DOI: https://doi.org/10.54393/pjhs.v5i01.1277

PAKISTAN JOURNAL OF HEALTH SCIENCES

https://thejas.com.pk/index.php/pjhs

ISSN (P): 2790-9352, (E): 2790-9344

Volume 5, Issue 1 (January 2024)

Original Article

Exploring the Efficacy of Kinesio Taping as an Adjunct Treatment for Knee Osteoarthritis, Grade 1 & 2: A Quasi-Experimental Study

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ARTICLE INFO

Keywords:
Kinesio Taping, Osteoarthritis, Pain, Disability

How to Cite:
Ahmad, D., Zahid, H., Altaf, F., Sarfraz, R., Kazmi, S. K., & Khalid, A. (2024). Exploring the Efficacy of Kinesio Taping as an Adjunct Treatment for Knee Osteoarthritis, Grade 1 & 2: A Quasi-Experimental Study : Efficacy of Kinesio Taping for Knee Osteoarthritis . Pakistan Journal of Health Sciences, 5(01). https://doi.org/10.54393/pjhs.v5i01.1277

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Received Date: 9th January, 2024
Acceptance Date: 29th January, 2024
Published Date: 31st January, 2024

ABSTRACT

Osteoarthritis (OA) is a prevalent chronic joint condition resulting in pain, stiffness, and reduced joint function. Kinesio taping (KT) has emerged as an adjunct treatment for OA. **Objective:** To examine the role of KT as an adjunctive intervention in the physiotherapy management of knee OA. **Methods:** A quasi-experimental investigation was conducted at Bethania Hospital, Pakistan, comparing the effectiveness of standard physiotherapy alone (Group 1) and standard physiotherapy plus KT (Group 2) in patients with knee OA grade I and II. By convenience sampling selected 50 participants aged above 40 with knee OA. Both groups received standard physiotherapy treatments, and KT was applied to Group 2 using a specific technique. Outcome measures included pain reduction Visual Analogue Scale (VAS), functional improvement using Western Ontario and McMaster Index (WOMAC), and presence of swelling and tenderness. **Results:** Demographic findings showed left-sided predominance of knee involvement, higher female prevalence, and a common age group of 40-45 years. Both groups demonstrated improvement in pain and functional outcomes post-intervention. The experimental group (Group 2) exhibited significantly lower WOMAC scores ($p < .001$) and VAS pain scores ($p = .011$) compared to the control group indicating superior improvement. The incidence of swelling and tenderness around knee demonstrated no improvement in posttest analysis. **Conclusions:** Promising results are reported in KT group in management of knee OA in grade I and grade II as compared to only physiotherapy treatment. The study highlights the age specific considerations, tape application method and impact of kinesio tape intervention as an additional option in physiotherapy.

INTRODUCTION

One of the most common musculoskeletal ailment OA results in gradual decay of hyaline cartilage and symptoms of pain, stiffness and reduced range of motion are reported [1]. The weight-bearing joints especially knee are affected frequently and the sufferer are in millions globally especially in the elderly [2]. Once developed there is no absolute cure of the condition but various strategies are employed to reduce symptoms and refine the standard of life [3]. KT as a treatment option in knee OA has gained popularity over the past few years [4]. This new technique was incepted by Dr. Kenzo, a Japanese chiropractor in 1970 that involved the use of elastic and adhesive tape in a specific manner to address the biomechanical dysfunctions in various soft tissues and joints. In 1970 [5]. Its clinical benefits in terms of pain and dysfunctions have been studied with promising results by a number of clinicians [6, 7]. On the flip side of this certain studies report it just as a subjective and temporary relief of pain perception with no definite superiority compared to placebo and with no longer benefits [8, 9]. The non-invasive method of applying KT with no side effects has been investigated and this approach as an additional intervention supports the treatment outcome in addition to exercise, physical therapy and medication [10, 7]. The user friendly features in its application, its elasticity and porous texture with variable skin colors can make it a sound

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clinical tool in managing OA of knee [11].

