

## Research Article

# Is Telephysiotherapy an Option for Improved Quality of Life in Patients with Osteoarthritis of the Knee?

Adesola C. Odole<sup>1,2</sup> and Oluwatobi D. Ojo<sup>1,3</sup>

<sup>1</sup> Department of Physiotherapy, College of Medicine, University of Ibadan, Ibadan 200284, Nigeria

<sup>2</sup> School of Research and Postgraduate Studies, Faculty of Agriculture, Science and Technology, North West University, Mafikeng Campus, Mafikeng 2735, South Africa

<sup>3</sup> Department of Physiotherapy, Neuropsychiatric Hospital, Aro, Abeokuta 110251, Nigeria

Correspondence should be addressed to Oluwatobi D. Ojo; [tobbyknow@hotmail.com](mailto:tobbyknow@hotmail.com)

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This study investigated effect of a 6-week telephysiotherapy programme on quality of life (QoL) of patients with knee osteoarthritis (OA). Fifty patients with knee OA were randomly and equally assigned into two treatment groups: clinic group (CG) and telephysiotherapy group (TG). The CG received physiotherapist-administered osteoarthritis-specific exercises in the clinic thrice weekly for 6 weeks while the TG received structured telephone monitoring with self-administered osteoarthritis-specific exercises for the same duration at home. Participants' QoL was assessed using WHOQoL-Bref at baseline, second, fourth, and sixth week of intervention. Data were analyzed using ANOVA and independent Student's *t*-test. Within-group comparison showed significant improvements in physical health domain ( $P = 0.00^*$  for TG and CG) and psychological domain ( $P = 0.02^*$  for TG;  $P = 0.00^*$  for CG) of WHOQoL following six-week intervention. However, there were no significant differences ( $P > 0.05$ ) in TG and CG's social relationship and environment domains. Between-group comparison showed no significant differences ( $P > 0.05$ ) between CG and TG's physical health, psychological, and social relationships domains of WHOQoL following 6-week intervention. However, there was significant difference in the environment domain ( $P < 0.05$ ). Telephysiotherapy using telephone medium improved QoL in patients with knee OA comparable to clinic based treatment.

## 1. Introduction

Osteoarthritis (OA) is the most common musculoskeletal disorder characterized by degeneration of articular cartilage, joint space narrowing, pain, and disability [1] with resultant poor quality of life [2]. Knee OA is a prevalent musculoskeletal condition affecting older people and causes pain and physical disability and reduces quality of life (QoL) with considerable economic burden on the health care system [3].

The worldwide prevalence estimates for symptomatic OA is about 13% in women and 10% in men aged 60 years and older. The proportion of people affected with symptomatic knee OA is likely to increase due to the aging of the population and the rate of obesity or overweight in the general population [4]. High prevalence rate of knee OA compared

with other types of OA has been documented [5]. The prevalence of knee OA increases rapidly in people aged  $\geq 40$  years [6]. In Nigeria, the prevalence of OA has been documented by several studies [7, 8] and the knee joint is the most frequently affected [7].

The management of knee OA is focused on optimizing the patient's QoL [9] and the term QoL references the general well-being of individuals and societies [10].

Physiotherapy treatment for knee OA involves therapeutic exercises which are used in almost all treatment sessions in the management of knee OA [11]. Exercise has been found to be an effective and well-tolerated treatment for knee OA [12].

The usual pattern of managing patients with knee OA requires patients to keep attending the clinic for one-on-one

sessions with the physiotherapists. However, patients who live far away from the clinics may find it difficult to attend clinic regularly due to distance and cost of transportation [13, 14]. In order to address these problems which could make treatment ineffective, telephysiotherapy which entails the use of telecommunications technology as a medium for providing information for therapeutic exercises to patients at homes that are at a distance from the physiotherapy clinics [15] should be considered.

Telephysiotherapy is the development of telemonitoring systems to facilitate independent rehabilitations of patients within their own homes [16]. Telemonitoring is a convenient way for patients to avoid travelling and to perform some of the more basic work of healthcare for themselves [17]. The objective of telephysiotherapy is to allow patients and medical experts to carry on their sessions through telecommunication networks as if they are in the same place [18]. The applications of telephysiotherapy have been previously documented in some medical conditions. Its effectiveness has been documented in rehabilitation of stroke and patients with total knee replacement [19–21]. However, it appears that there is dearth of studies in developing countries like Nigeria on the effect of telephysiotherapy in the management of patients with osteoarthritis of the knee.

