie's back extension exercises in standing, three sets of 10 repetitions.
3. Knee-to-chest stretches performed in prone lying followed by bridging, planks, and quadruped exercises (three sets of 10 repetitions each).

The safety outcome and extent to which the patient complied with the recommendations and exercise instructions, especially during his HEP and aerobic exercise, were assessed by self-reported frequency, duration, and intensity of exercises [22].

Results

There was never a day when symptoms relapsed or worsened, as reported in his subjective assessments. Findings are described below and in detail in Table 3.

Table 3. Test and Measures

Test and Measure	Initial Evaluation Results	10th Session	Discharge Evaluation Results
Pain at Low Back (NPRS)	9/10	5/10	2/10
ODI	40.0% moderate disability	40.0%	16.0% minimal disability
Borg's RPE	15*	10	10
MMT	5/5 globally	-	5/5 Globally
VOP/Spring Test	8/10 at L3-5	-	2/10 only at L4/5
SLR	Negative	-	Negative
Slump Test	Unremarkable	-	Unremarkable

* Retrospective assessment

Note: Numeric pain rating scale (NPRS), Oswestry disability index (ODI), and Borg's rate of perceived exertion (RPE). Manual muscle test (MMT), Straight leg raise (SLR).

McKenzie Assessment

On final examination and evaluation during the 16th session, the outcome of personal significance to the patient was the correction of his lateral shift, which resolved completely after the second visit. The pain centralized and only occurred slightly in the early morning and after prolonged sitting four to six hours.

Pain

The primary cause of complaint was the right LBP. At the initial visit, the pain was 8/10 on the NPRS; at discharge, the patient reported a central pain with a score of 2/10 and no right-sided pain.

Disability

At baseline measurement, an ODI score of 40.0% was computed (i.e., moderate disability). At the patient's 10th session, this score remained unchanged. During his tenth treatment session,

his LBP was 5/10 on NPRS with the spring test, MMT was 5/5 globally, and both the SLR and slump test were unremarkable.

However, the ODI was re-evaluated at discharge and the patient reported the following values in each category; pain intensity (2), personal care (0), lifting (1), walking (0), sitting (1), standing (1), sleeping (0), sex life (1), social life (1), traveling (1). His total score was eight (16.0%), or minimal disability [18].

Discussion

This case report describes the management of an elderly patient in Nigeria with a three-year history of LBP. The intervention used an aerobic conditioning program along with conventional multimodal interventions, which is usually not the standard practice in Nigeria. The key findings in this case study were: 1) observed improvements in pain level in the low back, 2) lumbar range of motion and alignment, 3) functional ability, and 4) cardiorespiratory fitness. Although some level of pain remained and case reports cannot determine effectiveness, these results suggest that the PT interventions provided in this case report helped the patient decrease pain and increase functional mobility after 10 sessions as evident in the NPRS, ODI, and RPE scales. The data from the outcome measures, shown in Table 3, reflect how a four-week treatment session employing multimodal interventions and aerobic exercise for a sedentary patient continued to produce good results and functional mobility at low cost to the patient. The combination of these therapies appeared to be safe for this patient. The prognosis for recovery for this patient in the short- and long-term were excellent based on the observed improvements in the four-week PT program and the lack of major co-morbidities that would indicate poor recovery.

There are several possible explanations for the observed clinical improvements related to the multi-modal therapy approach. First, considerations that may have positively influenced the patient's treatment include the

patient's low prior level of fitness, compliance with his HEP, good overall health, and the frequency of sessions (i.e., four times per week). Second, these interventions employed distinctive skill sets and utilized evidence-based practice while also acknowledging the variability observed in older adults, the region of clinical practice, and the interwoven care systems that impact outcomes; these are key characteristics of best practice [15]. Third, the pleasurable, therapeutic, psychological, and social dimensions of walking was evident for this patient; however, these factors have been under research [23].

The use of walking, especially in low- and middle-income countries, is beneficial through engendering improved fitness at low cost, greater physiological activity, and energy turnover. One limitation of this case report, inherent in the structure and purpose of case reports, is that case reports cannot determine the effectiveness of interventions. This case report only describes the clinical intervention without assessing the effectiveness of the combined approach employed for this patient, especially given his initial poor level of physical fitness. Second, there was no exercise treadmill in the government hospital where the patient was being treated. Third, at the initial evaluation, the level of intensity of the walking exercise for the patient was not quantified by any outcome measurement. The patient was asked to give a retrospective assessment using the Borg RPE scale (see Table 4). Furthermore, VO_2 max, the best indicator of cardiorespiratory fitness, should have been used instead of the Borg RPE as an outcome measure for aerobic exercise capacity given the sedentary status of the patient. However, the equipment used for this measurement is typically too expensive for hospitals in Nigeria, which preclude its widespread use.

High quality experimental studies, such as randomized controlled trials, are needed in Nigeria to compare the effectiveness of the management of LBP by combining aerobic

exercises with conventional therapies compared to using conventional therapies alone. Despite the need for further research, the information provided by this case report may be useful for PTs in managing similar patients in Nigeria with LBP through evidence-based approaches.

In summary, this case report described the management of an older adult patient in Nigeria with chronic LBP incorporating aerobic exercise as an adjunct to conventional multimodal interventions. While future research is needed, this case suggests that the utilization of aerobic exercise within a conventional multimodal treatment approach is safe and could be useful for the management of chronic LBP in an older adult living in Nigeria. Future research is needed to fully assess the effectiveness of this combined approach for LBP management in African countries.

Conclusion

Despite the need for further research, the information provided by this case report may be useful for PTs in managing similar patients in Nigeria with LBP through evidence-based approaches. For example, combining aerobic exercises with other modes of therapy by PTs,

especially when a patient has a poor level of fitness, cannot be overemphasized, and is clearly illustrated in this case report. Therapists in geriatric specialties, acute care, women's health, and almost any subspecialty in PT can utilize the systemic conditioning of patients through a structured aerobic program to support the overall wellbeing of individuals suffering from musculoskeletal conditions while employing other evidence-based approaches. PTs in Nigeria can use the established conditioning effects of aerobic training to improve cardiovascular endurance in patients, which may help address deconditioning that is common in patients with LBP.

Conflict of Interest

The authors hereby declare that there is absolutely no conflict of interest in this case report.

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