ORIGINAL ARTICLE

Impact of Mobile App-based Non-surgical Nursing Intervention on the Adherence to Exercise and Other Management among Patients with Knee Osteoarthritis

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Abstract

Background and objective: Technology is an important part of today's scenario. In the healthcare department, many technological advancements took place that make it easy for patients as well as healthcare providers. This study was designed to assess the effectiveness of the mobile app-based non-surgical nursing management on reducing the problems of knee osteoarthritis (KOA) patients attending physiotherapy OPD, PGIMER, Chandigarh.

Materials and methods: This randomized control trial was conducted at physiotherapy OPD, PGIMER, Chandigarh. A total of 80 participants attending physiotherapy OPD from July 15, 2019, to August 30, 2019, were involved in the study and randomized into two groups (experimental and control groups) using a random number table. Problems of KOA patients were assessed by interviewing them. The protocol was in the form of a mobile app (Jiyyo app)-based non-surgical nursing management of KOA patients. This app contained the patient's information, audio call and messages option, medical record-keeping, bills, appointments. Follow-up can also be done through this app. Through this app exercise pdf file was sent to the patient's app that contained exercises related to the KOA. After baseline assessment, a mobile app was installed in the mobile of the experimental group. Weekly motivational telephonically call was done to participants of the experimental group. Monthly two follow-ups were done to motivate the participants. The control group was asked to carry out the instructions given to them. Post-assessment was done after 3 months in both groups by using the same interview schedule.

Results and analysis: There was a significant improvement in physical function and movement of the knee. Knee movement, physical functions improved and there was decreased joint stiffness ($p \leq 0.01$) and level of pain ($p \leq 0.01$). The experimental group had significantly better adherence to treatment and exercises. The control group had no significant improvement after 3 months.

Conclusion: Mobile-based non-surgical nursing management for KOA patients was effective in improving the adherence to the prescribed exercises, treatment and helped in reducing pain and improving activities of daily living among patients with KOA.

Keywords: Elders, Knee osteoarthritis, Mobile app-based non-surgical management.

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Introduction

Osteoarthritis (OA) is the second most common joint disease with a prevalence of 22–39% in India. It is estimated to be the 10th leading cause of non-fatal burden.[1,2] Osteoarthritis of the knee is a major cause of morbidity impairment, particularly among females. Most cases of knee osteoarthritis (KOA) have no known cause and are referred to as primary OA. Primary OA is mostly related to aging. It can present as localized, generalized, or erosive OA. Secondary OA is caused by another disease or condition such as obesity, repeated trauma or surgery, congenital abnormality, gout, diabetes, and other hormonal disorder. Knee osteoarthritis is a chronic degenerative disorder of multifactorial etiology characterized by the loss of articular cartilage, hypertrophy of bone at the margins, subchondral sclerosis, and range of biochemical and morphological alterations of the synovial membrane and knee joint capsule.[3,4]

The most important treatment of KOA is regular exercise and adherence to treatment. Exercise decreases the pain and enhances physical function and ultimately the quality of life. A common recommendation is to offer education or information on the different aspects of the disease to KOA patients in combination with exercise.[5] Regular physiotherapy is the best treatment. As we know that there is a shortage of doctors, nurses, and other health professionals in India and it is not possible for them to follow up with the patients outside the hospital. In the meantime, it is equally difficult to manage the rush of patients requiring physiotherapy in the hospital. Moreover, it is difficult for the patients to visit the hospital regularly to get physiotherapy as most of the patients are elderly and require another family member to accompany them

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to the hospital. This leads to non-adherence of treatment and ultimately worsening the condition of the patient.

The need for physiotherapy among patients with knee arthritis can be supported by the use of technology. This support can be provided to patients in the form of an app on their phones. Through this app, they can get instructions whenever they need it and their problems can be managed to some extent if they follow instructions regularly. Hence, a mobile app can be developed as a solution to overcome most barriers to treatment adherence. An app-based non-surgical nursing care concept may improve the health of the patient with KOA by improving their physical activities, reducing the pain and ultimately reducing their dependency. Through this approach, patients can care at home easily and a large number of patients can be covered for whom it is difficult to visit the hospital frequently.