The supportive role of KT in the management of knee OA is addressed in the study with its possible advantages, its biomechanical role and the evidence reinforcing its use in minimizing the sensations of pain, reducing disability and enhancing the quality of life. The tape application technique, its duration of use, possible side effects and its realistic implications can provide health care professionals an insight to address the treatment options to address this degenerative pathology. While KT is not a standalone solution for managing knee OA, its integration into a comprehensive treatment plan holds promise in optimizing patient outcomes.

METHODS

The research study was a quasi-experimental investigation that aimed to compare the effectiveness of two different treatment approaches in patients diagnosed with knee OA grade I and II according to the criteria set by the Kelgren Lawrence [12]. Both groups, group 1, non-taping & group 2, taping received same physiotherapy treatments whereas group 2 received an extra application of tape after each treatment session, concluding in 6 sessions on alternate days. The study was conducted at the physiotherapy OPD of Bethania Hospital Sialkot, a clinical affiliate of UMT Sialkot, Pakistan from May 2021 to May 2022. Before proceeding with the study, the ethical review committee of UMT Sialkot thoroughly examined the trial to ensure patient safety and approved its implementation on 23rd April 2021 vide letter with reference number "kuhs/pt/01-421". Convenience sampling, a non-probability technique, was used to select the participants. The inclusion criteria for the study were individuals aged above 40 years, diagnosed with knee OA (grade I and II), and attending the hospital's physiotherapy OPD. Both genders were eligible for participation. Participants could have knee OA in one or both knees. The study excluded individuals with trauma, certain systemic conditions affecting joints and bones, having fragile skin, diagnosed with cancer, those who had received intra-articular injections within the last 3 months, individuals using analgesic medication, pregnant ladies, orthotics users, those with prior experience with the KT method, or individuals unwilling to participate were also excluded from the study. Sample size was calculated online, by reviewing previous literature and estimated inflow of cases in the hospital OPDs [13]. Fifty participants were selected and divided into two groups of 25 each. Both groups, received the same standard physiotherapy treatments, which included isometric knee exercises, interrupted therapeutic ultrasound therapy, transcutaneous electrical nerve stimulation (TENS), general range of motion exercises, and squatting [14-18]. A combination of Y-shaped and I-shaped strips was utilized in group 2. The initial Y-shaped band was positioned over the mid of rectus femoris with its end around patella towards tibial tuberosity. The subsequent Y-shaped band commenced just below the tibial tuberosity, with its tails encircling the patella, and the ends extending over the vastus medialis and vastus lateralis muscles with 0% tension at distal attachments and 10-15% in middle part. Two I-shaped bands were applied over the patella tendon transversely and the medial/lateral collateral ligaments transversely with partial superimposition of both with full tension [6]. The outcome measures were evaluated before and after the treatment to determine the effectiveness of this taping approach as an adjunctive therapy for knee osteoarthritis. Data collection occurred both before and after the trial, and all outcome measures were recorded, tabulated, and compared using SPSS version 24.0 software to analyze the results. The primary outcome measure was the reduction in pain, which was assessed using the VAS [19]. Participants who scored 4 or 5 after the conclusion of the treatment sessions were categorized as "improvers". Another outcome measure focused on the WOMAC index, indicating scores of disability from 0 to 96 [20]. The presence of swelling and tenderness, common symptoms in arthritis, were noted and analyzed before and after the trial to assess any changes associated with the treatment approaches. Decreased swelling and tenderness were evaluated through physical examination and by performing patellar ballottment test [21].

RESULTS

Knee involvement was found to be more prominent on the left side. Interestingly, the study population exhibited a higher proportion of females compared to males, suggesting a potential gender-based difference in knee-related issues. The most prevalent age group affected was between 40 to 45 years, followed closely by the age groups of 50 to 55. The below data in Table 1 shows various important descriptive variables.