According to American Telemedicine Association, telemedicine is defined as the remote delivery of healthcare services and clinical information using telecommunications technology such as internet, wireless, satellite, and telephone media [22]. More so, it has been documented that the concept of telemonitoring can be carried out simply over a telephone or may be as complex as using satellite technology and videoconferencing to do a real-time consultation [23].

Therefore, this study is designed to investigate the effect of a 6-week telephysiotherapy programme on quality of life of patients with osteoarthritis of the knee using telephone medium which is widely available, affordable and relevant telecommunication in Nigeria.

## 2. Materials and Methods

**2.1. Participants.** Patients diagnosed with knee osteoarthritis were drawn from out-patient physiotherapy clinics in three hospitals in Southwestern Nigeria: University College Hospital, Ibadan, Neuropsychiatric Hospital, Aro, Abeokuta, and State Hospital, Ijaye, Abeokuta.

Inclusion criteria are as follows: patients that have been diagnosed with OA of the knee joint, patients that are literate in English or Yoruba language, and patients that have means of communication via mobile telephone.

Exclusion criteria are as follows: presence of comorbid medical conditions such as mental illness, diabetes, uncontrolled high blood pressure, and cancer that can influence overall well-being.

**2.2. Outcome Measure.** World Health Organisation Quality of Life-Bref (WHOQoL-Bref) and its Yoruba translated version. The 26-item WHOQoL-Bref is used in clinical trials to investigate changes in quality of life over the course of

interventions [24]. The WHOQoL-Bref was developed in the context of four domains of QoL: physical, psychological, social, and environment domain scores scaled in a positive direction; that is, higher scores denote higher quality of life [25]. It is self-administered by respondents but an experienced interviewer may assist the administration by reading items aloud where self-completion is not possible, usually for reasons of literacy or disability. The results of a study conducted by Skevington et al. [26] of WHOQoL group indicate that, overall, the WHOQoL-Bref is a sound, cross-culturally valid assessment of QoL, as reflected by its four domains: physical, psychological, social, and environment. The internal consistency shown by Cronbach's alpha for physical domain is 0.82, psychological domain is 0.81, social domain is 0.68, and environment domain is 0.80. Pearson's correlations (one-tailed test) between domains for the total sample were strong, positive, and highly significant ( $P < 0.0001$ ), ranging from 0.46 (physical versus social) to 0.67 (physical versus psychological). The Yoruba version is a valid translation of the English WHOQoL-Bref. Stroke participants' domain scores on the Yoruba translated version of WHOQoL-Bref correlated significantly with those on its English version ( $r = 0.695\text{--}0.859$ ;  $P = 0.000$ ) [27].

## 3. Methods

**3.1. Research Design.** This study was a randomized clinical trial.

**3.2. Sampling Technique.** The calculated sample size ( $N$ ) was fifty (50) patients with knee osteoarthritis. Simple random sampling using a computer generated table of random numbers was used to assign patients equally into telephysiotherapy group and clinic-based group.

**3.3. Procedure.** Ethical approval was sought and obtained from the Research Ethics Committee of University of Ibadan/University College Hospital (UI/UCH), Nigeria. The patients were assessed and screened in line with the inclusion and exclusion criteria. The eligible patients were duly informed of the rationale and procedure for the study and were enlightened about the aim of the research in improving physiotherapy services to patients with knee OA. Thereafter, informed consent was obtained from each patient and confidentiality was ensured.

The patients were assigned equally into clinic-based group (25 patients) and telephysiotherapy group (25 patients) randomly using a computer generated table of random numbers.

**3.4. Telephysiotherapy Group.** Quality of life of this group of patients was assessed at baseline using WHOQoL-Bref. Standardized exercise programmes for patients with knee OA [28] were explained and performed for these patients. A copy of the standardized exercise programmes for patients with knee OA was given to each patient in this group to serve as a guide while performing the exercise at home, three times in a week for six weeks. Mobile telephone monitoring

using uniform statements contained in structured telephone monitoring guide on the three occasions of the standardized exercise programmes in a week was done to monitor and coach them about the exercise programmes. They were also provided with exercise log-book for proper documentation of the exercise procedure. This group of patients only reported to the clinics at the end of the second, fourth, and sixth week for reassessment of their QoL.

