



## Comparison of Intra-Articular Platelet-Rich Plasma Versus Corticosteroids in the Treatment of Early Knee Osteoarthritis in Tertiary Care Center in Chengalpattu District

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### KEYWORDS

Platelet-rich plasma, Corticosteroids, Knee osteoarthritis.

### ABSTRACT:

**Background:** Knee osteoarthritis (OA) is a prevalent degenerative joint disorder, leading to pain and impaired function, especially in early stages. Intra-articular injections of corticosteroids (CS) and platelet-rich plasma (PRP) are common non-surgical treatments. This study compares the efficacy and safety of PRP versus CS in the management of early knee OA at a tertiary care center in Chengalpattu district.

**Methods:** A total of 60 patients aged 50-69 years with early-stage knee OA were randomly assigned to receive either intra-articular PRP (30 patients) or CS (30 patients). Pain, function, and range of motion (ROM) were evaluated at baseline, 2, 4, and 6 months using Visual Analog Scale (VAS), Modified WOMAC, and ROM measurements. Adverse effects were recorded.

**Results:** Both treatments provided significant improvement in pain and function over time. However, PRP showed superior long-term results compared to CS, with more sustained pain reduction and functional improvement at 4 and 6 months ( $p < 0.05$ ). The CS group showed a plateau in improvement after 4 months. Adverse reactions were minimal and comparable in both groups.

**Conclusion:** PRP is more effective than corticosteroids for long-term management of early knee OA, offering sustained symptom relief without significant side effects.



## INTRODUCTION

Knee osteoarthritis (OA) is one of the most common and debilitating musculoskeletal disorders affecting individuals worldwide. It is a major cause of pain, disability, and reduced quality of life, particularly in older adults. The knee joint, being a weight-bearing joint, is highly susceptible to degenerative changes that lead to cartilage breakdown, inflammation, and progressive functional limitations.<sup>(1)</sup>

In the context of early knee OA, the management focus is on slowing the progression of the disease and alleviating symptoms, primarily pain and dysfunction. This is particularly important, as early intervention can help prevent or delay the need for more invasive treatments such as joint replacement surgery. Several conservative treatment modalities have been proposed for managing knee OA, with varying degrees of success. Among these, intra-articular (IA) injections have gained significant attention, particularly those involving platelet-rich plasma (PRP) and corticosteroids, as they offer targeted therapy directly into the joint space, where the pathology is most pronounced.<sup>(2)</sup>

In recent years, the use of intra-articular PRP as a treatment for knee OA has emerged as a promising alternative to traditional therapies. PRP, derived from the patient's own blood, contains a high concentration of platelets and growth factors that are believed to promote tissue healing and reduce inflammation. In contrast, corticosteroid injections, which have been used for decades to treat inflammatory conditions, are thought to provide rapid anti-inflammatory effects, thus reducing pain and improving joint function in the short term. However, concerns about the long-term efficacy and potential side effects of corticosteroids, such as cartilage degeneration, have led to increasing interest in alternative treatments like PRP.<sup>(3)</sup>

Our study aims to compare the effectiveness of intra-articular PRP injections versus corticosteroids in the treatment of early knee osteoarthritis at a tertiary care center in Chengalpattu district. Early knee OA is characterized by mild to moderate cartilage wear, with the preservation of joint structure but the onset of significant symptoms. Both PRP and corticosteroid injections offer potential benefits for symptom management, but it remains unclear which of these therapies is superior, particularly in the long-term

management of early-stage knee OA. The purpose of this study is to evaluate the clinical outcomes, including pain relief, functional improvement, and adverse effects, associated with each treatment modality.<sup>(4,5)</sup>

Platelet-rich plasma (PRP) is an autologous biologic treatment that has gained significant attention in recent years for the treatment of knee OA. PRP is prepared from the patient's own blood by centrifuging it to concentrate platelets and growth factors. The growth factors present in PRP, including platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF- $\beta$ ), and vascular endothelial growth factor (VEGF), are believed to promote tissue repair, reduce inflammation, and stimulate the regeneration of damaged cartilage. These factors play a crucial role in cellular processes such as cell proliferation, migration, and collagen synthesis, all of which are important for cartilage healing and joint homeostasis.<sup>(6)</sup>

Studies have shown that PRP injections can provide significant pain relief and functional improvement in patients with knee OA, particularly in the early to moderate stages of the disease.<sup>(6,7,8)</sup> The evidence regarding the efficacy of PRP for knee OA remains mixed. Some studies report significant improvements in pain and function following PRP injections, while others suggest that the benefits may be modest and transient. Factors such as the concentration of platelets, the preparation method, and the frequency of injections may influence the outcomes. Furthermore, the cost of PRP treatment and the need for specialized equipment and expertise limit its widespread use.<sup>(6,7,8)</sup>

In the short term, corticosteroid injections are highly effective in providing pain relief and improving joint function, making them a popular treatment choice for patients with knee OA. Numerous studies have demonstrated that corticosteroid injections can provide significant symptomatic relief, with some patients experiencing relief for weeks or even months following treatment. However, the long-term efficacy of corticosteroids remains a subject of debate. While corticosteroids can provide rapid symptomatic relief, repeated use has been associated with potential risks, including cartilage degeneration, joint infection, and weakening of the surrounding tissues. The concern is particularly relevant in knee OA, where the long-term



preservation of cartilage is crucial to prevent further degeneration.<sup>(9)</sup>

While both PRP and corticosteroid injections are widely used in the treatment of knee OA, there is a lack of consensus regarding which treatment is more effective, particularly in the early stages of the disease. The primary aim of our study is to compare the clinical outcomes of intra-articular PRP versus corticosteroid injections in the treatment of early knee OA.<sup>(10,11)</sup>

## MATERIALS AND METHODS

### 1. Study Design

This was prospective, Quasi Experimental, comparative study aimed at evaluating the efficacy and safety of intra-articular platelet-rich plasma (PRP) injections compared to corticosteroid injections in the treatment of early knee osteoarthritis (OA) in a tertiary care center in Chengalpattu district.

### 2. Study Setting

The study was conducted at a tertiary care center in Chengalpattu district, a region with a significant population burden of knee OA.

### 3. Study Population

The study included adult patients aged 40–70 years diagnosed with early knee osteoarthritis (Grade I to II on the Kellgren-Lawrence scale) who have symptoms of knee pain and functional limitation but have not yet required surgical intervention.

#### Inclusion Criteria:

- Diagnosis of early knee OA (Grade I or II on the Kellgren-Lawrence scale).
- Age between 40 and 70 years.
- Moderate knee pain (4-6 on the Visual Analog Scale for pain).
- Functional limitations as assessed by the Western Ontario and McMaster Universities Arthritis Index (WOMAC) score.
- Informed consent provided.

#### Exclusion Criteria:

- Severe knee OA (Grade III or IV on the Kellgren-Lawrence scale).

- History of knee surgery (e.g., total knee replacement, meniscectomy).
- Systemic inflammatory diseases (e.g., rheumatoid arthritis).
- Infections or malignancies of the knee.
- Use of anticoagulant therapy.
- Pregnancy or lactation.
- Allergy to any of the components in corticosteroid or PRP injections.

### 4. Sample Size Calculation

Sample size calculation done by OpenEpi online software, based on the previous study[6]. The Mean and SD of P(Patients receiving Intra-articular PRP injections) and S(Patients receiving intra-articular Steroid injection) values are  $110 \pm 11.07$  and  $99.06 \pm 9.95$  with 5% level of significance and 80% power.

The total sample size is 20 in each group including 10% non-response rate, for better generalization 30 samples were included in the study in each group.

### 5. Group Assignment

Participants were assigned to one of two groups with Quasi Experimental design:

- Group P: Intra-articular PRP injections.
- Group S: Intra-articular corticosteroid injections.