Through the use of app-based non-surgical nursing intervention, it would be possible to personalize the exercise program and individualize motivational factors, which may optimize individual outcomes. For regular motivation of patients for adherence to the treatment, the technology in the form of app can be used. As nowadays everyone is using one or another means to connect with social media and the use of the smartphone has been increased many folds. Hence, the need was felt to develop such a kind of app for the welfare of KOA patients.

Objective

To assess the effectiveness of the app-based non-surgical nursing management on treatment adherence and selected outcomes of patients diagnosed with KOA attending physiotherapy OPD, PGIMER, Chandigarh.

Materials and Methods

A randomization control trial research design was employed. Ethical approval was taken from the Institute Ethics Committee, PGIMER, Chandigarh (INT/IEC/2019/000746). The trial was registered with CTRI (CTRI/2019/07/019989). By using the total enumeration sampling technique, 80 participants were enrolled from Physiotherapy OPD, PGIMER, Chandigarh, from July 15, 2019, to August 30, 2019. They were randomized into two groups (experimental and control groups) by using random number tables. An independent researcher generated the allocation sequences. The data were collected by using an interview schedule comprised of (a) Sociodemographic profile of patient, (b) Clinical profile of patient, (c) Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scale,[6] (d) Visual analog pain scale[7] and general activity of daily living (GADL) scale.[8] Western Ontario and McMaster Universities Osteoarthritis Index scale and visual analog pain scale were freely available for the use of researchers. Permission to use the GADL scale was obtained from the authors. Western Ontario and McMaster Universities Osteoarthritis Index scale includes total 24 questions in which 2 questions are related to knee stiffness, 17 questions related to physical function, and 5 questions related to knee pain during activity. Participants rank their answers between 0 and 4. Zero score was given for none, 1 for slight, 2 for moderate, 3 for very, 4 for extreme. Each question carries 4 marks by making 96 as the total score of scale. There was no categorization of the score, only the total score of participants was calculated. The score near zero was best and the score near 96 was the worst. The reliability of the scale is 0.85.[6] General activity of daily living scale includes a total of 13 questions related to daily living activities. Participants mark their answer to each question in between 0 and 2. Score 2 was given for independent, 1 for a partial dependent, and 0 for a dependent. Each question carries 2 marks by making 26 as the total score of scale. A normal score of the GADL scale indicating independence is 23 to 24/26. A higher score indicates independence and a lower score indicates dependency. Internal consistency of the scale is 0.849.[8] As per the visual analog pain scale, participants rank their response from 0 to 10. It was divided into 5 categories (1) 0—no pain, (2) 1–3—mild pain, (3) 4–6—moderate to severe, (4) 7–9—very severe, and (5) 10—worst pain. The reliability of the scale is 0.96.[7]

The intervention was developed in the form of mobile app-based non-surgical nursing management and this app was named as Jiyyo app. It was prepared by Chandigarh-based HealthCare Tech start-up founded by two IIT Roorkee Computer Science Engineers and a Pediatrician. Jiyyo builds advanced software to better connect healthcare providers with each other and to their patients. Jiyyo has proposed to develop a collaborative relationship in the area of inter-hospital/institution communication for patient referrals and back-referrals. This included the Jiyyo Referral Software app (or JRS) to be used by PGI to proactively get information about the patients being referred to it from other hospitals thereby opening a communication channel between PGIMER and the hospitals referring patients to it. This app contained the patient's information, audio call and massages option, medical record-keeping, bills, appointments, follow-up, etc. Through this app exercise pdf file was sent to the patient's app that contains exercises related to the KOA.