**3.5. Clinic-Based Group.** The quality of life of this group of patients was also assessed at baseline using WHOQoL-Bref. However, the physiotherapists, not the patients, administered the same standardized exercise programme for patients with knee OA [28] to this group, three times in a week for 6 weeks in the clinic, and they were neither monitored nor coached on mobile telephone. These patients' QoL was also reassessed at second, fourth, and sixth week of clinic intervention.

English and Yoruba versions of WHOQoL-Bref were used for the assessment procedure in the two groups.

#### 4. Data Analysis

Analysis of variance (ANOVA) was used to compare quality of life at baseline, second, fourth, and sixth week of intervention in clinic-based group and telephysiotherapy group, respectively.

Post hoc analysis of least square difference (LSD) was used to locate exactly where differences occur where there were statistical significant differences after using ANOVA.

Also, independent Student's *t*-test was used to compare quality of life between the two treatment groups (clinic-based and telephysiotherapy groups) at baseline, second, fourth, and sixth week of intervention.

Trends of quality of life in both groups were presented using graphs.

Level of significance was set at 0.05.

#### 5. Results

**5.1. Demographics of Participants.** Fifty (50) patients (26 males and 24 females) with osteoarthritis of the knee in age range of 37–72 years with a mean age of  $55.50 \pm 7.55$  years participated in the study. Twenty-five patients (12 males and 13 females) were in the clinic group (CG) with a mean age of  $54.96 \pm 7.81$  years and also an equal number (14 males and 11 females) in the telephysiotherapy group (TG) with a mean age of  $56.04 \pm 7.40$  years.

Both groups were comparable in their ages at baseline ( $P = 0.62$ ) (Table 1).

**5.2. Comparison of Physical Health Domain Scores of WHOQoL of Participants in Telephysiotherapy Group across Baseline, Second, Fourth, and Sixth Week of Intervention.** The mean physical health domain scores of WHOQoL of participants in telephysiotherapy group (TG) were significantly different across baseline, second, fourth, and sixth week of intervention (Table 2).

TABLE 1: Demographics of participants.

Group	N	Age	<i>t</i>	P value
		Mean $\pm$ SD (Years)		
CG	25	$54.96 \pm 7.81$	-0.502	0.62
TG	25	$56.04 \pm 7.40$		

CG: clinic based group; TG: telephysiotherapy group.

\*Significant level is at 0.05.

TABLE 2: Comparison of physical health domain scores of WHOQoL of participants in telephysiotherapy group across baseline, second, fourth, and sixth week of intervention.

Time point	N	PHD	<i>F</i>	P value
		Mean $\pm$ SD		
Baseline	25	$53.72 \pm 11.40$	11.208	0.00*
Second week	25	$57.32 \pm 9.70$		
Fourth week	25	$64.08 \pm 9.28$		
Sixth week	25	$69.28 \pm 10.94$		

PHD: physical health domain; WHOQoL: World Health Organization Quality of Life scale.

\*Significant level is at 0.05.

TABLE 3: Post hoc test of physical health domain scores of WHOQoL of participants in telephysiotherapy group across baseline, second, fourth, and sixth week of intervention.

Week	P value
Baseline–second week	0.22
Baseline–fourth week	0.00*
Baseline–sixth week	0.00*
Second–fourth week	0.02*
Second–sixth week	0.00*
Fourth–sixth week	0.08

\*Significant level is at 0.05.

The result of post hoc test (least square difference) shows that there were significant differences in physical health domain scores of WHOQoL of participants in telephysiotherapy group between baseline and fourth week, baseline and sixth week, second and fourth week, and second and sixth week. However, there were no significant differences between baseline and second week and fourth and sixth week (Table 3).

**5.3. Comparison of Physical Health Domain Scores of WHOQoL in Clinic Group across Baseline, Second, Fourth, and Sixth Week of Intervention.** The mean physical health domain scores of WHOQoL of participants in clinic group (CG) were significantly different across baseline, second, fourth, and sixth week of intervention (Table 4).

The result of post hoc test (least square difference) shows that there were significant differences in physical health domain scores of WHOQoL of participants in clinic group between baseline and fourth week, baseline and sixth week, second and fourth week, and second and sixth week. However, there were no significant differences between baseline and second week and fourth and sixth week (Table 5).