### 6. Treatment Protocol

#### Platelet-Rich Plasma (PRP) Injections:

- A single intra-articular PRP injection will be prepared by centrifuging 30 mL of the patient's whole blood at a specified speed to isolate the platelet-rich component. The resulting PRP, which is concentrated with platelets, growth factors, and cytokines, will be injected directly into the affected knee joint under aseptic conditions.

- The injection will be administered by an experienced orthopaedic surgeon or pain management specialist.

#### Corticosteroid Injections:

- A single dose of methylprednisolone acetate (40



mg) will be injected into the affected knee joint under sterile conditions. The dose and injection technique will follow standard clinical guidelines.

- The corticosteroid will be administered by the same medical team.

Both treatments will be administered as a single injection. The follow-up period will be 6 months with assessments at baseline, 2 months, 4 months, and 6 months post-injection

## 7. Outcome Measures

Primary Outcome Measures:

1. **Pain Reduction:** Pain will be assessed using the Visual Analog Scale (VAS) for pain, where 0 represents no pain and 10 represents the worst possible pain. A reduction of 2 or more points in VAS score will be considered clinically significant.

2. **Functional Improvement:** Functional outcomes will be assessed using the Western Ontario and McMaster Universities Arthritis Index (WOMAC), which measures pain, stiffness, and physical function. A significant improvement in the total WOMAC score, as well as in the subscales, will be used to evaluate functional recovery.

Secondary Outcome Measures:

1. **Quality of Life:** The Short Form 36 (SF-36) questionnaire will be used to assess overall health-related quality of life, including physical and mental health subscales.

2. **Range of Motion (ROM):** The knee's range of motion will be measured using a goniometer, comparing flexion and extension before and after treatment.

3. **Patient Satisfaction:** Patient satisfaction will be

assessed on a 5-point Likert scale (1 = very dissatisfied to 5 = very satisfied) to evaluate the perceived effectiveness of the treatment.

## 8. Follow-up and Data Collection

- **Baseline assessment:** Initial assessment will include demographic data, clinical examination, and imaging of the knee joint (X-ray and/or MRI) to confirm the diagnosis and assess disease severity.

- **Follow-up assessments:** At each follow-up visit (2 months, 4 months, 6 months), participants will undergo a repeat clinical evaluation, including VAS pain score, WOMAC score, SF-36, ROM measurements, and adverse event monitoring.

## 9. Statistical Analysis

Data analysis was performed using SPSS (Statistical Package for the Social Sciences) software.

The following statistical methods were employed:

- **Descriptive statistics:** To summarize demographic characteristics, baseline clinical measures, and follow-up data.

- **Comparison between groups:** The difference in outcome measures (VAS, WOMAC, SF-36) between the PRP and corticosteroid groups will be analyzed using Student's t-test for continuous variables and Chi-square tests for categorical variables.

- **Repeated measures analysis:** To assess the change in pain and function over time within and between the groups, repeated measures analysis of variance (ANOVA) will be used.

- **Significance level:** A p-value < 0.05 will be considered statistically significant.

## OBSERVATIONS & RESULTS

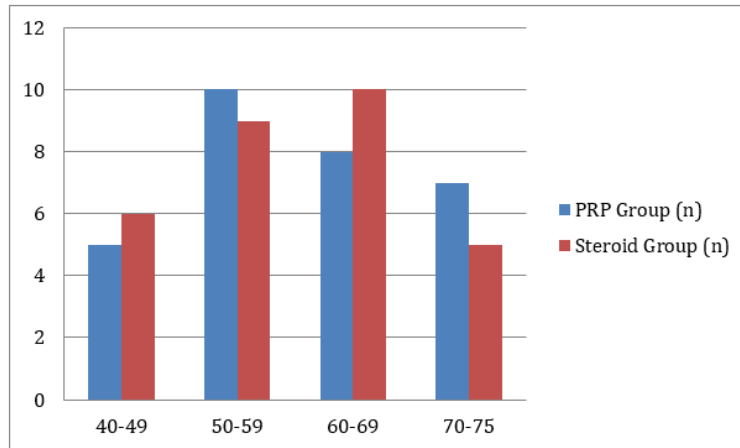
**Table 1A) Age Range Distribution for the PRP and Steroid groups:**

| Age Range (Years) | PRP Group (n) | Steroid Group (n) | Total (n) |
|-------------------|---------------|-------------------|-----------|
| 40-49             | 5             | 6                 | 11        |
| 50-59             | 10            | 9                 | 19        |
| 60-69             | 8             | 10                | 18        |
| 70-75             | 7             | 5                 | 12        |
| <b>Total</b>      | <b>30</b>     | <b>30</b>         | <b>60</b> |



Table 1A presents the age range distribution for participants in the PRP (Platelet-Rich Plasma) and Steroid groups. Both groups have an equal total number of participants (n=30), with the majority in the 50-59 and

60-69 age ranges. The PRP group shows a slightly higher representation in the 50-59 range, while the Steroid group has a balanced distribution across the age ranges.



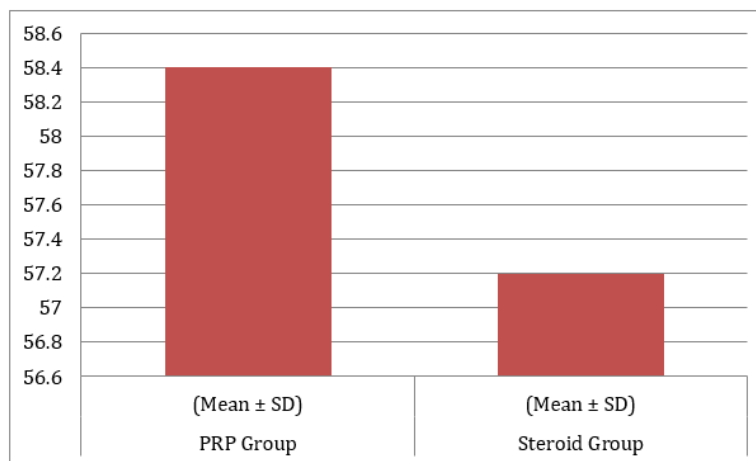
GRAPH 1A ) Age Range Distribution for the PRP and Steroid groups

Table 1 B Age Distribution of Study Groups

| Variable | PRP Group (Mean ± SD) | Steroid Group (Mean ± SD) | p-value |
|----------|-----------------------|---------------------------|---------|
| Age      | 58.4 ± 8.5            | 57.2 ± 9.1                | 0.520   |

Table 1B displays the mean age distribution for the PRP and Steroid groups in the study. The PRP group has a mean age of 58.4 years (± 8.5 SD), while the Steroid

group has a mean age of 57.2 years (± 9.1 SD). The p-value of 0.520 indicates no statistically significant difference in age between the two groups.



GRAPH 1 B Age Distribution of Study Groups

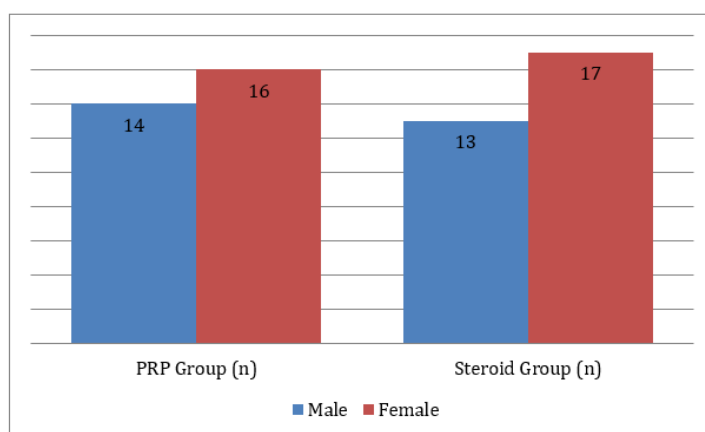


**Table 2) Gender Distribution of Study Groups**

| Variable    | PRP Group (n) | Steroid Group (n) | p-value |
|-------------|---------------|-------------------|---------|
| Male/Female | 14/16         | 13/17             | 0.740   |

Table 2 shows the gender distribution between the PRP and Steroid groups, with the PRP group having 14 males and 16 females, and the Steroid group having 13 males and 17 females. The distribution is similar across both

groups, and the p-value of 0.740 indicates no statistically significant difference in gender composition between the groups.



