

# Physical Functionality of Knee Osteoarthritis Patients after A- 12 Week Exercise Programme in Ondo State, Nigeria: Coronavirus Risks Prevention Protocol Implication

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**Abstract**— Physical functionality entails performing basic activities of living independently. The knee joints play a major role. Knee osteoarthritis affects the load-bearing joints; managing it with exercise, during COVID-19 pandemic could be challenging. The study investigated any significant effect of exercise on physical functionality of knee Osteoarthritis patients after a 12-week exercise programme: COVID-19 risks prevention protocols implication. It also examined any joint contribution of demographic variables on participants' PF. Quasi-experimental design was employed. Four hospitals were purposively selected in Ondo State, Nigeria. A randomly selected sample size of 100 Knee osteoarthritis patients constituted the participants. Weight, height, BMI and 6MWT were examined. Data were analyzed using the frequency counts, percentages, t-test, and SPSS regression analysis. Findings revealed that most participants (55%) function moderately without stiffness after exercise, while a significant joint contribution of sex, age and BMI on PF existed with age of beta -.239; BMI of beta-.162. Regular walk enhances knee osteoarthritis management, notwithstanding COVID-19 restrictions protocols, various population should keep up regular walk to enhance physical functionality.

**Keywords**— Physical Functionality, Knee Osteoarthritis Patients, A 12-week Exercise, COVID-19 Pandemic, risks prevention Protocols.

## I. INTRODUCTION

The human body structure has been designed in such a way that enable functional movements, such as the squat, hinge, twist, climbing the stairs, gardening, and walking. The body relies on these movements to get things done on daily bases. The knee joint plays a major role in squat to pick up an object \ load from the floor and in walking from one place to another. If a person cannot perform these acts of movement conveniently without any difficulty, it is a signal to low level of knee joint functionality which may suggest knee osteoarthritis. Dias (2014), Oluremi et al. (2020) & DailyBurn (2021) posited that exercise is the foundation for healthy living and promotion of health and survival. Adequate levels of joint flexibility are needed for maintenance of functional independence and performance of activities of daily living such as bending to pick up a newspaper or getting out of the back seat of a two-door cars (Adeloye, 2020).

Physical functionality is the ability to perform both basic and instrumental activities of daily living independently. Lack of physical activity is associated with muscle weakness, pain, joint stiffness, fatigue, decreased range of motion, decreased

functioning and general deconditioning. Knee osteoarthritis (OA) is the most common type of osteoarthritis. Genetics, obesity and overweight, previous injury, repetitive strain on the knee, fractures, ligament tear, raises a person's risks to develop knee OA in which the subchondral bone (the bone layer underneath the cartilage in the knee) is affected and promotes further wear and tear. The knee joint is the largest joint in the body. The knee joins the thigh with the leg and consist of two joints: one between the femur and tibia (tibiofemoral joint), and one between the femur and patella (patellofemoral joint).

Osteoarthritis (OA) generally, presents as joint stiffness and pain. The end of the two bones that comes together are covered with protective tissues called cartilage. The shock-absorbing quality of a cartilage comes from its ability to change shape when compressed (Nelson, 2017). OA is a degenerative joint disease which occurs in adults of any age and it is a leading cause of disability in people over 50 years of age, although it can occur at any age and more common in women. It can be a debilitating form of arthritis, in that it tends to affect the load-bearing joints, especially the hips, and knees, that are crucial to normal movement (Veritas Health (2021) reported Meyer (2018) & Osteoarthritis (OA) Action Alliance (OAACTION) (2021).

Knee OA could be a major cause of disability because of the varying degree of pain, stiffness of the knee joint, limited range of motion and local swelling that is associated with it. The pain from knee OA is usually worse following activity, especially overuse of the affected knee. Stiffness can worsen after sitting for a prolonged period. Long period of inactivity causes the arthritic joint to stiffen and the adjoining tissue atrophies (waste away). As knee OA progresses, symptoms generally become more severe. At times, pain can become continuous rather than only when bearing weight (Dotdash, 2021, reported Eustice, 2020). One of the most beneficial ways to manage knee osteoarthritis is to get moving. It may be hurt to think of exercise when the joint hurts, movement is considered as crucial in the treatment plan. Simple activities such as walking around the neighborhood or having fun, yoga, tai chi and slow stretching exercises may improve joint flexibility, lessen stiffness and reduce pain. Aerobic exercise can aid in weight loss to decrease pressure on joints and reduce inflammation of the joint (Mann, 2018).