TABLE 4: Comparison of physical health domain scores of WHOQoL of participants in clinic group across baseline, second, fourth, and sixth week of intervention.

Time point	N	PHD	F	P value
		Mean ± SD		
Baseline	25	51.48 ± 15.61	10.214	0.00*
Second week	25	55.68 ± 14.00		
Fourth week	25	64.08 ± 13.05		
Sixth week	25	71.16 ± 12.00		

\*Significant level is at 0.05.

TABLE 5: Post hoc test of physical health domain scores of WHOQoL of participants in clinic group across baseline, second, fourth, and sixth week of intervention.

Week	P value
Baseline–second week	0.28
Baseline–fourth week	0.00*
Baseline–sixth week	0.00*
Second–fourth week	0.03*
Second–sixth week	0.00*
Fourth–sixth week	0.07

\*Significant level is at 0.05.

TABLE 6: Comparison of psychological domain scores of WHOQoL of participants in telephysiotherapy group across baseline, second, fourth, and sixth week of intervention.

Time point	N	PD	F	P value
		Mean ± SD		
Baseline	25	64.48 ± 10.03	3.464	0.02*
Second week	25	67.04 ± 9.10		
Fourth week	25	69.72 ± 7.97		
Sixth week	25	71.96 ± 7.55		

PD: psychological domain; WHOQoL: World Health Organization Quality of Life scale.

\*Significant level is at 0.05.

5.4. Comparison of Psychological Domain Scores of WHOQoL of Participants in Telephysiotherapy Group across Baseline, Second, Fourth, and Sixth Week of Intervention. The mean psychological domain scores of WHOQoL of participants in telephysiotherapy group (TG) were significantly different across baseline, fourth, and sixth week of intervention (Table 6).

The result of post hoc test (least square difference) shows that there were significant differences in psychological domain scores of WHOQoL of participants in telephysiotherapy group between baseline and fourth week, baseline and sixth week, and second and sixth week. However, there were no significant differences between baseline and second week, second and fourth week, and fourth and sixth week (Table 7).

5.5. Comparison of Psychological Domain Scores of WHOQoL of Participants in Clinic Group across Baseline, Second, Fourth, and Sixth Week of Intervention. The mean psychological domain scores of WHOQoL of participants in clinic group

TABLE 7: Post hoc test of psychological domain scores of WHOQoL of participants in telephysiotherapy group across baseline, second, fourth, and sixth week of intervention.

Week	P value
Baseline–second week	0.30
Baseline–fourth week	0.04*
Baseline–sixth week	0.00*
Second–fourth week	0.28
Second–sixth week	0.05*
Fourth–sixth week	0.37

\*Significant level is at 0.05.

TABLE 8: Comparison of psychological domain scores of WHOQoL of participants in clinic group across baseline, second, fourth, and sixth week of intervention.

Time point	N	PD	F	P value
		Mean ± SD		
Baseline	25	61.04 ± 10.45	5.399	0.00*
Second week	25	66.60 ± 10.74		
Fourth week	25	69.64 ± 9.45		
Sixth week	25	71.40 ± 8.23		

\*Significant level is at 0.05.

TABLE 9: Post hoc test of psychological domain scores of WHOQoL of participants in clinic group across baseline, second, fourth, and sixth week of intervention.

Week	P value
Baseline–second week	0.04*
Baseline–fourth week	0.00*
Baseline–sixth week	0.00*
Second–fourth week	0.27
Second–sixth week	0.09
Fourth–sixth week	0.53

\*Significant level is at 0.05.

(CG) were significantly different across baseline, second, fourth, and sixth week of intervention (Table 8).

The result of post hoc test (least square difference) shows that there were significant differences in psychological domain scores of WHOQoL of participants in clinic group between baseline and second week, baseline and fourth week, and baseline and sixth week. However, there were no significant differences between second and fourth week, second and sixth week, and fourth and sixth week (Table 9).

5.6. Comparison of Social Relationship Domain Scores of WHOQoL of Participants in Telephysiotherapy Group across Baseline, Second, Fourth, and Sixth Week of Intervention. The mean social relationships domain scores of WHOQoL of participants in telephysiotherapy group (TG) were not significantly different across baseline, second week, fourth week, and sixth week of intervention (Table 10).