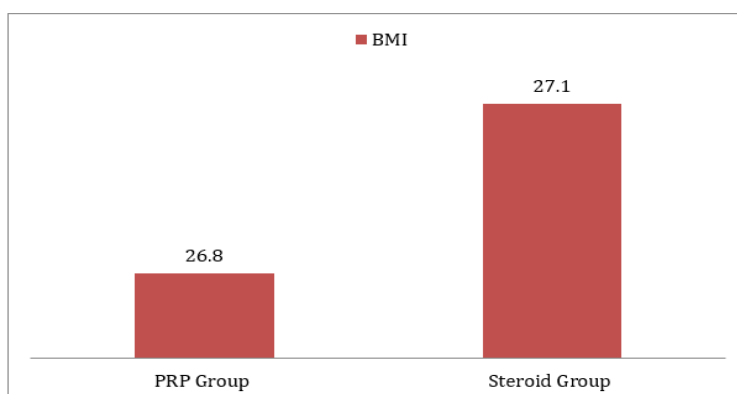
**GRAPH 2) Gender Distribution of Study Groups**

**Table 3) BMI of Study Groups**

| Variable | PRP Group (Mean ± SD) | Steroid Group (Mean ± SD) | p-value |
|----------|-----------------------|---------------------------|---------|
| BMI      | 26.8 ± 3.4            | 27.1 ± 3.1                | 0.670   |

Table 3 presents the BMI (Body Mass Index) comparison between the PRP and Steroid groups. The PRP group has a mean BMI of 26.8 (± 3.4 SD), while the Steroid group

has a mean BMI of 27.1 (± 3.1 SD). With a p-value of 0.670, there is no statistically significant difference in BMI between the two groups.



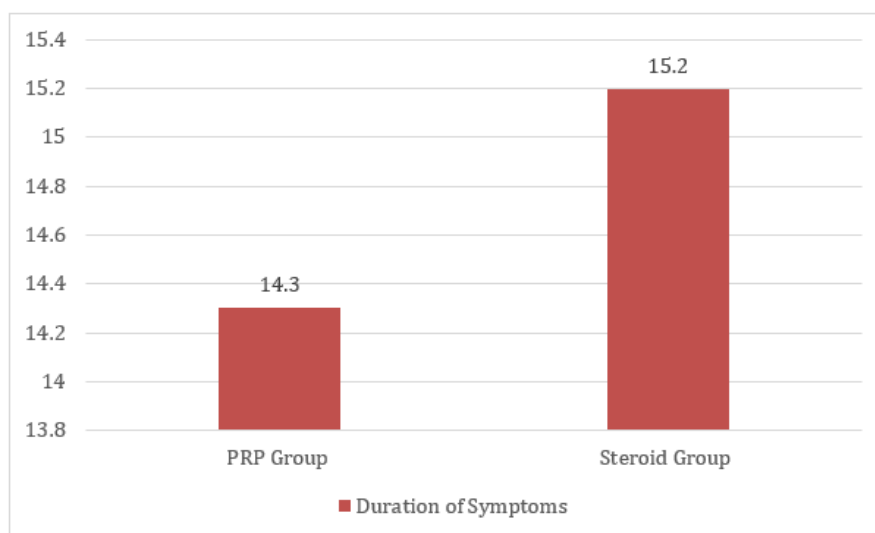
**GRAPH 3) BMI of Study Groups**

**Table 4) Duration of Symptoms in Study Groups**

| Variable             | PRP Group (Mean ± SD) | Steroid Group (Mean ± SD) | p-value |
|----------------------|-----------------------|---------------------------|---------|
| Duration of Symptoms | 14.3 ± 6.8 months     | 15.2 ± 7.0 months         | 0.590   |

Table 4 compares the duration of symptoms between the PRP and Steroid groups. The PRP group shows a mean symptom duration of 14.3 months ( $\pm 6.8$  SD), while the Steroid group has a mean duration of 15.2 months ( $\pm 7.0$

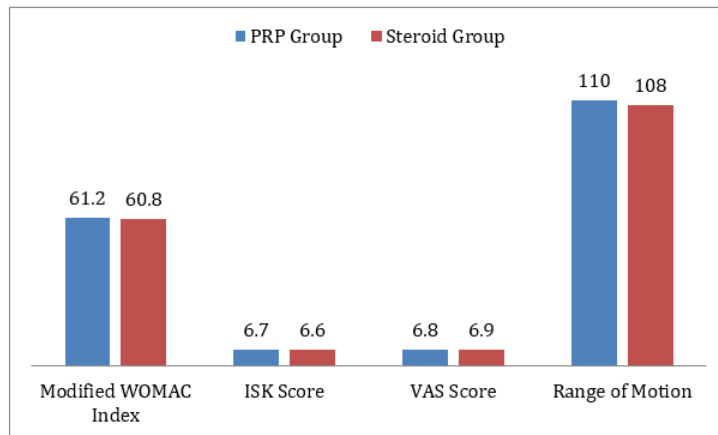
SD). The p-value of 0.590 indicates no statistically significant difference in symptom duration between the two groups.

**GRAPH 4) Duration of Symptoms in Study Groups****Table 5) Baseline Knee Pain and Function Scores in PRP and Steroid Groups**

| Score Type           | PRP Group (Mean ± SD) | Steroid Group (Mean ± SD) | p-value |
|----------------------|-----------------------|---------------------------|---------|
| Modified WOMAC Index | 61.2 ± 10.5           | 60.8 ± 10.1               | 0.850   |
| ISK Score            | 6.7 ± 1.9             | 6.6 ± 2.0                 | 0.870   |
| VAS Score            | 6.8 ± 1.3             | 6.9 ± 1.4                 | 0.920   |
| Range of Motion      | 110 ± 12.3 degrees    | 108 ± 13.0 degrees        | 0.750   |

Table 5 outlines baseline knee pain and function scores for the PRP and Steroid groups. The PRP group has a mean Modified WOMAC Index score of 61.2 ( $\pm 10.5$  SD), ISK score of 6.7 ( $\pm 1.9$  SD), VAS score of 6.8 ( $\pm 1.3$  SD), and range of motion at 110 degrees ( $\pm 12.3$ ).

The Steroid group scores similarly across these metrics, with p-values (0.850, 0.870, 0.920, and 0.750) indicating no statistically significant differences between the groups in baseline knee pain and function.



