ORIGINAL ARTICLE

# Tele-rehabilitation versus Face To Face Rehabilitation after Knee Joint Replacement

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## ABSTRACT

**Background:** Joint substitution of lower limbs like hip and knee replacements are viewed as a high volume surgery with great achievement rates and physical restoration assumes a significant role in recovery of these patients. However, access to recovery and follow up is restricted. Post joint substitution patients living in remote territories and those with the danger of joint dislocation find difficulty to recovery benefits once they are released from emergency clinic. Access issues produce extra burden. The purpose of current study was to evaluate whether telerehabilitation performed from a health center to patient's place after discharge from hospital among knee replacement was practically effective as alternative treatment.

**Methods:** A quasi-experimental study was conducted on 50 post total knee replacement patients for a period of 6 months at Ghurki hospital. Patients were divided into two groups. Group A received telerehabilitation. Group B received face to face rehabilitation for 2 months. Ranges, muscle strength and functional status were measured through goniometer, manual muscle testing and timed get up and go test. Assessment was done using Fischer exact test at baseline, after 2 weeks and followed up after 2 months.

**Results:** p-value for knee flexion came out to be 0.03 where as for quadriceps it was 0.02 after 2 weeks, which was found to be statistically significant. After 2 months, p-value for knee flexion was 0.016 and 0.000 for functional status.

**Conclusion:** Use of telerehabilitation is found to be equally effective as compared to face to face rehabilitation among knee replacement patients.

**Keywords:** Knee Arthroplasty; Standard Rehabilitation; Telerehabilitation; Knee Replacement.

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doi.org/10.36283/PJMD9-2/012

## INRODUCTION

Total knee arthroplasty is considered as the best surgical intervention for serious conditions like terminal stages of osteoarthritis of knee. An expanding pattern has been seen for such technique over the earlier decade, with around forty thousand performed in Australia and eighty five thousand in United Kingdom[1]. Enhancing postoperative consideration for Total knee, Replacement through early restoration has demonstrated to be effective[2]. Rehabilitation is viewed as imperative part of treatment procedure post total joint substitution and results in progress in practical exercises for decrease in pain[3].

The extending availability of negligible cost Internet and correspondence advancements has given the chance to oversee development-based answers and to convey wellbeing related administrations to the patients just after discharge[4]. Telerehabilitation, one of the promising fields of telemedicine, is described as the utilization of gadgets, procedure, and techniques to convey health services remotely[5]. Telerehabilitation is gaining attention as alternative option in contrast to customary face to face rehabilitation[6]. It incorporates the utilization of various data innovations to viably give recovery

care to people living in remote zones. Such administrations incorporate a wide exhibit of procedures like history, examination, assessment, mediation, development, discussion and counseling[7].

The use of telerehabilitation guaranteed the delivery of healthcare benefits directly to the patient's homes. This has huge advantage to patients living in remote territories and to urban regions patients with transportation troubles by focusing on access issues. In total knee arthroplasty patients face difficulty in seeking health facilities after discharge from hospital. Availing heath services also add monetary burden to the patient[8]. Access issues further overstate for people living somewhat far from urban regions because of time factor and voyaging cost[9].

Past written works have given advantageous impacts of telerehabilitation in various post careful orthopedic conditions. A lot of research in this specific zone has for the most part focused on populace with complete knee arthroplasty. A few randomized preliminaries contrasted the viability of telerehabilitation innovation with conventional eye-to-eye restoration in knee substitution patients[10]. Tousignant et al., inferred that telerehabilitation not just give similar results to patients with total knee substitution yet in addition brought about expanded dimension of patient satisfaction[11].

Notwithstanding attractive satisfactory outcomes just as proposals from wellbeing plans for cost decrease by shortening length of emergency clinic stays, the innovation of telerehabilitation isn't in any case widely circulated and utilized[12]. The significant clarification for this hole between current proof and telerehabilitation administrations exists because of specialized necessities required for settling intercession surroundings in remote territories. Another reason is that a wide inclusion of system is expected to reach at far off areas. Until now, surveys are accessible on telerehabilitation focusing on generally neurological rehabilitation[13].

Joint substitution of lower limbs like hip and knee replacements are viewed as a high volume surgery with great achievement rates and physical restoration assumes a significant role in recovery of these patients[14]. However, access to recovery and follow up is restricted. Post joint substitution patients living in remote territories and those with the danger of joint dislocation find difficulty to recovery benefits once they are released from emergency clinic. Therefore, the main purpose of current study was to evaluate whether telerehabilitation performed from a health center to patient's place after discharge from hospital among knee replacement population was practically effective as alterative treatment.