5.7. Comparison of Social Relationship Domain Scores of WHOQoL of Participants in Clinic Group across Baseline, Second, Fourth, and Sixth Week of Intervention. The mean social



TABLE 10: Comparison of social relationship domain scores of WHOQoL of participants in telephysiotherapy group across baseline, second, fourth, and sixth week of intervention.

Time point	N	SRD	F	P value
		Mean $\pm$ SD		
Baseline	25	64.80 $\pm$ 8.92	0.560	0.64
Second week	25	64.52 $\pm$ 9.41		
Fourth week	25	66.80 $\pm$ 8.29		
Sixth week	25	67.04 $\pm$ 8.44		

SRD: social relationships domain; WHOQoL: World Health Organization Quality of Life scale.

\*Significant level is at 0.05.

TABLE 11: Comparison of social relationship domain scores of WHOQoL of participants in clinic group across baseline, second, fourth, and sixth week of intervention.

Time point	N	SRD	F	P value
		Mean $\pm$ SD		
Baseline	25	65.76 $\pm$ 12.37	0.350	0.79
Second week	25	67.04 $\pm$ 11.62		
Fourth week	25	67.00 $\pm$ 11.22		
Sixth week	25	69.04 $\pm$ 10.58		

\*Significant level is at 0.05.

relationships domain scores of WHOQoL of participants in clinic group (CG) were not significantly different across baseline, second, fourth, and sixth week of intervention (Table 11).

**5.8. Comparison of Environment Domain Scores of WHOQoL of Participants in Telephysiotherapy Group across Baseline, Second, Fourth, and Sixth Week of Intervention.** The mean environment domain scores of WHOQoL of participants in telephysiotherapy group (TG) were not significantly different across baseline, second week, fourth week, and sixth week of intervention (Table 12).

**5.9. Comparison of Environment Domain Scores of WHOQoL of Participants in Clinic Group across Baseline, Second, Fourth, and Sixth Week of Intervention.** The mean environment domain scores of WHOQoL of participants in clinic group (CG) were not significantly different across baseline, second week, fourth week, and sixth week of intervention (Table 13).

**5.10. Between-Group Comparison of Participants' Physical Health Domain of WHOQoL at Baseline, Second, Fourth, and Sixth Week of Intervention.** The mean physical health domain scores of WHOQoL of the participants in the two groups (clinic group versus telephysiotherapy group) were not significantly different at baseline, second, fourth, and sixth week of intervention (Table 14). This is also represented on bar charts (Figure 1).

**5.11. Between-Group Comparison of Participants' Psychological Domain of WHOQoL at Baseline, Second, Fourth, and Sixth**

TABLE 12: Comparison of environment domain scores of WHOQoL of participants in telephysiotherapy group across baseline, second, fourth, and sixth week of intervention.

Time point	N	ED	F	P value
		Mean $\pm$ SD		
Baseline	25	64.52 $\pm$ 7.76	1.570	0.20
Second week	25	65.08 $\pm$ 7.16		
Fourth week	25	67.76 $\pm$ 8.11		
Sixth week	25	68.48 $\pm$ 8.09		

ED: environment domain; WHOQoL: World Health Organization Quality of Life scale.

\*Significant level is at 0.05.

TABLE 13: Comparison of environment domain scores of WHOQoL of participants in clinic group across baseline, second, fourth, and sixth week of intervention.

Time point	N	ED	F	P value
		Mean $\pm$ SD		
Baseline	25	59.08 $\pm$ 8.01	1.750	0.16
Second week	25	59.76 $\pm$ 8.58		
Fourth week	25	62.24 $\pm$ 8.48		
Sixth week	25	63.76 $\pm$ 7.80		

\*Significant level is at 0.05.

TABLE 14: Between-group comparison of participants' physical health domain of WHOQoL at baseline, second, fourth, and sixth week of intervention.

Time point	Group	N	PHD	t	P value
			Mean $\pm$ SD		
Baseline	CG	25	51.48 $\pm$ 15.61	-0.579	0.57
	TG	25	53.72 $\pm$ 11.40		
Second week	CG	25	55.68 $\pm$ 14.00	-0.482	0.63
	TG	25	57.32 $\pm$ 9.70		
Fourth week	CG	25	64.08 $\pm$ 13.05	0.000	1.00
	TG	25	64.08 $\pm$ 9.28		
Sixth week	CG	25	71.16 $\pm$ 12.00	0.579	0.57
	TG	25	69.28 $\pm$ 10.94		

\*Significant level is at 0.05.