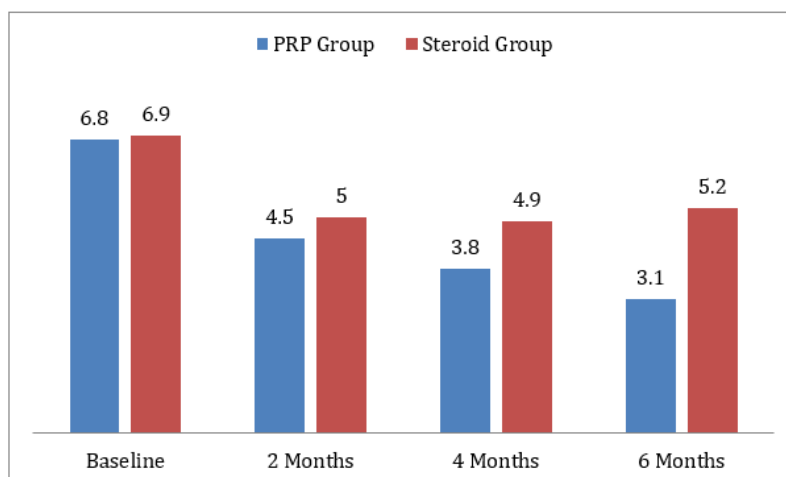
**GRAPH 5) Baseline Knee Pain and Function Scores in PRP and Steroid Groups**

**Table 6) VAS Score at Baseline and Follow-Up (2, 4, and 6 Months)**

| Timepoint | PRP Group (Mean ± SD) | Steroid Group (Mean ± SD) | p-value |
|-----------|-----------------------|---------------------------|---------|
| Baseline  | 6.8 ± 1.3             | 6.9 ± 1.4                 | 0.920   |
| 2 Months  | 4.5 ± 1.2             | 5.0 ± 1.3                 | 0.320   |
| 4 Months  | 3.8 ± 1.1             | 4.9 ± 1.2                 | 0.040*  |
| 6 Months  | 3.1 ± 1.0             | 5.2 ± 1.3                 | 0.010*  |

Table 6 shows VAS (Visual Analog Scale) pain scores for the PRP and Steroid groups at baseline and follow-up periods of 2, 4, and 6 months. Both groups started with similar baseline scores (p=0.920). At 2 months, there was no significant difference in pain reduction between the

groups (p=0.320). However, by 4 and 6 months, the PRP group demonstrated significantly greater pain reduction than the Steroid group, with p-values of 0.040 and 0.010, respectively.



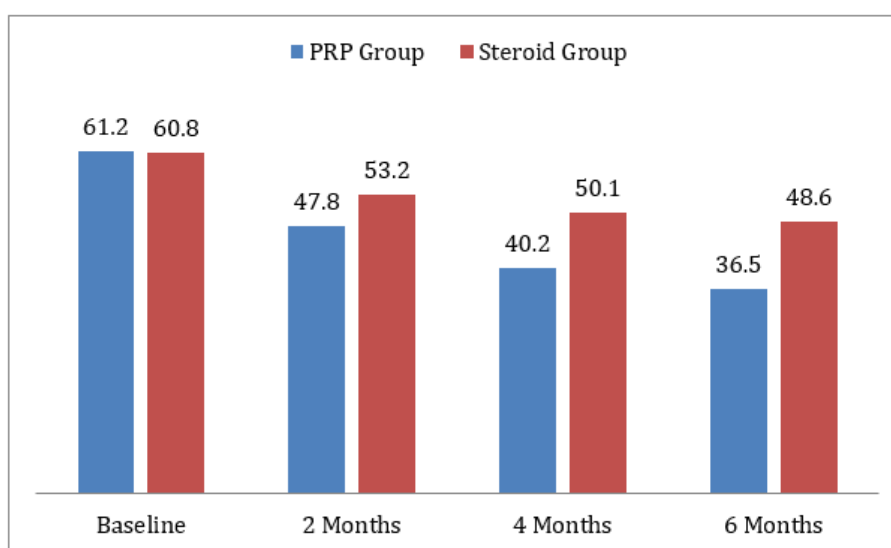
**GRAPH 6) VAS Score at Baseline and Follow-Up (2, 4, and 6 Months)**

**Table 7) Modified WOMAC Index Scores at Baseline and Follow-Up (2, 4, and 6 Months)**

| Timepoint | PRP Group (Mean ± SD) | Steroid Group (Mean ± SD) | p-value |
|-----------|-----------------------|---------------------------|---------|
| Baseline  | 61.2 ± 10.5           | 60.8 ± 10.1               | 0.850   |
| 2 Months  | 47.8 ± 9.6            | 53.2 ± 10.4               | 0.050*  |
| 4 Months  | 40.2 ± 8.7            | 50.1 ± 9.8                | 0.020*  |
| 6 Months  | 36.5 ± 7.9            | 48.6 ± 9.4                | 0.010*  |

Table 7 displays Modified WOMAC Index scores for the PRP and Steroid groups at baseline and at 2, 4, and 6-month follow-ups, assessing knee pain and function. Both groups had similar baseline scores (p=0.850). At 2 months, the PRP group showed a trend toward

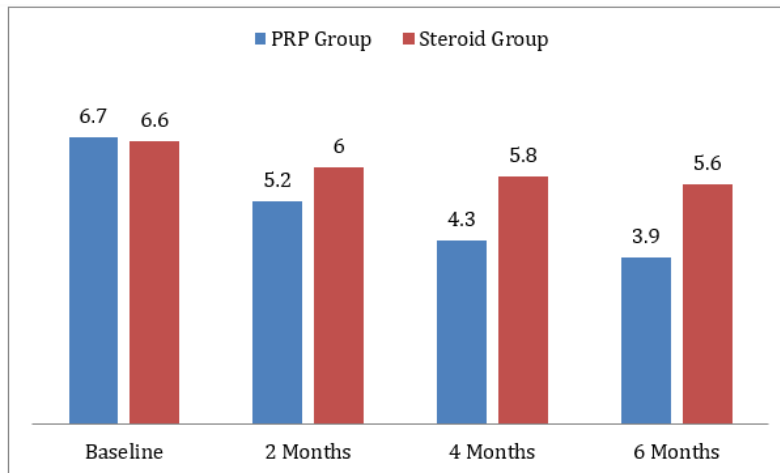
improvement compared to the Steroid group (p=0.050). By 4 and 6 months, the PRP group demonstrated significantly greater improvement, with p-values of 0.020 and 0.010, respectively, indicating more effective pain and function outcomes over time.

**GRAPH 7) Modified WOMAC Index Scores at Baseline and Follow-Up (2, 4, and 6 Months)****Table 8) Index of Severity for Knee Osteoarthritis (ISK) Scores at Baseline and Follow-Up (2, 4, and 6 Months)**

| Timepoint | PRP Group (Mean ± SD) | Steroid Group (Mean ± SD) | p-value |
|-----------|-----------------------|---------------------------|---------|
| Baseline  | 6.7 ± 1.9             | 6.6 ± 2.0                 | 0.870   |
| 2 Months  | 5.2 ± 1.5             | 6.0 ± 1.7                 | 0.090   |
| 4 Months  | 4.3 ± 1.3             | 5.8 ± 1.6                 | 0.030*  |
| 6 Months  | 3.9 ± 1.2             | 5.6 ± 1.4                 | 0.010*  |

Table 8 shows the Index of Severity for Knee Osteoarthritis (ISK) scores for the PRP and Steroid groups at baseline and at 2, 4, and 6-month follow-ups. Baseline scores were similar between groups (p=0.870). At 2 months, there was no significant difference in ISK

score improvement (p=0.090), but by 4 and 6 months, the PRP group showed significantly greater reductions in severity, with p-values of 0.030 and 0.010, respectively, indicating improved knee osteoarthritis outcomes over time with PRP.