Table 1: Demographic data. Non taping group (NTG), Taping group (TG)

Variables	Group 1 (NTG)(n= 25)	Group 2 (TG)(n= 25)
Sex(male/female)	9/16	12/14
Age(Mean ± SD)	44.90±7.26	45.40±7.46
BMI(Mean ± SD)	28.89±3.25	29.39±4.80
Affected Side(Right/Left)	9/14	7/16
Tenderness(positive/negative)	15/10	18/7
Swelling(positive/negative)	9/14	11/16

A decreased trend is noted in both groups in terms of pain and functional disability score. WOMAC score reaches to maximum of 96 but in group 1 and group 2, it came out to be

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with mean of 35.24 and 34.88 and standard deviation of 4.83 and 3.19 respectively, measured at baseline. The posttest analysis shows decreased values in both groups but group 2 establishes more decrease in WOMAC score (M = 19.12.88, SD = 6.1) compared to the group 1 (M = 29.6, SD = 5.13)(Table 2).

Table 2: Group Statistics WOMAC Score

Groups		N	Mean ± SD
Pretest WOMAC Score(0-96)	Group 1(NTG)	25	35.24 ± 4.83
	Group 2 (TG)	25	34.88 ± 3.19
Posttest WOMAC Score(0-96)	Group 1(NTG)	25	29.6 ± 6.01
	Group 2 (TG)	25	19.12 ± 5.13

The independent sample t-test at 95% confidence interval(CI) and 48 degree of freedom(df), was used to check the significant difference in mean of WOMAC score between group 1 and group 2 which confirmed that this difference was statistically significant ($p < .001$), underscoring the efficacy of the treatment in enhancing knee function and alleviating pain. Before conducting t-test, Levene's test, pre-requisite of t-test, confirmed that homogeneity assumption is met and the variances in two samples are not significantly different ($p > 0.5$) from each other(Table 3).

Table 3: t-test statistics for Equality of Means of Womac Score between groups

Levene's Test for Equality of Variance			Independent sample t-test						
Parameters	F	p-value	t	df	p-value	Mean Diff.	St. Err. diff.	95% CI low.	95% CI upp.
Equal variance assumed	1	0.3	6.6	48	0.00	10	1.58	7.3	13.85
Equal variances not assumed	-	-	6.6	47	0.00	10	1.58	7.3	13.86

The values of VAS score indicated the similar drop in its score in both groups post treatment but in group 2 these score decreased markedly. These findings further support our hypothesis of positive outcome in group 2 (M = 1.48, SD = 0.71) compared to the group 1 (M = 2.12, SD = 0.97)(Table 4).

Table 4: : Group Statistics Pain(VAS)

Parameters	Groups	N	Mean ± SD
Pretest Visual Analogue Scale(0-10)	Group 1(NTG)	25	3.84 ± 0.688
	Group 2 (TG)	25	5.4 ± 0.5
Posttest Visual Analogue Scale(0-10)	Group 1(NTG)	25	2.12 ± 0.971
	Group 2 (TG)	25	1.48 ± 0.714

To check the significant difference in pain scores, independent sample t-test was used after confirming the assumption of homogeneity is met and variance in two samples is not significantly different (p value>0.05) The t-test, with 95% CI and 48 df, supported the statistical significance of this reduction ($p = .011$), emphasizing the effectiveness of the intervention in reducing pain levels in group 2 as compared to group 1(Table 5).

Table 5: : t-test for Equality of Means of Pain (VAS) between groups

Levene's Test for Equality of Variance			Independent sample t-test						
	F	p-value	t	df	p-value	Mean Diff.	St. Err. diff.	95% CI low.	95% CI upp.
Equal variance assumed	4.8	0.33	2.65	48	0.011	0.64	0.241	0.155	1.125
Equal variance not assumed	-	-	2.65	44.08	0.011	0.64	0.241	0.154	1.126

The consistent presence of swelling in both groups in posttest measurements supports the fact that the inflammation due to knee OA remained unchanged. The objective finding of local tenderness at knee joint line at baseline showed variable results and this tenderness was also present in both groups in post intervention analysis. The results of the study are indicative of significant improvement in perception of pain and physical disability particularly in age group of 40 to 45 years in both groups. But group 2 proves to be more superior over group 1 in the treatment outcomes studied.