**Week of Intervention.** The mean psychological domain scores of WHOQoL of the participants in the two groups (clinic group versus telephysiotherapy group) were not significantly different at baseline, second, fourth, and sixth week of intervention (Table 15). This is also represented on bar charts (Figure 2).

**5.12. Between-Group Comparison of Participants' Social Relationships Domain of WHOQoL at Baseline, Second, Fourth, and Sixth Week of Intervention.** The mean social relationships domain scores of WHOQoL of the participants in the two groups (clinic group versus telephysiotherapy group) were not significantly different at baseline, second, fourth, and sixth week of intervention (Table 16). This is represented on bar charts (Figure 3).

TABLE 15: Between-group comparison of participants' psychological domain of WHOQoL at baseline, second, fourth, and sixth week of intervention.

Time point	Group	N	PD	t	P value
			Mean ± SD		
Baseline	CG	25	61.04 ± 10.45	-1.187	0.24
	TG	25	64.48 ± 10.03		
Second week	CG	25	66.60 ± 10.74	-0.156	0.88
	TG	25	67.04 ± 9.10		
Fourth week	CG	25	69.64 ± 9.45	-0.032	0.97
	TG	25	69.72 ± 7.97		
Sixth week	CG	25	71.40 ± 8.26	0.025	0.80
	TG	25	71.96 ± 7.55		

\*Significant level is at 0.05.

TABLE 16: Between-group comparison of participants' social relationships domain of WHOQoL at baseline, second, fourth, and sixth week of intervention.

Time point	Group	N	SRD	t	P value
			Mean ± SD		
Baseline	CG	25	65.76 ± 12.37	0.315	0.75
	TG	25	64.80 ± 8.92		
Second week	CG	25	67.04 ± 11.62	0.843	0.40
	TG	25	64.52 ± 9.41		
Fourth week	CG	25	67.00 ± 11.22	0.072	0.94
	TG	25	66.80 ± 8.29		
Sixth week	CG	25	69.04 ± 10.58	0.739	0.46
	TG	25	67.04 ± 8.44		

\*Significant level is at 0.05.

TABLE 17: Between-group comparison of participants' environment domain of WHOQoL at baseline, second, fourth, and sixth week of intervention.

Time point	Group	N	ED	t	P value
			Mean ± SD		
Baseline	CG	25	59.08 ± 8.01	-2.439	0.02*
	TG	25	64.52 ± 7.76		
Second week	CG	25	59.76 ± 8.58	-2.379	0.02*
	TG	25	65.08 ± 7.16		
Fourth week	CG	25	62.24 ± 8.48	-2.353	0.02*
	TG	25	67.76 ± 8.11		
Sixth week	CG	25	63.76 ± 7.80	-2.099	0.04*
	TG	25	68.48 ± 8.09		

\*Significant level is at 0.05.

5.13. *Between-Group Comparison of Participants' Environment Domain of WHOQoL at Baseline, Second, Fourth, and Sixth Week of Intervention.* The mean environment domain scores of WHOQoL of the participants in the two groups (clinic group versus telephysiotherapy group) were significantly different at baseline, second, fourth, and sixth week of intervention (Table 17). This is represented on bar charts (Figure 4).

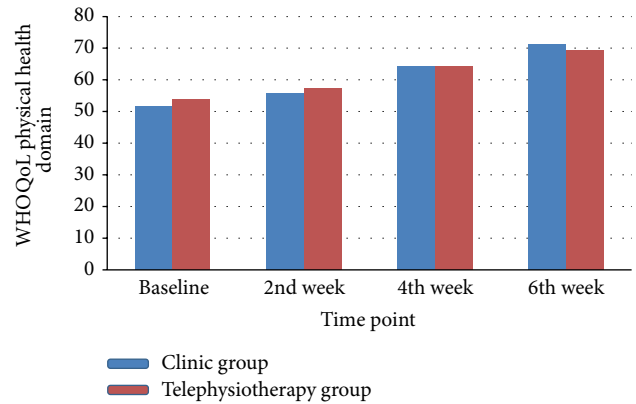


FIGURE 1: Bar chart showing between-group comparisons of participants' physical health domain of WHOQoL following six weeks of intervention.