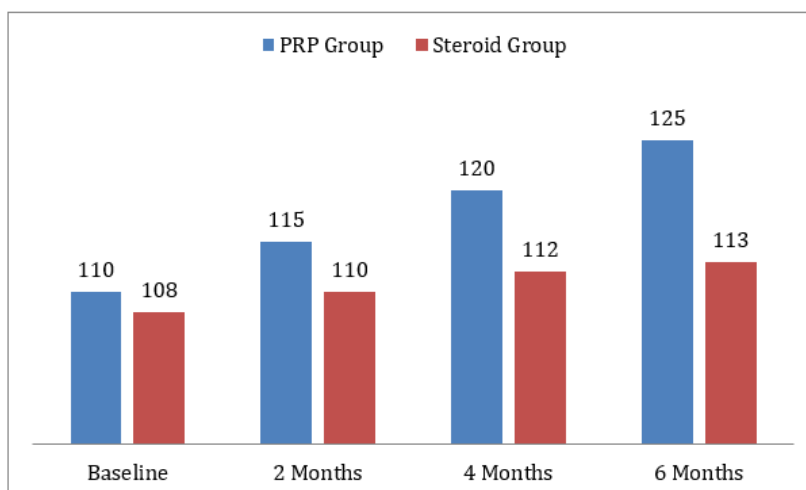
GRAPH 8) Index of Severity for Knee Osteoarthritis (ISK) Scores at Baseline and Follow-Up (2, 4, and 6 Months)

Table 9) Range of Motion in Knee Joint at Baseline and Follow-Up (2, 4, and 6 Months)

| Timepoint | PRP Group (Mean ± SD) | Steroid Group (Mean ± SD) | p-value |
|-----------|-----------------------|---------------------------|---------|
| Baseline  | 110 ± 12.3 degrees    | 108 ± 13.0 degrees        | 0.750   |
| 2 Months  | 115 ± 11.5 degrees    | 110 ± 12.2 degrees        | 0.060   |
| 4 Months  | 120 ± 10.4 degrees    | 112 ± 11.8 degrees        | 0.030*  |
| 6 Months  | 125 ± 9.7 degrees     | 113 ± 11.5 degrees        | 0.010*  |

Table 9 presents the range of motion (ROM) in the knee joint for the PRP and Steroid groups at baseline and at 2, 4, and 6-month follow-ups. Both groups had similar baseline ROM (p=0.750). At 2 months, there was a trend toward improved ROM in the PRP group (p=0.060). By

4 and 6 months, the PRP group showed significantly greater improvement in knee joint ROM compared to the Steroid group, with p-values of 0.030 and 0.010, respectively, indicating enhanced flexibility over time with PRP treatment.



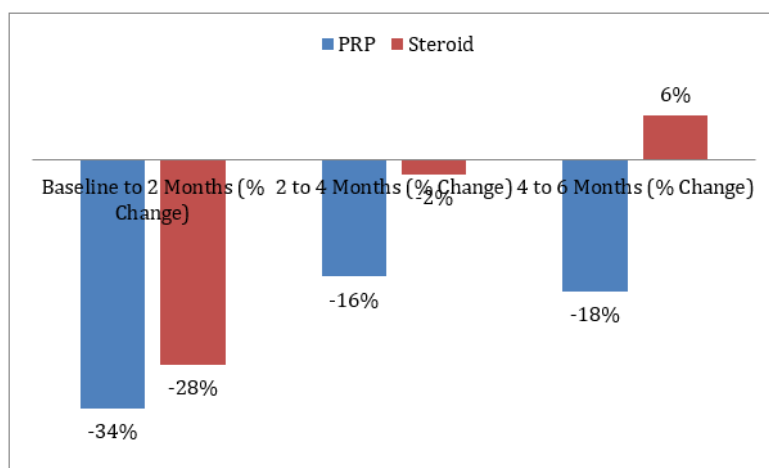
GRAPH 9) Range of Motion in Knee Joint at Baseline and Follow-Up (2, 4, and 6 Months)

**Table 10) Change in Pain Score (VAS) from Baseline Over Time within Each Group**

| Group   | Baseline to 2 Months (% Change) | 2 to 4 Months (% Change) | 4 to 6 Months (% Change) | Total Change (%) |
|---------|---------------------------------|--------------------------|--------------------------|------------------|
| PRP     | -34%                            | -16%                     | -18%                     | -54%             |
| Steroid | -28%                            | -2%                      | +6%                      | -25%             |

Table 10 illustrates the change in pain scores (VAS) from baseline over time within each group. The PRP group showed a continuous and significant decrease in pain scores, with a total change of -54%, including a -34% reduction from baseline to 2 months, -16% from 2 to 4 months, and -18% from 4 to 6 months. In contrast, the

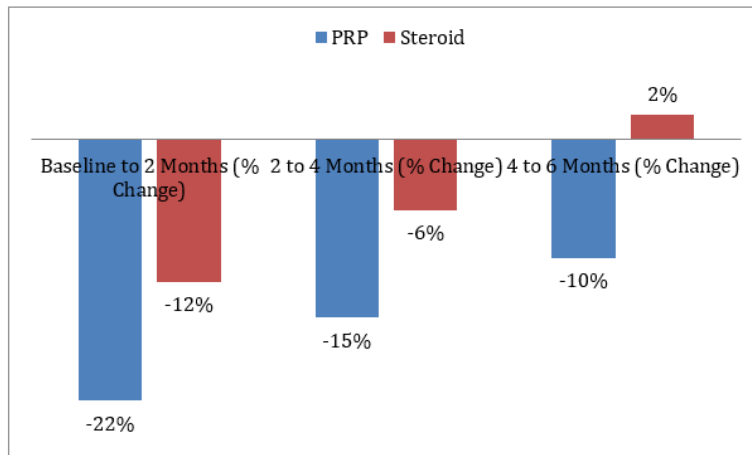
Steroid group showed a smaller total change of -25%, with pain reduction of -28% from baseline to 2 months, followed by minimal improvement between 2 to 4 months (+6%), and a slight increase in pain from 4 to 6 months.

**GRAPH 10) Change in Pain Score (VAS) from Baseline Over Time within Each Group****Table 11) Change in Modified WOMAC Index Score from Baseline Over Time within Each Group**

| Group   | Baseline to 2 Months (% Change) | 2 to 4 Months (% Change) | 4 to 6 Months (% Change) | Total Change (%) |
|---------|---------------------------------|--------------------------|--------------------------|------------------|
| PRP     | -22%                            | -15%                     | -10%                     | -40%             |
| Steroid | -12%                            | -6%                      | +2%                      | -16%             |

Table 11 shows the change in Modified WOMAC Index scores from baseline over time within each group. The PRP group experienced a significant improvement with a total change of -40%, including a -22% reduction from baseline to 2 months, -15% from 2 to 4 months, and -

10% from 4 to 6 months. In contrast, the Steroid group showed a smaller total change of -16%, with only a -12% reduction from baseline to 2 months, followed by minimal improvements from 2 to 4 months (-6%) and a slight increase in score from 4 to 6 months (+2%).



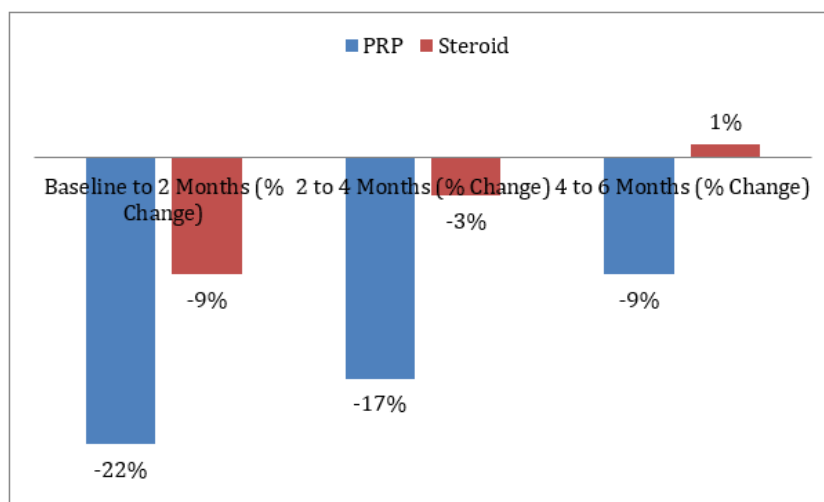
GRAPH 11) Change in Modified WOMAC Index Score from Baseline Over Time within Each Group

Table 12) Change in ISK Score from Baseline Over Time within Each Group

| Group   | Baseline to 2 Months (% Change) | 2 to 4 Months (% Change) | 4 to 6 Months (% Change) | Total Change (%) |
|---------|---------------------------------|--------------------------|--------------------------|------------------|
| PRP     | -22%                            | -17%                     | -9%                      | -38%             |
| Steroid | -9%                             | -3%                      | +1%                      | -11%             |

Table 12 illustrates the change in ISK scores from baseline over time within each group. The PRP group showed a substantial improvement, with a total change of -38%, including a -22% reduction from baseline to 2 months, -17% from 2 to 4 months, and -9% from 4 to 6

months. In contrast, the Steroid group exhibited a smaller total change of -11%, with only a -9% reduction from baseline to 2 months, minimal improvement from 2 to 4 months (-3%), and a slight increase in score from 4 to 6 months (+1%).