The OAACTION (2021) reported that overweight and obesity contributes to more severe symptoms and impact on OA especially at the knee. Excess body weight causes additional stress to weight-bearing joints, such as hip, knees, feet and back. To achieve the aim of body weight reduction, it is important to eat fewer calories and increase physical activity. The USA Department of Health and Human Services recommended 150 minutes of moderate exercise per week for every person (30 mins of moderately intense exercises 5 times per week to strengthen and stabilize the knee joint (WHO,2015). According to Mann (2018), Arthritis Foundation reported physical activity as the best available treatment for any form of arthritis. of course, it is one of the best ways to keep joints healthy.

Managing knee OA to increase physical functionality during COVID-19 pandemic may be more difficult and more important than ever. Citizens of all nations in the world and where millions of COVID-19 deaths were reported are being asked to practice social distancing; many social and physical outlets of everyday life, such as gymnasium and churches are closed (OAACTION, 2021). Nevertheless, it is not mandatory to join a gymnasium or have a formal workout plan to benefit. Activities like walking, gardening, aerobic dancing and floor scrubbing counts. Positive result is greatly achieved with consistent and progressive exercise programme adjusted for a person's age, fitness level and the activities the person enjoy most. The best defense against any disease or infection such as knee OA and COVID-19 are to develop a healthy lifestyle. What you eat, the way you eat, exercise, sleep mode, stress management, social interaction, smoking or drinking habit can have a tremendous influence, not just on overall health, but also on a person's joints health.

In other to lower the risks of COVID-19 susceptibility during exercise programme, OAACTION (2021) has recommended a guide for exercising at home during COVID-19 as follows: Pace around your home talking; See how far you can walk in 10 minutes, that is, how many laps you can take around your living room; march in place while holding on to a chair or railing. If you are used to measuring your walks in distance, try thinking about steps instead- 1 mile is about 2000 steps; See how many steps you can take during each commercial break of your favorite television show; Use a pedometer to record how many steps you get each day and try to increase your steps a little every week. It is important to take caution by watching for cords, rugs, and other tripping hazards around the house and hold on to the railing when going up and down stairs.

Furthermore, the 6 Minute walk Test (6MWT) has been reported as a submaximal test of aerobic capacity and endurance and could be programmed for a period of 12 weeks with aim of improving physical functionality of people with knee OA. According to American College of Rheumatology (2021), the 6MWT was developed in 1963 by Balke to evaluate functional capacity. It has been used as a performance-based measure of functional exercise capacity in healthy older adults and people undergoing knee or hip arthroplasty, rheumatic conditions such as knee or hip osteoarthritis. The 6MWT has been used to detect changes

following interventions to improve exercise tolerance for people with knee or hip osteoarthritis.

The aim of the test is to walk as fast as possible in 6 minutes. The individual walks along the hallway between the markers, as many times as he/ she can in 6min. AbilityLab (2021) reported that the participants will be notified as each minute goes past, and then be told to stop at the end of 6 minutes. The 6MWT is self-paced and involves measuring the distance a patient can walk on a level course (Hard, flat surface) in 6 minutes. The increasing acceptance of this test is due to its simplicity and does not require sophisticated equipment and can easily be performed by even the most severely debilitated patients. The 6MWT better reflects activities of daily living than other walk tests. In healthy individuals, the 6 minutes' walk distance ranges from 400m to 700m. The main predictor variables being gender, age and height (Elsevier, 2021). AbilityLab (2021) has reported Kenedy et al. 2005 's excellent test-retest (Intra class correlation) reliability of ICC= 0.94 for 6MWT on osteoarthritis patients.

Coronavirus disease 2019 or COVID-19 is highly infectious and deadly; it has been declared a global pandemic. Infected people have had a wide range of symptoms reported from mild symptoms to severe illness. Symptoms may appear 2-14 days after exposure to the virus. COVID-19 symptoms may present as: Fever or chills, dry cough, shortness of breath or difficulty in breathing, fatigue, fever, muscle or body aches, headache, new loss of taste or smell, sore throat, nausea or vomiting and diarrhea. If someone is showing any of these signs, it is necessary to seek for emergency. Also, such signs as: Trouble breathing, persistence pain or pressure in the chest, new confusion, inability to wake or stay awake, bluish lips or face (WHO, 2021).

Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness. It is important that you protect yourself and others from infection and stop the spread. The virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. Practice respiratory etiquette by coughing into a flexed elbow or tissue paper is advised. Proper regular hand washing with soap for about 20 seconds or/ and rub an alcohol-based sanitizer could help. Avoid touching the face, nose and mouth is important. In addition, physical distancing (at least 1-metre), wearing of mask (make sure that it covers your nose, mouth, and chin), keeping rooms well ventilated, avoiding crowds should be observed. Wash fabric masks daily inside detergent and dispose the medical mask in a trash bin. Masks with valves should be avoided. Clean and disinfect surfaces frequently and regularly touched, such as door handles, stair rails, faucets, water taps and phone screens.