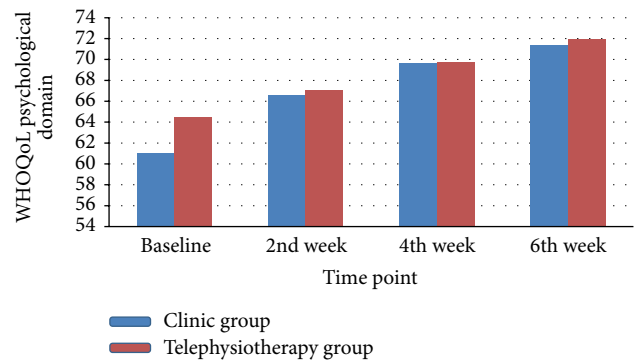


FIGURE 2: Bar chart showing between-group comparisons of participants' psychological domain of WHOQoL following six weeks of intervention.

## 6. Discussion

This study has scientifically investigated the effect of a 6-week telephysiotherapy programme on quality of life of patients with osteoarthritis of the knee. Fifty patients (26 males and 24 females) with osteoarthritis of the knee participated in the study. 96% of the participants are between the age range of 40–69 years and this is in line with the age prevalence of knee OA as documented in several studies [6, 29].

Sophisticated telecommunication means such as real-time video conferencing and satellite which are widely used in developed countries are not widely available for general use in developing countries like Nigeria, basically because they are expensive for average Nigerians. Thus, this research employed the use of mobile telephone which is an affordable and widely used telecommunication means in Nigeria. This medium (mobile telephoning) has been documented to be an acceptable form of telehealth/telemonitoring system [22, 23]. It appears there are no documented studies on the effect of telephysiotherapy among individuals with knee osteoarthritis in Nigeria. Therefore, the findings from this research would be compared with related works from other parts of the world and studies in different patients' population.

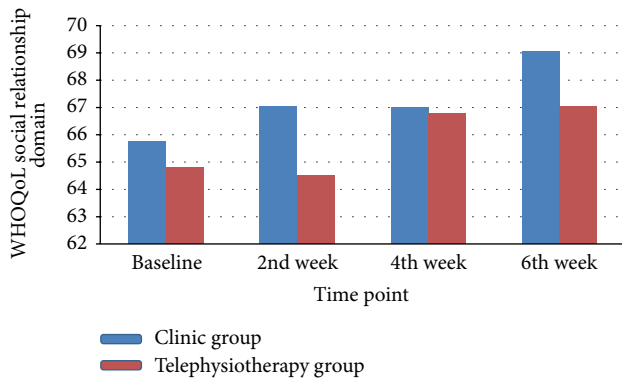


FIGURE 3: Bar chart showing between-group comparisons of participants' social relationship domain of WHOQoL following six weeks of intervention.

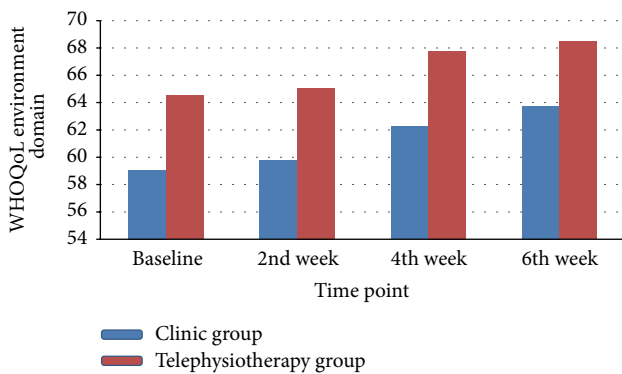


FIGURE 4: Bar chart showing between-group comparisons of participants' environment domain of WHOQoL following six weeks of intervention.

Dar et al. [30] reported no significant difference in typical elderly population of heart failure patients between those in usual care group and telemonitoring group in overall health-related quality of life as measured through the generic Euroqol (EQ5D) over the 6-month follow-up period and quality of life measured through the disease specific Minnesota living with heart failure questionnaire (MLwHF) ( $P = 0.5$  for EQ5D and  $P = 0.6$  for MLwHF).

Also, Russell [21] documented that the achieved outcomes following six weeks of either traditional outpatient rehabilitation services or internet-based outpatient rehabilitation (telerehab group) in 65 patients who underwent total knee replacement (TKR) are similar. The patients were randomized to receive six weeks of either traditional outpatient rehabilitation services or telerehabilitation exercises. Patients in the telerehab group received rehabilitation exercises (open and closed kinetic loop active exercises) through real-time (live video and audio) interaction with a physical therapist via an internet-based system and therapy sessions were limited to 45 minutes.

