

Effect of Different Percentages of Body Weight Traction on Pain Intensity and Disability-Level of Patients with Chronic Knee Osteoarthritis

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Abstract

Background and Aim: Knee osteoarthritis (OA) is one of the most common degenerative diseases and a leading cause of severe pain and disability. Different methods have been suggested for treatment of OA. This study compared the effect of different percentages of patient's body weight (%BW) traction technique on pain intensity and disability-level of patients.

Methodology: 30 patients with chronic (OA) of the knee were purposively recruited and randomly allocated into groups of %BW (10%,20%, 30%). Skin traction kit Traction was administered to the affected patient's knee in sitting position with knee joint in loose pack at hip perpendicular to the knee position on 15 0 elevations of the affected knee joint by the bed side. The suspended weight that is %BW in form of sandbag was attached to the kit. Cryotherapy was applied to the affected knee joint during the traction session for 15 minutes. The traction period was for 20 minutes, the patient rested for 5 minutes before bearing weight on the treated lower limb. The patient's pain intensity and disability were assessed with Visual analogue Scale (VAS) and Ibadan Hip Knee Osteoarthritis (IKHOAM) respectively at pre intervention 1st, 3rd and 6th week ($p>0.05$).

Results: Thirty patients (Female 18 (60%), Male 12 (40%) diagnosed of knee OA were recruited for this experimental study. There was significant change in the pain intensity using different percentages of body weight across weeks (10%: $F=8.76$; $p=0.001$), (20%: $F=7.34$, $p=0.003$), (30%: $F=7.34$, $p=0.003$). And there was no significant change in disability level for 10% and 20% BW, however, there was significant change of 30% BW at 6th week on disability ($F=3.42$, $p=0.05$).

Conclusion: 20% BW was more effective on pain intensity and 30%BW on disability level of patient with knee OA.

Keywords: Knee osteoarthritis; Traction technique ; Pain intensity; Disability level

Introduction

Osteoarthritis (OA) is a degenerative joint disease characterized by the breakdown of articular cartilage, subchondral bone thickening, and new bone growth [1]. It is a degenerative joint condition characterized by the slow loss of cartilage, which results in the formation of bony spurs and cysts at the joint's borders [2]. Osteoarthritis is also the most widespread disease in our culture, with a worldwide distribution [3]. Knee osteoarthritis, also known as degenerative joint disease, is the result of cartilage loss and deterioration of joint structures [4]. Osteoarthritis is considered to be the fourth leading cause of disability, with symptomatic knee osteoarthritis affecting 10% of males and 13% of females aged 60 and older[5]. The proportions of people with symptomatic knee osteoarthritis have reportedly increased as a result of population aging and the general population's obesity rate [6]. Over the course of a year, 25% of adults over the age of 55 may experience a chronic episode of knee discomfort, with one in every six of them needing to see their general practitioner about it [7]. Knee OA affects 16 percent of people aged 15 and up, and 22.9 percent of people aged 40 and up. In 2020, there are around 654.1 million people in the world (40 years and older) with knee OA [8]. The incidence of knee osteoarthritis in Nigeria is rising with the increasing average age of the general population [9]. In the report by [10] 2 the first community-based study on symptomatic knee osteoarthritis in English medical literature, among 1044 participants recruited through a multi-stage cluster sampling technique, the estimated point prevalence of knee osteoarthritis was 19.6% [10] and the highest prevalence of knee osteoarthritis (48.3%) was observed among the elderly with a female preponderance [11]. Similarly, another study in Nigeria reported a higher proportion of knee osteoarthritis among female participants. [12, 13]. The prevalence rates of knee osteoarthritis varies according