## METHODS

This quasi-experimental study was conducted at Ghurki trust and teaching hospital from July 2018 to January 2019. Since, 50 Patients who had total knee replacement were recruited for the study. Sample size calculation was done keeping the level of significance as 0.05, power of study as 80% and standard deviation as 21%(14). Written informed consent was taken from each patient. Study was approved from the Institutional Review Board of University of Lahore IRB-UOL-FAHS/438-2019. Patients were assigned into two groups just prior to discharge from hospital. Both groups received similar type of face to face therapy including knee range exercises, gait training and community functions in physical therapy department for 2 weeks. After completion of rehabilitation protocol before the start of telerehabilitation and home based treatment, therapist ensured the absence of complications. First group received telerehabilitation through telephonic mode and the other group received face to face rehabilitation at physiotherapy department where patients visited therapist. Assessment was performed after knee replacement prior to discharge from hospital and 2 months after intervention. Patients were included in the study if they had primary knee replacement following knee osteoarthritis, discharge from hospital for home, had internet facility in their home place, had residency almost 3 hours away from hospital. Exclusion criteria was those patients who had serious health issues which could provide hurdle in rehabilitation sessions, had mental concerns, had serious post surgical complications and had weight bearing limitations.

Convenient sampling was used as sampling technique. Therapy included 45 minutes session each day, 4 times a week for 2 months. The intensity, duration and progression of exercise were done according to patients needs. The effect of therapy in terms of range of motion was assessed through goniomenter. Strength of Quadriceps and hamstring muscle was measured using manual muscle tester. Functional assessment of parameters of balance and gait were assessed using timed get up and go test. These assessments were performed at baseline, 2 weeks after completing face to face rehabilitation and then after 2 months of telerehabilitation. Demographic characteristics were presented. Categorical variables were depicted in the form of frequency and percentages. Mean difference between groups was assessed using Fischer Exact test. P value of less than 0.05 was taken as significant.

## RESULTS

Table 1 showed the comparison of demographic characteristics of the participants between

telerehabilitation group (Group A) and face to face rehabilitation group (Group B). Mean age in group A was 65±5 and in group B it was 67± 7.In group A there were 14 males and 11 females whereas in group B there were 17 males and 8 females. In 18 participants from group A right knee was involved while in group B right knee involvement was in 21 patients. Co morbid conditions like hypertension, arthritis, diabetes and stroke was present in 12 patients in group A and 14 patients in group B. Active knee flexion and extension were 96.3 and -3.43 respectively in group A where as in group B flexion was 95.4 and extension was -2.13. Quadriceps and hamstring muscle strength were 9.8 kg and 12.05 kg in group A while 10.2 and 11.41 kg in group B respectively.

**Table 1: Demographic features of participants.**

| Demographic Features | Group A: Telerehabilitation | Group B: Face to Face Rehabilitation | p-Value |
|---|---|---|---|
| **Age (years)** | 65±5 | 67± 7 | 0.014 |
| **Gender** | | | |
| Male | 14(56.0%) | 17(68 .0%) | 0.264 |
| Female | 11(44.0%) | 8(32.0%) | |
| **Knee Involved** | | | |
| Right | 18(72.0%) | 21(84.0%) | 0.732 |
| Left | 7(28.0%) | 4(16.0%) | |
| **Co-morbid condition** | | | |
| Present | 12(48.0%) | 14(56.0%) | |
| Absent | 13(52.0%) | 11(44.0%) | 0.058 |
| **Active Knee Ranges** | | | |
| Knee Flexion | 96.3 (7.42) | 95.4 (6.85) | 0.353 |
| Knee Extension | - 3.43 (2. 96) | -2.13 ( 3.12) | |
| **Muscle Strength(kg)** | | | |
| Quadriceps | 9.8 (3.73) | 10.2(3.68) | 0.161 |
| Hamstring | 12.05 (3.64) | 11.41(4.18) | |
| Time get up and go test | 23.94 (10.34) | 19.66 (8.16) | 0.692 |

The mean difference in parameters of ranges, strength and functional status from baseline after 2 weeks of face to face rehabilitation in both groups was shown in Table 2. The p value of knee extension, hamstring strength and functional status showed equal results in both groups.

 doi.org/10.36283/PJMD9-2/012

**Table 2: Change in parameters after 2 weeks of face to face rehabilitation.**

| Variables | Group A: Telerehabilitation Mean (SD) | Group B: Standard treatment Mean (SD) | p-Value |
|---|---|---|---|
| Knee Flexion | 6.85(4.31) | 5.69(6.86) | **0.03** |
| Knee Extension | 0.3(2.34) | 0.8(3.47) | 0.39 |
| Quadriceps strength (kg) | 2.85(2.46) | 2.13(2.69) | **0.02** |
| Hamstring strength (kg) | 1.36(2.97) | 1.74(1.62) | 0.75 |
| Time get up and go test | 3.74(1.94) | 4.38(3.74) | 0.06 |

Table 3 showed that comparable results were found in both groups; the group A which received rehabilitation via telephonic mode and group B which received face to face rehabilitation at physiotherapy department.