The above reports are similar to our research findings which showed no significant difference ( $P > 0.05$ ) in physical,

psychological, and social relationship domains of quality of life between patients with knee osteoarthritis (OA) in telephysiotherapy group and clinic based group at baseline, second, fourth, and sixth week of intervention.

Furthermore, the efficacy of telephysiotherapy as shown in our findings where significant differences were noted in quality of life of patients in telephysiotherapy group between weeks 0–4, 0–6, 2–4, and 2–6 in physical health domain and weeks 0–4, 0–6, and 2–6 in psychological domain of WHOQoL is similar to the outcomes of two recent studies discussed below.

Keerthi et al. [31] assessed the efficacy of telerehabilitation via videoconferencing when compared to telephonic consultation for home based treatment of patients with knee OA using exercise. The results of this study showed percentage difference in pain, stiffness, and physical function in both groups, that is, patients in telerehabilitation via videoconferencing and patients in telephonic consultation group. The percentage difference in the former is a better home based exercise program in osteoarthritis of the knee though. The significant improvements in outcomes of pain, stiffness, and physical function documented in the telephonic consultation group are similar to the significant improvements in physical health and psychological domains of WHOQoL that were recorded in patients with knee OA in telephysiotherapy group during six weeks of intervention in our research.

Likewise, Margolis [32] reported that patients receiving telemonitoring along with high blood pressure management support from a pharmacist were more likely to lower their blood pressure than those not receiving extra support. They studied 450 patients with uncontrolled high blood pressure. Approximately half (222) of the patients were assigned to traditional care through their primary care providers while the remaining 228 patients in the intervention group saw a primary care provider and received additional telemonitoring support from a pharmacist. The latter measured their blood pressure at home and sent the readings electronically to a secure website. Participating pharmacists accessed the information and consulted the patients every two to four weeks by phone. The researchers found that blood pressure decreased more in the telemonitoring group. At the start of the study, patients' blood pressures averaged 148/85 mmHg while at six months the average was 126/76 mmHg in the telemonitoring intervention and 138/82 mmHg in the traditional care group. This result is also similar to the significant improvements in physical health and psychological domains of WHOQoL we recorded in patients with knee OA in telephysiotherapy group during six weeks of intervention in our research. However, the results of Keerthi et al. [31] and Margolis [32] discussed above are contrary to our findings in social relationship and environment domains of WHOQoL where no significant differences were noted during 6 weeks of telephysiotherapy intervention.

Summarily, our study showed that the outcome of quality of life in patients with osteoarthritis of the knee under telephysiotherapy treatment is comparable to those in clinic based group following six weeks of intervention. Besides,

there were significant improvements in physical and psychological domains of quality of life in patients with osteoarthritis of the knee following 6 weeks of telephysiotherapy intervention. The effectiveness and usability of telephysiotherapy in the management of patients with knee osteoarthritis have been demonstrated in this study. This mode of therapeutic intervention in patients with knee OA would undoubtedly reduce clinic visits, clinic waiting time, and cost incurred on transportation to the clinic, especially for patients living at distant places from physiotherapy clinics.

## 7. Conclusion

Telephone-based physiotherapy intervention is effective in management of patients with knee osteoarthritis and it produces a similar outcome in terms of quality of life to conventional clinic based physiotherapy as documented in this research. Thus, this mode of treatment may be considered in the management of patients with osteoarthritis of the knee and more research should be carried out on the usability and effectiveness of telephysiotherapy in the management of other conditions amenable to physiotherapy.

## Conflict of Interests

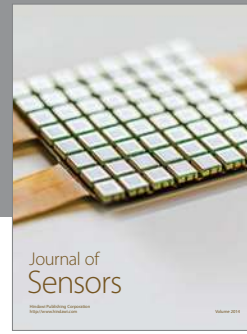
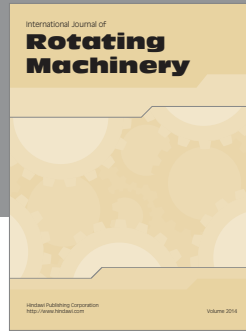
The authors declare that there is no conflict of interests regarding the publication of this paper.

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