After interviewing the patients, the Jiyyo app was installed into the mobile phone of the participants of an experimental group, and a pictorial exercises pdf file was sent to them. They were instructed regarding the use of an app. They were given a demonstration regarding the use of the app and exercises for KOA given in the app. This was followed by a return demonstration from them till they gained skill in using the app and performing exercises given in the app. Weekly motivational telephone calls were made for 3 months to the participants regarding regular exercises. They were asked to clarify any doubts regarding the use of the app. Monthly follow-up was done for 2 months. Control group participants were asked to carry out the activity as per the prescription of doctors and physiotherapists. Post-assessment was done for both the groups after 3 months by using the same tools used during pre-assessment. Descriptive and inferential statistics were used to analyze the data using SPSS (version 22).

Results

Participants were in the age range of 40–65 years with a mean age of 54.98 ± 7.09 years (experimental group) and 52.95 ± 8.11 years (control group). Most of the participants were females (experiment group = 72.5%; control group = 80%). Nearly half of the participants had <4 family members (experimental = 50%; control group = 60%). Nearly half of the participants were from the upper class in the experimental group (45%) and 32.5% in the control group. Both the groups were homogeneous as per sociodemographic profile ($p > 0.05$).

At the baseline, most of the participants had reported partial movement of the knee in the experimental (95%) and control group (92.5%). More than one management regimen was used by them (medicine, massage, physiotherapy, hot fermentation, etc.). More

than one prescription was given to participants by a physician (antibiotic, painkiller, supplements, etc.). Both the groups were homogeneous as per clinical profile ($p > 0.05$).

Tables 1 and 2 depict the effect of app on problems related to the knee. The post-assessment score after 3 months of intervention has shown significant improvement in all the problems related to the knee (e.g., stiffness, stairs climbing, standing, sitting, pain during the walk, weight-bearing, rest, etc.) ($p < 0.05$ as per *t*-test) when compared with pre-assessment score in the experimental group (higher scores indicate more problems). In the control group, in some of the problems related to KOA showed no significant change ($p > 0.05$ as per *t*-test) related to knee activity where as in others it worsened after 3 months.

Most of the participants were independent and could perform their daily activities. Some participants were not performing some activities not because they were not capable to do so but they were not doing like preparing meals, washing and ironing (not done by males), driving and handling financial matter (not done by females). The mean score of activity of daily living as per the GADL scale remained the same in the experimental and control groups after 3 months. There was no significant change in the GADL after 3 months of intervention ($p > 0.05$).

Table 3 reveals the intragroup and intergroup comparison among participants indicating the level of pain. The intragroup comparison showed that before the intervention the pain score was almost the same in both the groups, i.e., the median pain score in the experimental group was 7 and 6 in the control group. After 3 months of intervention, there was a significant reduction in the pain score in the experimental group, i.e., median pain score reduced to 4 in the experimental group, and in the control group, the median pain score increased to 7 ($p < 0.05$ as per Mann–Whitney test). Intergroup comparison showed a significant improvement in the experimental group as the median pain score was decreased from 7 to 4 after 3 months of intervention ($p < 0.05$ as per Wilcoxon test). The control group had no significant change in the pain score even the median pain score was increased after 3 months from 6 to 7.

Figure 1 shows the adherence to regular exercise among participants of the experimental group. In the 1st week, 67.5% of participants performed exercises regularly and it increased weekly. In the 5th week, adherence to exercises increased and 90% of participants performed regular exercises. At the end of the 9th week, 95% of participants performed regular exercises. The figure further depicts the satisfaction among participants of the experimental group that also increased with time. In the 1st week, 62.5% of participants reported that they felt better when compared with the previous week. At the end of 6th week, 80% of participants responded that they felt better when compared with previous week. At the end of the 9th week, almost all (95%) of the participants reported that they felt better than the previous week.