**Table 3: Change in parameters after 2 months of telerehabilitation as compared to standard treatment.**

| Parameters | Group A: Telerehabilitation Mean (SD) | Group B: Standard treatment Mean (SD) | p-Value |
|---|---|---|---|
| Knee Flexion | 17.56(2.53) | 14.97(4.45) | **0.0 16** |
| Knee Extension | 1.4(2.96) | 0.6(1.49) | 0.86 |
| Quadriceps strength (kg) | 7.59(4.41) | 4.10(3.06) | 0.64 |
| Hamstring strength (kg) | 3.26(0.82) | 2.78(1.37) | 0.98 |
| Time get up and go test | 5.48(2.11) | 4.29 (0.58) | 0.0 6 |

## DISCUSSION

Current study provides support on effectiveness of emerging mode of health care delivery telerehabilitation post hospital discharge among patients who underwent knee replacement. The findings of the study suggested that participants in telerehabilitation groups had similar outcomes when compared with traditional face to face therapy.

Therefore, prior discussing findings of study, some limitations must be address. It should be noted that it was a quasi-experimental single blinded study, randomization element was missing. Other comparable studies post replacement among population with shoulder arthroplasty and traumatic contractures of upper extremity depicted vague findings about comparability of measuring outcomes[15]. Scanty researches are available which give meaningful data on measuring outcomes.

Potential results were observed in previous researches evaluating the use of telerehabilitation in different orthopedic conditions postoperatively. Sufficient evidences have been found on total knee arthroplasty. Several randomized trials determined

the effectiveness of telerehabilitation as compared to face to face rehabilitation in patients who underwent knee replacement[16]. An important outcome reported in patients who received telerehabilitation was increased level of patient satisfaction[17]. The current study evaluated the outcomes of strength, range and functional status after knee replacement at 2 weeks and did a follow-up after 2 months.

An emergent body of evidence supports the utilization of virtual rehabilitation in vast variety of clinical situations. Telerehabilitation for neurology related conditions, cardiac issues, orthopedic injuries, cord injuries; speech and language pathologies have been well evaluated with equivalent results to conventional rehabilitation[18]. Russell et al. suggested that the outcomes of range of motion, strength, stability, postoperative pain and overall quality of life for patients receiving telerehabilitation had comparable results to those getting conventional rehabilitation. However, future studies were required to add to the body of evidence[5].

Tousignant et al. emphasized the results of Russell et al. and concluded that home based telerehabilitation is equally effective as traditional care in decreasing disability level and enhancing knee function post two months of intervention[19]. This was additionally reinforced by Piqueras and colleagues who evaluated a 14 days telerehabilitation plan and concluded that it has comparable results as traditional therapy[16].

Multiple factors contribute the success rate of telerehabilitation, which include physical, emotional and functional outcomes, economic burden from view of consumer as well as provider and compliance to the treatment plan. Despite the fact that literature proposed increased satisfaction level in patients, undergoing telerehabilitation care, but successful execution is mostly dependent on early patient uptake[20]. Thus, the technology access could be challenging and difficult especially in older population.

A randomized controlled trial study protocol registered in Australian Clinical Trial registry aimed to determine the comparison of telerehabilitation with face to face intervention among population with total hip replacement and economic analysis for consumers and providers. Almost seventy individuals who underwent hip replacement were recruited. After discharge, participants were randomized into two groups. One group participants were enrolled in paper home exercise plan performed thrice daily. The other group received same program except treatment was directed directly in their homes through telerehabilitation technology. The study concluded that if results were as effective as traditional care, telerehabilitation could be beneficial in focusing access problems and could also reduce the cost issues. The study recommended that more studies should be conducted on the comparative effectiveness of telerehabilitation versus traditional face to face treatment in joint arthroplasty patients[21].

## CONCLUSION

The study concluded that utilization of telerehabilitation is found to be equally effective as compared to face to face rehabilitation among total knee replacement patients. This mode of health care delivery provides the benefit of reducing sessions of in person therapy at physical therapy clinics and the connected use of expensive medical transportation. This technique also proves to provide a paradigm shift for traditional rehabilitation in clinical environments.

## ACKNOWLEDGEMENTS

I would like to acknowledge Prof. Dr. Amer Aziz who provided a strong background about total knee arthroplasty and its characteristics. I would like to extend my gratitude to my mentor Prof. Hafiz Asim and my supervisor Prof. Ashfaq Ahmad for providing support and guidance in this project.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## ETHICS APPROVAL

Study was approved by the Institutional Review Board of University of Lahore IRB-UOL-FAHS/438/2019.

## PATIENT CONSENT

Written informed consent was obtained from the participants of the study.

## AUTHOR'S CONTRIBUTIONS

SS given the conception and design, collected and assembled the data. SS, AF and ZS performed the analysis and interpretation of the data. SS, AA and HMA also assisted in drafting of the article. Furthermore, SS, AA and HMA did the critical revision of the article for important intellectual content. SS and AA showed the statistical expertise while AA given the final approval and the sponsorship of the article.

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