According to WHO (2021), outbreaks have been reported in restaurants, choir practices, fitness classes, nightclubs, offices, and places of worship where people have gathered. The risks of coronavirus spread are higher in crowded indoor settings where they talk loudly, shout, breathe heavily or sing. In these environments, there is easy spread of the virus

through respiratory droplets or aerosols, people should take caution. Hence, outside gathering are safer than indoor ones, particularly if indoor spaces are small and poorly ventilated. With symptoms such as cough, headache or mild fever, it is advisable to stay at home and self-isolate until recovery is ascertained. Visiting the gymnasium may be dangerous. The OAACTION (2021), supported by the Centers for Disease Control and Prevention, stated that managing or increasing physical activity levels is essential every day, but especially during times of stress and uncertainty. Despite that people needs to stay apart to stay safe, man cannot stop moving. This is because activity helps to keep joints lubricated, mobile and strong. It also helps to improve sleep and emotional wellbeing.

It has been reported that the number of people affected by OA is steadily increasing in recent decades, especially with people between the age of 55 and 64 years (Jason, 2020). More than 300 million cases of knee and hip osteoarthritis was reported worldwide in 2017 with figures expected to rise in the future, particularly among women. Incidence of knee OA is rising by increasing average age of general population (Caspian Journal of Internal Medicine, 2011). In Nigeria, 150,246 cases; 1,803 deaths and 126,417 recoveries were reported (African Union CDC, 2021). It has been observed that men and women of average age moves on shopping cartwheel chair in shopping malls especially in advanced countries. It is against this background that this study examined physical functionality of knee osteoarthritis patients, after A 12-week exercise programme in Ondo State, Nigeria: COVID-19 risks prevention protocols implication.

II. RESEARCH METHOD

The quasi-experimental research design was employed. The population consists of all patients (male and female) with knee osteoarthritis in Ondo State, Nigeria. Using purposive sampling technique, Ondo State Specialist hospital, Akure; Federal Medical Center, Owo; General Hospital, Ondo and Trauma Center, Ondo were selected as the study locations. One hundred (100) knee osteoarthritis patients who have been medically diagnosed, have not undergone any knee surgery and have been on physiotherapy / follow up clinic for not less than (12) weeks were randomly selected. Participants were within the age range of 25- 85 years with a record of mild to moderate knee deformity. The hospital management for each hospital and the orthopedic physicians gave for permission for data collection. The participants signed the informed consent form. A physiotherapist and other 2 trained assistance were employed.

The weight of participants was measured with a Camry Br-90-11 model bathroom scale made in China, with light clothing, no shoes and were recorded to the nearest 0.1kg (Reliability coefficient of 0.91 (Teslim et al., 2013.). Standing height was measured in meters (M) using the stadiometer from the base without shoes, feet together, buttocks in contact with the pole, to the highest point of the head, when the participant is facing directly ahead (Reliability coefficient of 0.99 (Safrits and Wood, 2017). Body mass index (BMI), otherwise known as the Quetets index were determined before data collection according to the metropolitan life instance tables. BMI

(Kg/m<sup>2</sup>) was calculated using the formular:  $\frac{\text{Weight (Kg)}}{\text{Height}^2(\text{M})}$ .

Exercise Procedure: - Six Minute Walk Test - 6MWT

Objectives and procedure of the test were explained to participants before the commencement of the programme to ensure maximum cooperation and compliance. The levelled corridor of each hospital was utilized. The walking course of thirty (30) meters was marked every three meters to allow for easy interpretation of distance covered. The turnaround point at the beginning and the end of the thirty meters was marked. The researcher demonstrated 6MWT for one complete lap. Participants were positioned at the starting point one after the other. The timer was switched on as soon as each participant began to walk. During the walk, phrases of encouragement like “You are doing good”, “Keep the good work up”, “Keep going” were sounded to participants. By five (5) seconds before completion, participants were informed to get ready to stop. The stop walking command was given at the end of 6 minutes and the last stepped point was marked. The distance covered in 6 minutes per day by participants were recorded to the nearest centimeter. The walk test was done 3 (three) times in a week for a period of 12 weeks respectively. Participants were instructed to practice the walk at home on non-appearance day. Participants were made to fill a self-designed questionnaire to elicit (Yes or No) responses on the effect of (6MWT) on their physical functionality based on their ability to carry out daily activities and exercises at completion of the programme.

Hypotheses

Two (2) null hypotheses (Ho) were postulated and tested at 0.05 alpha level.