to study population as well as the the methods applied for diagnosis [14, 15]. Obesity as one of the risk factor that contribute majorly to the occurrence and reoccurrence of knee OA (Figure 1). Obesity was consistently the main factors with knee OA and body composition is known to related with osteoarthritis [16-18]. Also age range of a patients was found to link with high incidence of knee Osteoarthritis [19]. According to research, knee osteoarthritis is prevalent across race and ethnic groups[20, 19]. Kellgren-Lawrence scale classified OA into two groups according to its aetiology, they are primary (idiopathic or non-traumatic) and secondary (usually due to trauma or mechanical misalignment). Pain is one of the obvious sign of OA [21], the pain associated with knee osteoarthritis is well-known for transitioning from intermittent weight-bearing pain to a more consistent and chronic pain [22]. The lower extremities is well-known as the major source of mobility limitation in older persons in the United States of America, owing to discomfort [23]. The pain experience among persons with OA has been evaluated through a number of qualitative research efforts. 3 Early phases of OA-related pain were marked by activity-related pain, which became more persistent with time and was punctuated by intermittent acute pain [24]. The more intense but

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Figure 1: Skin traction technique for OA of the right knee joint.

less frequent pain that comes and goes (intermittent) had a bigger impact on quality of life than the 'background' (continuous) pain, leading to a decrease in engagement in an attempt to avoid provoking such episodes [25]. The severity of OA pain varies, with around one-third of those with knee OA describing their symptoms with words like burning, tingling, numbness, and pins and needles [26]. Mood, engagement in social and recreational activities, and sleep were all negatively affected by the discomfort [24, 27]. Osteoarthritis is the most common type of arthritis and one of the primary causes of disability around the world [28]. The link between osteoarthritis and disability has been demonstrated, and osteoarthritis impairment rises with age, physical activity, and lifestyle [29]. OA is one of the most common causes of disability in the world, limiting movement and daily activities [30]. Disability associated with OA is attributed to pain [30]. Knee OA is a common cause of functional disability, particularly in the middle-aged and elderly [31]. It is also a leading cause of loss of self-independence among those of middle to elderly age [32]. Several factors have been shown to impact with functional disability in knee OA and these includes pain severity, [33] presence, number, and severity of comorbidities [34]. Radiograph may show reduced joint space and marginal osteophyte as a physical sign of OA [35]. Conventionally, OA require different category of interventions, physiotherapy is one of the significant and effective intervention [36]. The interventions are 4 electrotherapy [37], cryotherapy [38], and therapeutic exercise [39]. There are less researches on application of sustained mechanical traction for management of knee dysfunction. Although, traction have been applied on other part of the body regions such as lumbar [40] and cervical region [41]. Traction has been reported to be effective in relieving pain and reducing disability level in patients with degenerative lumbar dysfunction [40], traction refers to the practice of slowly and gently pulling on a fractured or dislocated body part. It is often done using ropes, pulleys, and weights [42]. The form of traction that will be used is sustained mechanical traction. Sustained mechanical traction is described as the force used to create a degree of tension on soft tissues and separation between joint surfaces with the use of heavy weights or mechanical devices [43]. Traction can also be applied on different body joint including the knee joint following degenerative condition and indicated for treatment of symptoms related to degenerative disease. A recent study demonstrated that mechanical joint traction of the knee through the use of an external fixing device on patients with degenerative arthritis showed promising results [44]. Traction

therapy with external fixation has also been shown to be effective in reducing pain in patients with degenerative arthritis by maintaining joint space [44]. Furthermore, this therapy increases joint space, maintains expansion, increases cartilage thickness, reduces bone loss, and improves knee function in patients with degenerative arthritis [45]. Recent studies have also shown that knee joint traction therapy may be useful for improving pain and function and reducing depression in patients with degenerative arthritis [45].

Although previous research conducted using different body weight traction force for the treatment of lumbar degenerative joint disease which was effective [40] but there are scarce research in utilization of traction coupled with the use of different percentages of body weights in the treatment of complication due to chronic knee osteoarthritis. This study therefore determine the effect of sustained mechanical traction using different percentages of body weight traction on disability-level and pain intensity in patients with chronic knee osteoarthritis.

Methods

Thirty- five patients aged 40-70 years with chronic osteoarthritis of the knee joint attending Physiotherapy Department, University of Medical Science, Nigeria, participated in this experimental study. The participants were purposively recruited and consecutively allocated into three group based on the percentages of body weight necessary for the traction.