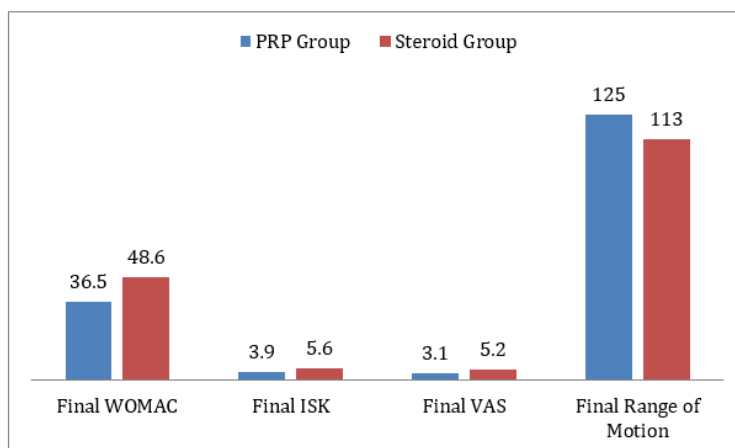
GRAPH 12) Change in ISK Score from Baseline Over Time within Each Group

**Table 13) Comparison of Final Outcome Scores Between PRP and Steroid Groups at 6 Months**

| Outcome Measure       | PRP Group (Mean ± SD) | Steroid Group (Mean ± SD) | p-value |
|-----------------------|-----------------------|---------------------------|---------|
| Final WOMAC           | 36.5 ± 7.9            | 48.6 ± 9.4                | 0.010*  |
| Final ISK             | 3.9 ± 1.2             | 5.6 ± 1.4                 | 0.010*  |
| Final VAS             | 3.1 ± 1.0             | 5.2 ± 1.3                 | 0.010*  |
| Final Range of Motion | 125 ± 9.7 degrees     | 113 ± 11.5 degrees        | 0.010*  |

Table 13 compares the final outcome scores between the PRP and Steroid groups at 6 months. The PRP group showed significantly better outcomes across all measures, including a lower Final WOMAC score (36.5 ± 7.9 vs. 48.6 ± 9.4), a lower Final ISK score (3.9 ± 1.2

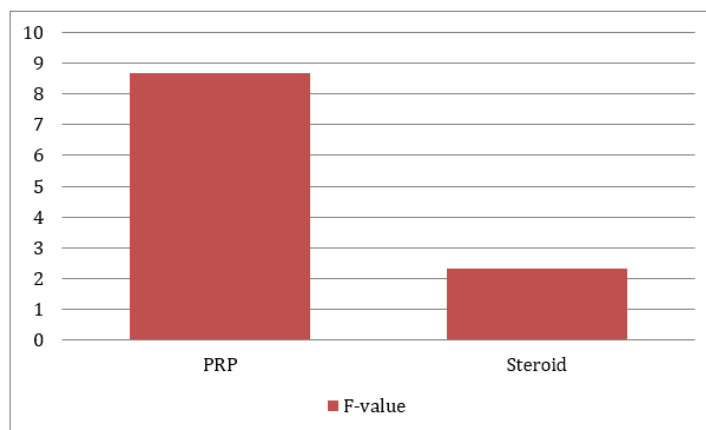
vs. 5.6 ± 1.4), a lower Final VAS score (3.1 ± 1.0 vs. 5.2 ± 1.3), and a greater Final Range of Motion (125 ± 9.7 degrees vs. 113 ± 11.5 degrees), with p-values of 0.010 for each measure, indicating superior improvement in the PRP group.

**GRAPH 13) Comparison of Final Outcome Scores Between PRP and Steroid Groups at 6 Months****Table 14) Repeated Measures ANOVA Results for Pain Score (VAS) Over Time**

| Group   | F-value | p-value | Significance    |
|---------|---------|---------|-----------------|
| PRP     | 8.67    | 0.003*  | Significant     |
| Steroid | 2.34    | 0.110   | Not Significant |

Table 14 presents the results of the repeated measures ANOVA for pain score (VAS) over time in the PRP and Steroid groups. The PRP group showed a significant improvement in pain scores with an F-value of 8.67 and a p-value of 0.003, indicating a statistically significant

reduction in pain over time. In contrast, the Steroid group had an F-value of 2.34 and a p-value of 0.110, which was not statistically significant, suggesting no significant change in pain scores over time.



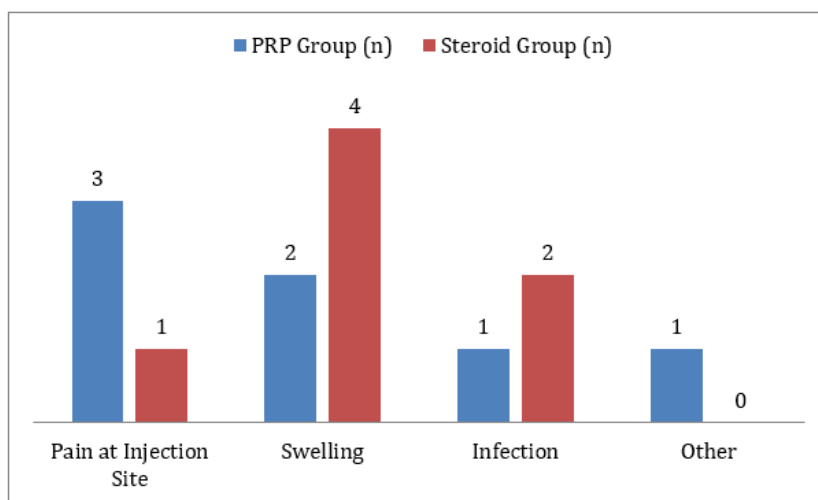
**GRAPH 14) Repeated Measures ANOVA Results for Pain Score (VAS) Over Time**

**Table 15) Side Effects and Adverse Reactions in PRP vs. Steroid Groups**

| Type of Side Effect    | PRP Group (n) | Steroid Group (n) | p-value |
|------------------------|---------------|-------------------|---------|
| Pain at Injection Site | 3             | 1                 | 0.250   |
| Swelling               | 2             | 4                 | 0.400   |
| Infection              | 1             | 2                 | 0.500   |
| Other                  | 1             | 0                 | 0.300   |

Table 15 compares the side effects and adverse reactions between the PRP and Steroid groups. The incidence of pain at the injection site, swelling, infection, and other side effects was similar between the two groups, with no

significant differences, as indicated by p-values of 0.250, 0.400, 0.500, and 0.300, respectively. This suggests that both treatments had comparable safety profiles in terms of side effects and adverse reactions



**GRAPH 15) Side Effects and Adverse Reactions in PRP vs. Steroid Groups**



## DISCUSSION

Knee osteoarthritis (OA) is a prevalent degenerative joint disease affecting millions globally, especially older adults. Characterized by cartilage degeneration, joint stiffness, and pain, OA significantly reduces mobility and quality of life. Conventional treatments, including physical therapy, analgesics, and corticosteroid injections, provide symptomatic relief but may have limited long-term benefits and potential side effects with repeated use.<sup>(12,13)</sup> Recently, intra-articular platelet-rich plasma (PRP) has emerged as a promising alternative, leveraging growth factors and bioactive proteins to potentially slow disease progression and promote cartilage regeneration. PRP is believed to enhance tissue repair through natural healing mechanisms, making it a compelling option for early knee OA.<sup>(14)</sup>

This study compares the efficacy of intra-articular PRP with corticosteroid injections in managing early knee OA in a tertiary care setting in Chengalpattu district, aiming to provide insight into which treatment offers better clinical outcomes in terms of pain relief, function, and overall patient satisfaction.