Table 1: Problems of the knee as per WOMAC scale among experimental and control group ($N = 80$)

	Experimental group			*Control group*		
Items	*Pre-test Mean ± SD*	*Post-test Mean ± SD*	*t value p value*	*Pre-test Mean ± SD*	*Post-test Mean ± SD*	*t value p value*
1. Stiffness: morning stiffness	3.43 ± 1.13	1.82 ± 1.21	8.79 (39) <0.01	2.98 ± 1.42	3.00 ± 1.37	−1.00 (39) 0.32
2. Stiffness later in the day	2.25 ± 1.12	1.30 ± 1.11	6.64 (39) <0.01	1.95 ± 1.17	1.95 ± 1.17	0
3. Physical function: descending stairs	3.38 ± 1.17	2.0 ± 1.15	9.13 (39) <0.01	3.38 ± 0.89	3.40 ± 0.90	−1.00 (39) 0.32
4. Ascending stairs	3.18 ± 1.31	2.02 ± 1.14	7.66 (39) <0.01	3.35 ± 0.80	3.42 ± 0.71	−1.77 (39) 0.08
5. Rising from sitting	3.43 ± 1.01	2.15 ± 1.16	7.42 (39) <0.01	3.13 ± 1.04	3.12 ± 1.04	0
6. Standing	2.73 ± 0.96	1.57 ± 1.10	7.08 (39) <0.01	2.40 ± 0.90	2.40 ± 0.90	0
7. Bending to floor	1.60 ± 1.39	1.00 ± 1.24	4.35 (39) <0.01	1.60 ± 1.05	1.60 ± 1.05	0
8. Walking on flat surface	2.80 ± 1.34	1.57 ± 1.29	5.74 (39) <0.01	2.18 ± 1.31	2.22 ± 1.31	−1.43 (39) 0.16
9. Getting in/out of car	1.25 ± 1.05	0.67 ± 0.97	4.47 (39) <0.01	0.95 ± 0.87	0.97 ± 0.86	−1.00 (39) 0.32
10. Going shopping	1.55 ± 1.10	0.90 ± 0.98	4.93 (39) <0.01	1.43 ± 0.87	1.47 ± 0.90	−1.43 (39) 0.16
11. Putting on socks	0.85 ± 1.07	0.50 ± 0.84	2.40 (39) 0.02	0.85 ± 1.07	0.92 ± 1.11	−1.77 (39) 0.08
12. Lying in bed	1.35 ± 1.27	0.50 ± 1.01	5.23 (39) <0.01	1.08 ± 1.14	1.07 ± 1.14	0
13. Taking off socks	0.83 ± 1.03	0.47 ± 0.84	2.47 (39) 0.01	0.78 ± 1.02	0.85 ± 1.05	−1.77 (39) 0.08
14. Rising from bed	1.63 ± 1.27	0.67 ± 1.02	6.09 (39) <0.01	1.38 ± 1.19	1.47 ± 1.17	−2.08 (39) 0.04
15. Getting in/out of bath	2.98 ± 0.80	1.72 ± 1.13	8.53 (39) <0.01	2.60 ± 1.05	2.62 ± 1.05	−1.00 (39) 0.32
16. Sitting	3.18 ± 0.93	1.87 ± 1.13	8.07 (39) <0.01	2.83 ± 1.01	2.85 ± 1.00	−1.00 (39) 0.32
17. Getting on/off toilet	3.18 ± 0.81	1.97 ± 0.94	7.45 (39) <0.01	3.08 ± 0.85	3.12 ± 0.82	−1.43 (39) 0.16
18. Heavy domestic duties	2.85 ± 1.02	1.90 ± 1.05	5.66 (39) <0.01	2.83 ± 1.08	2.87 ± 1.01	−1.43 (39) 0.16
19. Light domestic duties	1.08 ± 1.04	0.67 ± 0.97	3.56 (39) <0.01	0.95 ± 0.90	1.15 ± 0.97	−3.12 (39) <0.01
20. Pain: walking	2.60 ± 1.03	1.35 ± 1.09	8.79 (39) <0.01	2.20 ± 1.06	2.25 ± 1.05	−1.43 (39) 0.16
21. Stair climbing	3.25 ± 1.21	2.10 ± 1.12	5.24 (39) <0.01	3.30 ± 0.88	3.32 ± 0.82	−1.00 (39) 0.32
22. Nocturnal	0.93 ± 1.18	0.35 ± 0.69	3.69 (39) <0.01	0.98 ± 1.18	1.10 ± 1.12	−2.36 (39) 0.02
23. Rest	0.63 ± 0.89	0.20 ± 0.56	3.44 (39) <0.01	0.48 ± 0.81	0.67 ± 0.91	−3.12 (39) <0.01
24. Weight bearing	2.78 ± 0.94	1.57 ± 1.03	8.08 (39) <0.01	2.48 ± 1.01	2.50 ± 1.01	−1.00 (39) 0.32