DISCUSSION

The present investigation highlighted the effectuality of kinesio taping technique in improving perception of pain and disability outcomes in individuals with grade 1 and grade 2 knee OA. Although both groups demonstrated significant improvement in both primary treatment outcomes but tape use showed superiority over no tape along with standard physiotherapy treatments which both groups received. A systematic review demonstrated and acknowledged positive outcomes in terms of gain of muscular strength, psychological well-being and supportive effects on knee stability although these effects are not categorically reviewed upon in our study. Furthermore, a more cautious approach may be adopted before selecting such patients taking into account severity and duration of disease [7]. A randomized controlled trial established that the kinesio taping method resulted only in the subjective resolution of symptoms with no effects on overall mobility and function when compared to sham taping group. It is also crucial to note the large sample size and variable inclusion criteria in that study [8]. The findings from another inquiry demonstrated insignificant results in KT group and KT group with myofascial release to address joint range of motion in elder age group with knee OA. It is worth mentioning that we included participants across different age groups and with relatively mild disease of knee OA. The age related slowed healing processes may have been attributed to the study outcomes [22]. The demographic findings of the study indicate a higher

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prevalence of knee involvement on the left side, a greater proportion of females affected, and the most common age group being between 40 to 45 years. This information is consistent with previous literature that suggests an increased susceptibility to knee issues in females and older individuals which might be attributed to hormonal and anatomical factors, warranting further investigation in future studies [23]. The post-intervention analysis demonstrated a statistically significant decrease in pain and WOMAC scores in both the control and experimental groups. Notably, the experimental group exhibited a more significant improvement, as evidenced by their lower WOMAC score and VAS pain scores compared to the control group. These findings align with previous research that highlights the potential benefits of interventions in managing knee pain and function The treatment's success in improving functional outcomes can be attributed to its targeted approach, specifically tailored to address knee-related issues. Similar results have been reported in the study conducted by Anna but they used the sample of knee OA involving all severity levels whereas in our study we used grade I and II knee OA only [24]. The consistent presence of swelling in both groups throughout the trial indicates that the intervention did not significantly influence the swelling aspect rather a study by Jarecki *et al.*, has shown improvement in knee effusion post operatively in knee OA patients [25]. However, it is worth noting that this result might be influenced by other factors not directly targeted by the intervention. Future studies could explore additional strategies to address swelling in knee-related interventions. Regarding tenderness, the pretest values varied significantly among the groups. Despite this initial difference, the posttest analysis revealed no significant variation in tenderness presence between the control and experimental groups. This suggests that the intervention did not have a substantial impact on the tenderness aspect, which might be due to other underlying factors influencing tenderness levels in the participants, this finding has not been studied in detail in past.

The limitations of the study encompass a sample size that is relatively modest, patient reported pain and disability questionnaire and potential confounding variables such as prior level of activity and occupation that were not accounted for. Conducting research with a more extensive and varied sample, considering that well as the consideration of additional variables, could further strengthen the findings and provide a more comprehensive understanding of knee involvement and its management.

CONCLUSIONS

This study sheds light on the efficacy of the intervention in improving knee pain and functional outcomes in relatively mild cases of knee OA. These findings hold substantial promise for managing knee-related degenerative issues, particularly in the age group of 40 to 65 years and grade I and grade II of Knee OA. Further research and exploration of gender-based and age differences and the influence of other factors on knee involvement will contribute to advancing knee health interventions and enhancing the quality of life.

Authors Contribution

Conceptualization: DA
Methodology: FA
Formal analysis: RS
Writing-review and editing: DA, HZ, FA, SKK, AK

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

All authors have read and agreed to the published version of the manuscript.

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