Patients with a history of chronic knee pain lasting at least three months and a Visual Analog Scale (VAS) score greater than 4 were selected for this study. Radiographic evidence confirmed degenerative changes in the knee joint, classified as Kellgren–Lawrence (KL) grade 1 or 2. Eligible participants, meeting these criteria, were enrolled via Quasi experimental study design and assigned to one of two treatment groups: Group P (PRP injection) or Group S (corticosteroid injection), with both interventions administered intra-articularly under aseptic precautions.

Participants in each group received follow-up evaluations at 2, 4, and 6 months post-injection. Clinical outcomes were assessed using standardized scoring systems, including the Modified Western Ontario and McMaster Universities Osteoarthritis Index (MWI), Lequesne’s Index of Severity for Knee Osteoarthritis (ISK), VAS score, and knee range of motion measured by a goniometer. These tools enabled a thorough comparison of pain relief, functional improvement, and joint mobility in both treatment groups over time.

Data were analyzed using SPSS software (version 16/17) and Microsoft Excel. Continuous data

were expressed as mean and standard deviation, and differences between the groups were evaluated using T-tests. For within-group changes over time, repeated measures ANOVA was performed, while two-way repeated measures ANOVA assessed differences between groups. Additionally, Pearson’s Chi-square test analyzed relationships between categorical variables. Statistical significance was set at  $p < 0.05$  for all analyses.

Age Range Distribution for the PRP and Steroid groups:

The age range distribution for participants in the PRP (Platelet-Rich Plasma) and Steroid groups. Both groups have an equal total number of participants ( $n=30$ ), with the majority in the 50-59 and 60-69 age ranges. The PRP group shows a slightly higher representation in the 50-59 range, while the Steroid group has a balanced distribution across the age ranges.

Age Distribution of Study Groups

Table displays the mean age distribution for the PRP and Steroid groups in the study. The PRP group has a mean age of 58.4 years ( $\pm 8.5$  SD), while the Steroid group has a mean age of 57.2 years ( $\pm 9.1$  SD). The  $p$ -value of 0.520 indicates no statistically significant difference in age between the two groups.

Gender Distribution of Study Groups

The gender distribution between the PRP and Steroid groups, with the PRP group having 14 males and 16 females, and the Steroid group having 13 males and 17 females. The distribution is similar across both groups, and the  $p$ -value of 0.740 indicates no statistically significant difference in gender composition between the groups.

BMI of Study Groups

The BMI (Body Mass Index) comparison between the PRP and Steroid groups. The PRP group has a mean BMI of 26.8 ( $\pm 3.4$  SD), while the Steroid group has a mean BMI of 27.1 ( $\pm 3.1$  SD). With a  $p$ -value of 0.670, there is no statistically significant difference in BMI between the two groups.

Duration of Symptoms in Study Groups

The duration of symptoms between the PRP and Steroid groups. The PRP group shows a mean symptom duration of 14.3 months ( $\pm 6.8$  SD), while the Steroid group has a



mean duration of 15.2 months ( $\pm 7.0$  SD). The p-value of 0.590 indicates no statistically significant difference in symptom duration between the two groups.

#### Baseline Knee Pain and Function Scores in PRP and Steroid Groups

Outlines baseline knee pain and function scores for the PRP and Steroid groups. The PRP group has a mean Modified WOMAC Index score of 61.2 ( $\pm 10.5$  SD), ISK score of 6.7 ( $\pm 1.9$  SD), VAS score of 6.8 ( $\pm 1.3$  SD), and range of motion at 110 degrees ( $\pm 12.3$ ). The Steroid group scores similarly across these metrics, with p-values (0.850, 0.870, 0.920, and 0.750) indicating no statistically significant differences between the groups in baseline knee pain and function.

#### VAS Score at Baseline and Follow-Up (2, 4, and 6 Months)

VAS (Visual Analog Scale) pain scores for the PRP and Steroid groups at baseline and follow-up periods of 2, 4, and 6 months. Both groups started with similar baseline scores ( $p=0.920$ ). At 2 months, there was no significant difference in pain reduction between the groups ( $p=0.320$ ). However, by 4 and 6 months, the PRP group demonstrated significantly greater pain reduction than the Steroid group, with p-values of 0.040 and 0.010, respectively.

#### Modified WOMAC Index Scores at Baseline and Follow-Up (2, 4, and 6 Months)

Modified WOMAC Index scores for the PRP and Steroid groups at baseline and at 2, 4, and 6-month follow-ups, assessing knee pain and function. Both groups had similar baseline scores ( $p=0.850$ ). At 2 months, the PRP group showed a trend toward improvement compared to the Steroid group ( $p=0.050$ ). By 4 and 6 months, the PRP group demonstrated significantly greater improvement, with p-values of 0.020 and 0.010, respectively, indicating more effective pain and function outcomes over time.

#### Index of Severity for Knee Osteoarthritis (ISK) Scores at Baseline and Follow-Up (2, 4, and 6 Months)

The Index of Severity for Knee Osteoarthritis (ISK) scores for the PRP and Steroid groups at baseline and at 2, 4, and 6-month follow-ups. Baseline scores were similar between groups ( $p=0.870$ ). At 2 months, there was no significant difference in ISK score improvement

( $p=0.090$ ), but by 4 and 6 months, the PRP group showed significantly greater reductions in severity, with p-values of 0.030 and 0.010, respectively, indicating improved knee osteoarthritis outcomes over time with PRP.

#### Range of Motion in Knee Joint at Baseline and Follow-Up (2, 4, and 6 Months)

The range of motion (ROM) in the knee joint for the PRP and Steroid groups at baseline and at 2, 4, and 6-month follow-ups. Both groups had similar baseline ROM ( $p=0.750$ ). At 2 months, there was a trend toward improved ROM in the PRP group ( $p=0.060$ ). By 4 and 6 months, the PRP group showed significantly greater improvement in knee joint ROM compared to the Steroid group, with p-values of 0.030 and 0.010, respectively, indicating enhanced flexibility over time with PRP treatment.

#### Change in Pain Score (VAS) from Baseline Over Time within Each Group

The change in pain scores (VAS) from baseline over time within each group. The PRP group showed a continuous and significant decrease in pain scores, with a total change of -54%, including a -34% reduction from baseline to 2 months, -16% from 2 to 4 months, and -18% from 4 to 6 months. In contrast, the Steroid group showed a smaller total change of -25%, with pain reduction of -28% from baseline to 2 months, followed by minimal improvement between 2 to 4 months (+6%), and a slight increase in pain from 4 to 6 months.

#### Change in Modified WOMAC Index Score from Baseline Over Time within Each Group

The change in Modified WOMAC Index scores from baseline over time within each group. The PRP group experienced a significant improvement with a total change of -40%, including a -22% reduction from baseline to 2 months, -15% from 2 to 4 months, and -10% from 4 to 6 months. In contrast, the Steroid group showed a smaller total change of -16%, with only a -12% reduction from baseline to 2 months, followed by minimal improvements from 2 to 4 months (-6%) and a slight increase in score from 4 to 6 months (+2%).