Ethical approval was obtained from the Ethics and Research committee and informed consent was secured from each patient and procedure of the research was explained to the participant. The anthropometric parameters of Weight, height and Body Mass Index were taken with their respective standard instruments. Participants whose percentages of their body weight (inform of suspended sand bag were strapped to their lower limb at the below knee level while leg is in loose pack and open chain position at right angle bent over a pillow with 3 inches crepe boundage were allocated into group A (10% of the participant's body weight), group B (20% of the participant's body weight) and group C (30% of the participant's body weight) Also Pain intensity and disability level of each participant was determined by Visual Analogue Scale (VAS) and Ibadan Knee Osteoarthritis Measure (IKOAM) respectively.

The Ibadan Knee/Hip Osteoarthritis Outcome measure (IKHOAM): The IKHOAM is a 2-domain/part, 28-item instrument. The domains are activity limitations domain and participation restrictions domain. The maximum obtainable score on IKHOAM is 209. The Part I of the IKHOAM Indicate the extent of limitations you experience in carrying out the following activities using these scales: Degree of difficulty: 4 = no difficulty; 3 = mild difficulty; 2 = moderate difficulty; 1 = severe difficulty; 0 = inability to carry out the activity. Nature of Assistance: 4 = requires no assistance; 3 = requires use of aid(s)/device(s) only; 2 = requires assistance of one person only; 1 = requires assistance of one person and the use of aid(s); 0 - unable to perform the activity. Part II: Indicate the extent of restriction you experience participating in the following life situations using the scale below. Extent of restriction: 3-full participation, 2- at risk full participation, 1 -participation with restriction, 0-no participation. Minimum score for each part is zero, maximum obtainable score for part I is 200, maximum obtainable score for part II is [9] and total maximum obtainable score on IKHOAM part I and part II is 209. The score of each patients is calculated as: Patient's score/Total possible score \times 100. Low score on IKHOAM implies low level of physical functioning ability and high level means high level of

physical functioning ability [46].

Moreover, Knee Traction technique was done with patient seated on a standard examination plinth with skin traction kit applied to the affected knee joint with 15 degree elevation above the level of the plinth with pillow placed below the popliteal fossa. The affected lower limb is placed with the thigh perpendicular to the knee joint in a loose pack position and the weight inform of sandbag attached to the bottom of the traction kit dangling. The weight was there for 20minute and cryotherapy was applied throughout the application of traction technique and discontinue after 20 minute and rest of 5minutes rest before bearing weight on the affected knee.

Results

Demographic and physical characteristics of knee osteoarthritis participants

A total of 30 participants with chronic knee osteoarthritis (12 males: 40% and 18 females; 60%) with mean age of 59.13 ± 6.42 years, mean weight of 89.56 ± 14.74 kg, mean height of 1.67 ± 0.89 m and mean BMI of 27.44 ± 4.40 kg/m² participated and completed this study (Table 1).

One-way ANOVA comparison of pain intensity and disability-level across the patients traction weight

One-way ANOVA comparison of pain intensity and disability level with percentages of body weight across the week of intervention patient's traction weight shows that there was significant changes in pain intensity between 3rd week and 6th week.

However, post hoc shows that there was significance reduction in pain intensity at 3rd to 6th week using 20% and 30% of body weight traction, also there was significance changes in the level of disability at 3rd and 6th week using 20% and 30% of body weight traction. The significance changes in disability-level and reduction in pain intensity was more significant using 20% of body weight traction compared to 30% of body weight traction (Table 2).

Discussion

This study focused on assessing the effect of different percentages of body weight traction on pain intensity and disability level on

Table 1: Sociodemographic variables of the parameter.

VARIABLES	X±SD
Age (Years)	59.1±6.42
Weight(Kg)	89.6± 14.74
Height(m)	1.7 ± 0.89
BMI (Kg/m ²)	27.4± 4.40

Table 2: Changes of percentages of body weight traction across the week using one-way ANOVA.