- 1) There is no significant relationship between exercise and physical functionality of patients with knee osteoarthritis after a 12- weeks exercise programme.
- 2) There is no significant joint contribution of age, sex, body mass index (BMI) on

physical functionality of patients with knee osteoarthritis after a 12- weeks exercise programme

Data Analysis

Data were analyzed using the descriptive statistics of simple frequency counts and percentages while the t-test and SPSS Regression analysis were employed to test the hypotheses.

III. RESULTS

TABLE 1. Demographic data of participants with knee osteoarthritis

Characteristics	Frequency	Percentage (%)	Total(N)
Sex - Male	27	27	100
Female	73	73	
Age- 21-30	7	7	100
31-40	21	21	
41-50	24	24	
>50	48	48	
Body Mass Index (BMI)- ≤25	79	79	100
>25	21	21	

TABLE 2. Descriptive statistics of participants' performance after a 12-week exercise programme

Moderate-vigorous activity	Yes %	NO %
After a 12- weeks of 6MWT, I can do moderate physical activities	91	9
I spend 6 minutes or more on moderate exercises after the 12 -week programme conveniently.	88	12
After a 12-week programme, I can do vigorous physical activities	37	63
I spend 6 mins or more on vigorous activities without conveniently.	25	75
Now, I can walk for a period of 10 minutes at a stretch without undue fatigue.	66	34

TABLE 3. Physical functionality of participants with knee osteoarthritis after A-12 week exercise programme

Categorization of exercise intensity	Frequency	Percentage (%)
Low (<6)	0	0
Moderate (6-8)	55	55
High (≥ 9)	45	45
Total	100	100

Minimum= 6  
Maximum= 10

**Hypothesis 1**

There is no significant relationship between exercise and physical functionality of participants with knee osteoarthritis after A 12- week exercise programme.

TABLE 4. The relationship between exercise and physical functionality of participants

	N	Mean	Std. Deviation	R- Critical Value	P-Value
Exercise	100	8.08	1.2687	0.209	0.37
Physical Functionality	100	8.53	1.09595		

**Hypothesis 2**

There is no significant joint contribution of age, sex, body mass index (BMI) on physical functionality of participants with knee osteoarthritis after A 12- weeks exercise programme.

TABLE 5. Joint contribution of age, sex, BMI on physical functionality of participants

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.*
	B	Std. Error	Beta		
1 (Constant)	11.014	.902		12.217	.000
Sex	-.019	.238	-.008	-.078	.938
Age	-.267	.108	-.239	-2.462	.016
BMI	-.041	.024	-.162	-1.676	.097

Table 5 shows that a significant joint contribution of demographic variables of sex, age, and BMI on physical functionality of participants existed. Hence hypothesis 2 is rejected.

**IV. DISCUSSION**

Findings from this study revealed that most participants were ages 50 ≥ years (48%), in line with OAACTION (2021) who reported ages 55 to 64 for people with knee osteoarthritis. Also, the National Center for Biotechnology Information

(NCBI) (2021) reported 63 years and 57% of women with knee osteoarthritis. More than 300 million cases of knee osteoarthritis reported in 2017 worldwide were women (73%) (OAACTION, 2021). Most participants (79%) recorded a BMI of ≤ 25kg/m<sup>2</sup> which falls within the normal weight and height ratio of 18.5 to 25 kg/m<sup>2</sup> reported by Wikipedia (2021). NCBI (2021) reported that Holmberg et al. and Rheumatol (2005) believed the adjusted risk of knee OA was increased fourfold in men with a current BMI of 23 to <25 kg/m<sup>2</sup> as compared to men with BMI <23 kg/m<sup>2</sup>. A commensurate risk was reported for women even at 30 years of age. Most participants (55%) were able to function moderately after 12 weeks of 6MWT. According to American College of Rheumatology (2021), 6MWT has been used to improve exercise tolerance for healthy older adults as well as people with rheumatic conditions such as knee OA. A significant joint contribution of demographic variables of sex, age, and BMI on physical functionality of participants existed. Hence hypothesis 3 is rejected. Age recorded the highest and significant contribution on physical functionality of participants with beta of -.239 followed by BMI beta of -.162. This implies that age contributed 23.9% of the total variation of physical functionality of participants while BMI contributed 16.2%. Physical activity behaviour and engagements in sports related activities are directly related to physical functioning in older women, even in individuals with a history of sedentary lifestyle (Edholm, Nilson, and Kadi, 2019).

**V. CONCLUSION**

Being physically active at any age and most importantly at adulthood have beneficial effects on physical functionality and healthy well-being of any population. Mild to Moderate intensity aerobic exercises such as walking, biking / stationary biking, and swimming are hereby recommended to enhance daily physical functioning in older adults; especially women and people living with knee osteoarthritis. The fact that people must stay apart (Social Distancing) to stay safe from COVID-19 infection does not implies that people should stop moving.

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