#### Change in ISK Score from Baseline Over Time within Each Group

The change in ISK scores from baseline over time within each group. The PRP group showed a substantial



improvement, with a total change of -38%, including a -22% reduction from baseline to 2 months, -17% from 2 to 4 months, and -9% from 4 to 6 months. In contrast, the Steroid group exhibited a smaller total change of -11%, with only a -9% reduction from baseline to 2 months, minimal improvement from 2 to 4 months (-3%), and a slight increase in score from 4 to 6 months (+1%).

### Comparison of Final Outcome Scores Between PRP and Steroid Groups at 6 Months

The final outcome scores between the PRP and Steroid groups at 6 months. The PRP group showed significantly better outcomes across all measures, including a lower Final WOMAC score ( $36.5 \pm 7.9$  vs.  $48.6 \pm 9.4$ ), a lower Final ISK score ( $3.9 \pm 1.2$  vs.  $5.6 \pm 1.4$ ), a lower Final VAS score ( $3.1 \pm 1.0$  vs.  $5.2 \pm 1.3$ ), and a greater Final Range of Motion ( $125 \pm 9.7$  degrees vs.  $113 \pm 11.5$  degrees), with p-values of 0.010 for each measure, indicating superior improvement in the PRP group

### Repeated Measures ANOVA Results for Pain Score (VAS) Over Time

The results of the repeated measures ANOVA for pain score (VAS) over time in the PRP and Steroid groups. The PRP group showed a significant improvement in pain scores with an F-value of 8.67 and a p-value of 0.003, indicating a statistically significant reduction in pain over time. In contrast, the Steroid group had an F-value of 2.34 and a p-value of 0.110, which was not statistically significant, suggesting no significant change in pain scores over time.

### Side Effects and Adverse Reactions in PRP vs. Steroid Groups

The side effects and adverse reactions between the PRP and Steroid groups. The incidence of pain at the injection site, swelling, infection, and other side effects was similar between the two groups, with no significant differences, as indicated by p-values of 0.250, 0.400, 0.500, and 0.300, respectively. This suggests that both treatments had comparable safety profiles in terms of side effects and adverse reactions.

The comparative analysis shows that while both PRP (platelet-rich plasma) and steroid (CS) treatments provide effective short-term relief for knee osteoarthritis, PRP demonstrates a more sustained benefit over time. In the user's study, PRP showed continuous improvement

in VAS pain scores and WOMAC functional scores up to six months, with significant gains in ISK and ROM scores as well. This finding aligns with Elksniņš-Finogejevs et al. (2020), who reported a similar long-term advantage of PRP over steroids. Cinar et al. (2023) observed that while intra-articular steroids (IAS) provided faster pain relief initially, PRP outcomes matched IAS by six months, emphasizing PRP's delayed but prolonged efficacy. The systematic review by Idres et al. (2023) supports this pattern, noting PRP's potential for sustained symptom relief in various RCTs. Across studies, adverse reactions were minimal for both PRP and steroid treatments, reinforcing the safety profile of PRP as a viable long-term alternative to steroids in knee osteoarthritis management. <sup>(15,16,17)</sup>

Knee osteoarthritis (OA) is one of the most prevalent musculoskeletal disorders, particularly affecting older adults, leading to pain, reduced mobility, and a diminished quality of life. In India, the incidence of knee OA is rising rapidly, partly due to the aging population and increased risk factors such as obesity, previous joint injury, and lack of physical activity. The management of knee OA in its early stages is crucial to slow the disease progression, alleviate symptoms, and improve functional outcomes, thus preventing the need for more invasive treatments such as total knee arthroplasty (TKA). The choice of effective therapeutic options for early knee OA remains an ongoing challenge for clinicians, with intra-articular injections of corticosteroids (CS) and platelet-rich plasma (PRP) emerging as two primary treatment modalities. <sup>(15,16)</sup>

This study, which compares the effectiveness of intra-articular PRP versus corticosteroids in the treatment of early knee OA at a tertiary care center in Chengalpattu district, holds significant importance due to several reasons. First, it contributes to the growing body of evidence on the comparative efficacy of non-surgical interventions for early knee OA, especially in the Indian context, where healthcare resources are limited and the burden of knee OA is substantial.

Knee OA is a major cause of disability in India, particularly among the elderly. With an increasing elderly population and changing lifestyle factors, the prevalence of OA is expected to rise. A large proportion of individuals with knee OA present with early-stage symptoms, including mild pain, stiffness, and limited



range of motion (ROM), which can severely impact daily functioning. Early intervention is critical to halt the progression of the disease and delay the need for surgical interventions. In this context, a non-invasive approach to manage symptoms is highly desirable. PRP, a biological treatment derived from the patient's own blood, is emerging as a promising option due to its potential to promote healing, reduce inflammation, and improve cartilage regeneration. Corticosteroids, on the other hand, have long been used for their potent anti-inflammatory effects but are associated with potential long-term side effects, including cartilage degeneration and joint infection. This study seeks to address the gap in understanding which of these therapies provides better long-term relief and functional improvement for early-stage knee OA. <sup>(17)</sup>

The clinical comparison of intra-articular PRP versus corticosteroids is of high clinical relevance. Corticosteroid injections provide rapid pain relief and are widely used for short-term management of OA symptoms. However, the long-term benefits of corticosteroids are limited, and repeated use can lead to cartilage damage and other adverse effects. PRP, on the other hand, is considered a more biologically regenerative treatment. It works by harnessing the healing potential of growth factors in platelets to stimulate tissue repair and reduce inflammation. PRP has gained attention for its ability to improve pain, function, and ROM in patients with early knee OA, potentially offering longer-lasting relief without the side effects associated with steroids.

The study's importance lies in its potential to provide a clearer understanding of how these two treatment modalities compare in terms of long-term pain relief, functional improvement, and side-effect profiles. Given the limited data on PRP treatment in Indian populations and the lack of head-to-head trials comparing it with corticosteroids, this study will provide valuable insights into the most effective treatment strategies for early knee OA.

This study can directly influence clinical practice in the management of early knee OA, particularly in resource-limited settings. In many tertiary care centers in India, healthcare costs and the availability of advanced treatment options can limit access to optimal care. Corticosteroid injections are relatively inexpensive

and widely available, making them a commonly used intervention. However, the rising concern over the long-term risks of corticosteroid use, including cartilage damage and reduced joint function, has led to increased interest in alternative therapies. If PRP is found to be superior in terms of long-term outcomes with a safer profile, it could become a first-line treatment option, especially for patients seeking to delay or avoid joint replacement surgery.

In conclusion, this study holds substantial importance in improving the understanding and management of early knee osteoarthritis, especially within the context of a developing healthcare system in India. By comparing the efficacy of intra-articular platelet-rich plasma and corticosteroids, it aims to provide robust evidence that will guide clinicians in choosing the most effective and sustainable treatment options for their patients. The potential for PRP to offer long-term relief without the side effects of corticosteroids could significantly impact the clinical landscape, improving patient outcomes and quality of life.

## CONCLUSION

- In conclusion, our study demonstrates that intra-articular platelet-rich plasma (PRP) provides more sustained benefits in the management of early knee osteoarthritis (OA) compared to corticosteroids (CS). While both treatments offer short-term pain relief and functional improvement, PRP showed superior long-term outcomes, including continued pain reduction and enhanced knee function over a 6-month period.
- The safety profiles of both interventions were comparable, with no significant differences in adverse reactions. These findings suggest that PRP may be a more effective, long-term solution for knee OA management, potentially influencing clinical treatment decisions in the future.

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