% BW	First	Third	Sixth	F-ratio	P-value
10 % BW					
Pain intensity	5.2±0.79	4.0±0.67	3.0±0.67	8.76	0.001
Disability	75.2±20.03	77.6±18.67	80.2±17.08	7.98	0.158
20% BW					
Pain Intensity	4.1±0.32	2.8±0.63	1.9±0.74	7.34	0.003*
Disability	87.7±3.94	90.5±2.14	80.2±17.08	7.98	0.115
30% BW					
Pain intensity	5.1±0.74	3.8±0.82	3.0±0.82	7.34	0.003*
Disability	79.8±13.71	82.45±13.628	82.45±13.62	3.42	0.05*

%BW: Percentage Body Weight

Table 3: Relationship of percentages of participant's body weight to clinical variables.

Pain intensity		
% BW	rho	p-values
10%	1.000	0.000*
20%	0.905	0.000*
30%	0.889	0.001*
%BW: Percentage Body Weight *Level of significant (p= 0.001		
Disability level		
% BW	rho	p-values
10%	0.994	0.000*
20%	-0.666	0.000*
30%	0.889	0.001*

patients with knee osteoarthritis. When the effectiveness of different percentages of body weight sustained mechanical traction was assessed, it was observed that knee traction was effective on pain intensity and disability-level of the participants.

This result is similar to a study by [40] which reported that there was significant increase in mobility of the lower extremity during the SLR test immediately following the 30% and 60% of body weight as compared to pretraction, also a study by reported that mechanical traction is more effective than conventional physiotherapy treatment in reducing pain and improving physical function in subjects' with knee osteoarthritis using 1/7th of patients' body weight. [48] also concluded that mechanical traction in conjunction with ultrasound and exercise are effective in management of knee osteoarthritis than ultrasound and exercise alone using 1/7th of patients' body weight, a study by [49] showed that knee joint traction therapy was effective in improving pain, physical function, and depression in patients with degenerative arthritis using 6% of patients' body weight (Table 3). This study also reported that adding knee traction to standard physiotherapy treatment can result in further improvement in pain relief, increased functional ability and better quality of life in patients with knee osteoarthritis [50] and research by [51] reported that there was significance effect of continuous knee joint traction treatment on the pain and quality of life of patients with gonoarthritis using 6% of patients' body weight .

Therefore is observed from previous literature that the increase in pain intensity has effect on increasing disability of the participant which [30] pointed out that high pain level is an important factor on increasing the disability level. The physiological evidence available for effectiveness of sustained mechanical traction on pain intensity was explained by [44]. Furthermore, this therapy increases joint space, maintains expansion, increases cartilage thickness, reduces bone loss, and improves knee function in patients with degenerative arthritis [45]. Other recent studies have also shown that knee joint traction therapy may be useful for improving pain and function and reducing depression in patients with degenerative arthritis [45, 51]. However, knee joint traction has shown positive effects in improving the pain, range of joint motion, and the quality of life [51]. Knee joint traction therapy results in muscle relaxation, stimulation of dynamic muscle contractions, and inhibition of protective muscle reflections, all of which are instrumental in decreasing pain [44]. Moreover, the increase in knee joint space due to continuous knee joint traction also helps reduce pain [45]. Traction therapy on the knee joint has the advantage of focusing traction on one segment and can be used to improve pain, tissue structure, and physical function by reducing joint contact and pressure on joint cartilage during movement and securing joint space. When the knee joint traction was applied in research, it was effective for increasing the joint space and cartilage space, decreasing the amount of

brain part lost, and the functions [51].

As a result of the available previous literature reviews that support the effect of sustained mechanical traction on knee osteoarthritis patients, the outcome of this study which found out the effect of sustained mechanical traction with different suspended weight on disability-level and pain intensity following patients with chronic knee osteoarthritis. Also, this study found out that there was positive relationship between pain intensity and traction weight and negative relationship between disability-level and traction weight, however there was significant effect of traction weight on pain intensity and disability-level.

Conclusion

Finally, 20% of BW was adequate for pain intensity and 30% BW would be adequate for disability in a case of a patient with knee OA.

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