Table 2: Problems of the knee as per WOMAC scale among the experimental group at different study periods ($N = 40$)

	Experimental group			
Items	*Pre-test Mean ± SD*	*At 1st month Mean ± SD*	*At 2nd month Mean ± SD*	*Post-test (3rd month) Mean ± SD*
1. Stiffness: morning stiffness	3.43 ± 1.13	2.75 ± 0.92	2.10 ± 0.90	1.82 ± 1.21
2. Stiffness later in the day	2.25 ± 1.12	2.10 ± 0.98	1.65 ± 0.92	1.30 ± 1.11
3. Physical function: descending stairs	3.38 ± 1.17	2.85 ± 1.00	2.17 ± 0.90	2.0 ± 1.15
4. Ascending stairs	3.18 ± 1.31	2.65 ± 1.05	2.12 ± 1.09	2.02 ± 1.14
5. Rising from sitting	3.43 ± 1.01	2.87 ± 0.82	2.32 ± 0.91	2.15 ± 1.16
6. Standing	2.73 ± 0.96	2.50 ± 0.81	2.00 ± 0.81	1.57 ± 1.10
7. Bending to floor	1.60 ± 1.39	1.42 ± 1.19	1.22 ± 1.07	1.00 ± 1.24
8. Walking on flat surface	2.80 ± 1.34	2.37 ± 1.05	1.90 ± 1.00	1.57 ± 1.29
9. Getting in/out of car	1.25 ± 1.05	1.07 ± 0.91	0.92 ± 0.85	0.67 ± 0.97
10. Going shopping	1.55 ± 1.10	1.42 ± 0.98	1.12 ± 0.88	0.90 ± 0.98
11. Putting on socks	0.85 ± 1.07	0.80 ± 0.96	0.60 ± 0.77	0.50 ± 0.84
12. Lying in bed	1.35 ± 1.27	1.12 ± 1.01	0.82 ± 0.93	0.50 ± 1.01
13. Taking off socks	0.83 ± 1.03	0.77 ± 0.97	0.55 ± 0.78	0.47 ± 0.84
14. Rising from bed	1.63 ± 1.27	1.32 ± 0.99	1.00 ± 0.96	0.67 ± 1.02
15. Getting in/out of bath	2.98 ± 0.80	2.50 ± 0.67	1.95 ± 0.78	1.72 ± 1.13
16. Sitting	3.18 ± 0.93	2.77 ± 0.73	2.12 ± 0.75	1.87 ± 1.13
17. Getting on/off toilet	3.18 ± 0.81	2.72 ± 0.67	2.20 ± 0.79	1.97 ± 0.94
18. Heavy domestic duties	2.85 ± 1.02	2.60 ± 0.70	2.05 ± 0.90	1.90 ± 1.05
19. Light domestic duties	1.08 ± 1.04	0.92 ± 0.91	0.70 ± 0.75	0.67 ± 0.97
20. Pain: walking	2.60 ± 1.03	2.20 ± 0.88	1.65 ± 0.89	1.35 ± 1.09
21. Stair climbing	3.25 ± 1.21	2.75 ± 0.89	2.12 ± 0.88	2.10 ± 1.12
22. Nocturnal	0.93 ± 1.18	0.75 ± 0.92	0.60 ± 0.84	0.35 ± 0.69
23. Rest	0.63 ± 0.89	0.50 ± 0.75	0.40 ± 0.67	0.20 ± 0.56
24. Weight bearing	2.78 ± 0.94	2.32 ± 0.72	1.87 ± 0.91	1.57 ± 1.03

Table 3: Level of pain during pre- and post-assessment as per visual analog pain scale among experimental and control group $N = 80$

Pain score	*Experimental Median (IQR)*	*Control Median (IQR)*	*Mann–Whitney test (U value) p value*
Pre-test	7.0 (3–10)	6.0 (5–9)	667.0 (0.18), 303.50 **(<0.01)**
Post-test	4.0 (2–10)	7.0 (5–10)	
Wilcoxon test	−5.51	−0.333	
(*Z* value) *p* value	(<0.01)	(0.73)	

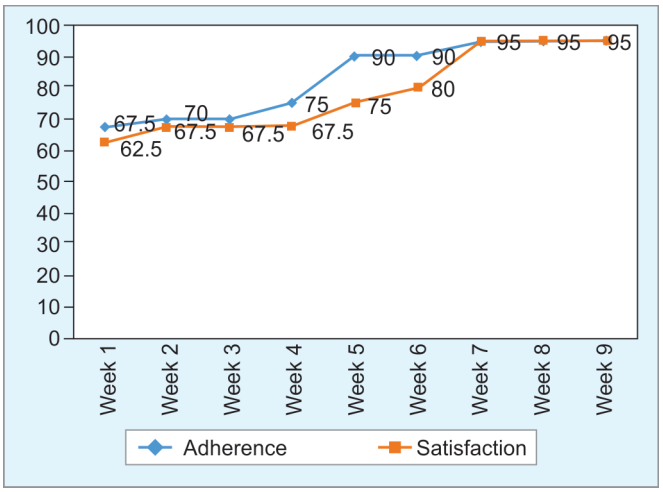

Fig. 1: Week-wise adherence to exercise and satisfaction among participants of the experimental group. The vertical axis shows the percentage (%) of participants who adhered to the prescribed regimen and satisfaction. The horizontal axis shows the weeks ($W = 1–9$ weeks)

Discussion

Exercise is an important part of the treatment regimen of KOA. The studies have shown that therapeutic exercise may be used as first-line conservative management for knee OA.[3] The "American Academy of Orthopaedic Surgeons" 2013 guidelines for the treatment of knee OA comprised a strong commendation for strengthening, neuromuscular education, low-impact aerobic exercise, and physical activity for those with symptomatic OA,[9] whereas as per "American College of Rheumatology" 2012 recommendations for the management of KOA include a strong commendation for aerobic and/or resistance land-based exercise as well as aquatic exercise.[10] Likewise, the 2008 expert consensus guidelines from the "Osteoarthritis Research Society International" advocate regular strengthening, aerobic, and range-of-motion exercise for every patient with knee OA.[11] The effectiveness of exercises on relieving the pain and disability is depending on the adherence to the exercises by the patients. However, when exercise therapy is prescribed, one main challenge is adherence to the exercises once supervision ends. There are many individual

barriers like, busy schedule, lack of motivation, and forgetting the exercises. The healthcare professionals dealing with the patients especially doctors and nurses need to find a way to help these patients to adhere to regular exercises. Hence, the present study was undertaken to develop and assess the effectiveness of mobile app-based non-surgical nursing management for patients having KOA. The app comprising exercises, clarify the doubts regarding exercise and other treatment measures at the home level and help the patients as a motivational force to do the exercise regularly.

The results of the present study show that the KOA was prevalent in the middle or elder age group as 25% of the participants of the experimental group and 22.5% of control group participants were between the age group of 60 years and 65 years. The mean age of participants in the experimental group was 54.98 ± 7.09 years and in the control group was 52.95 ± 8.11 years. Hence, the participants with age >50 years are higher in the number who suffered from KOA. A study conducted in Kanchipuram District, Tamil Nadu, 2018 also showed that KOA was more prevalent among age > 50 years. Knee osteoarthritis was 7.7 times more in people with age >50 years when compared with <50 years.[12] A meta-analysis concluded that the prevalence of symptomatic OA was more in aged over 60 years and 25% of adults over 55 years report at least one episode of knee pain each year due to underlying OA.[13]

The present study result revealed that KOA was more common among females as 72.5% of participants were females in the experimental group and 80% of females in the control group. A study conducted in South India, 2019 has shown that Globally, OA knee is the 4th leading cause of incapability among women and 8th in men.[14] Another study conducted in Alberta, Canada, reported that out of the total 4,733 samples 8.9% of females had KOA, and only 6.3% of males were affected.[15]

In the present study, experimental group shows a significant improvement in the knee problem after 3 months of mobile app-based non-surgical nursing intervention. As it was helpful to remember the steps of exercise, clarifying the doubts of participants regarding exercise and adherence to exercise. Similarly, in 2018, a user-driven exploratory study was conducted on the usage of an exercise app in the care of people with OA. The study focused on three main themes: competition as motivation, training together, and barriers. The results revealed that the participants wanted to do their training and had knowledge on exercise and pain but found it hard to motivate themselves. The patients with OA missed the observation, comments, and encouragement by the supervising physiotherapist as well as their peers. They found a way to optimize the training app for long-term continuation of exercising for patients with OA. It was concluded that it improved with the use of a technology (App), including motivational and other behavioral factors.[16]

The present study reported significant improvement in physical function, movement of the knee joint, reduction of stiffness, and level of pain among patients having KOA in the experimental group after using the mobile app-based non-surgical nursing management for 3 months. A similar study was conducted on the use of exercise apps for people with OA.[16] Findings of the study were similar to the present study in that participants wanted to do the exercises on time but found it hard to motivate themselves and they also tend to forget the steps of the exercises. Timely motivation and clearance of doubts regarding exercises are important in improving adherence. This aspect was clearly reflected in the present study. The participants were followed up for 3 months and weekly telephonically motivational calls were also done. Every week the participants were asked about their adherence to regular exercises, and how did they feel when compared with the previous week. Participants were further motivated by the researcher to do the regular exercises for positive outcomes. Similar results were reported in a study conducted at Chandigarh where patients with mild or moderate KOA in two groups received a package of non-pharmacology interventions including a set of supervised exercise sessions, kinesthesia, balance, and agility (KBA), meditation, weight reduction advice, and weekly telephonic reminders. Another group of patients received the same package except for KBA and meditation. WOMAC, VAS, and performance-based measures were measured. The study resulted in significant improvement in WOMAC and VAS scores in both the groups.[17]

Mobile app-based non-surgical nursing management for KOA patients was effective in improving the adherence to regular exercise, intake of supplements, and medicine among KOA patients. Regular exercise helped improve the physical functions of the knee joint like bending, sitting, rising, stairs climbing, transporting from one place to another, climbing stairs and coming down from the stairs, etc., among the participants of the experimental group when compared with the control group. The level of pain also decreased among participants in the experimental group when compared with the control group. This all was because of the adherence to exercise among participants of the experimental group.

Conclusion

A mobile app (Jiyyo)-based non-surgical nursing management was effective in managing the problems of patients having KOA by improving the adherence to exercises, treatment, which in turn helped the patient in improving physical function and reduction in joint stiffness and level of pain.

Recommendations

It is recommended that nurses and other healthcare professionals should make use of such mobile apps in routine care of patients with KOA; a protocol on management of patients with KOA is developed that can be utilized by nurses and other healthcare professionals while caring for patients with KOA and can be utilized and tested in other settings and at large sample size for its feasibility and effectiveness.

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