Ambispective Analysis of PRP Therapy: Evaluating Efficacy, Safety and Quality of Life in Osteoarthritis Patients

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Abstract:

Background: This research examines the effectiveness of platelet-rich plasma (PRP) therapy in treating knee osteoarthritis (OA), emphasizing pain alleviation, joint function, and overall quality of life. Carried out at a tertiary hospital, a combined retrospective and prospective analysis was conducted on patients undergoing PRP therapy. Information on demographics, Visual Analog Scale (VAS) scores, stiffness, physical function, and quality of life (WOMAC) was gathered, indicating notable enhancements after therapy. Pain relief was significant, with VAS scores decreasing to 0-2 for the majority of patients. Stiffness and physical functionality also enhanced, as 51 patients indicated mild or no stiffness, while 41 reported minimal to no physical challenges. Quality of life demonstrated notable improvements, and long-term follow-up revealed lasting advantages even one year after treatment. PRP therapy demonstrated few side effects, reinforcing its effectiveness and safety in treating knee osteoarthritis. Additional extensive research is required to validate these results and refine PRP procedures.

Keywords: Platelet-rich plasma, osteoarthritis, pain relief, stiffness, physical function, VAS scores, WOMAC score, Quality of life.

Introduction

Osteoarthritis (OA) is a major contributor to disability and diminished quality of life globally, particularly among those over 55 years old. Closely associated with aging and elevated body mass index (BMI), OA mainly impacts joints that bear weight. With increasing life expectancy and obesity levels, OA has emerged as a significant health issue, especially in older populations [(1)].

OA is characterized by a disruption in cartilage production, resulting in cartilage deterioration, bone growth, and the development of osteophytes [(1,2)]. The knee is particularly prone to injury, and the increasing requirement for knee replacements highlights the necessity for efficient conservative therapies [(3)].

Platelet-Rich Plasma (PRP) therapy has surfaced as a hopeful regenerative medicine technique, promoting tissue healing, adjusting inflammation, and reducing knee OA symptoms [(4)]. Moreover, drugs, physiotherapy, and injections are frequently utilized to treat OA. The effectiveness of treatment is frequently evaluated with pain and functional metrics, including the Visual Analogue Scale (VAS) and the WOMAC index.

PRP Preparation and Administration

To create PRP, whole blood is taken from the patient and spun in a centrifuge to separate the red blood cells (RBCs) from the platelets. According to the formulation, PRP can either be rich in leucocytes or poor in leucocytes. PRP is administered into the injured joint, commonly with ultrasound assistance to guarantee accurate positioning. The typical PRP treatment consists of three injections that are administered six weeks apart. PRP enhances recovery by producing growth factors that encourage tissue regeneration, attract stem cells, and diminish inflammation.

Methodology

An Ambispective observational study was planned and executed by department of Orthopedic in a tertiary care hospital. An approval was obtained prior to the study from the Institutional Ethics Committee (BIPS/IEC/2023/P2).

With Objectives, Assessing the Clinical Efficacy, Quality of Life Measurement(using Visual Analogue Scale, Western Ontario and McMaster Universities Arthritis Index(WOMAC), Long-term Follow-up.

Inclusion criteria: Adults >18 years with VAS pain >3, failed conservative treatments, and co-morbidities like diabetes, obesity, or hypertension. Patients must be unwilling or unavailable for knee arthroplasty.

Exclusion criteria: Immunosuppressed individuals, connective tissue disorders, recent steroid

injection (<6 months), tumors, backache, infected knee, PRP allergies, or hemoglobin <10g/dl.

Data analysis

Statistical comparison carried out using the one way Annona and Karl Pearson Co-efficient method.

In association, p-value of <0.05 & <0.1 was considered as significant and p- value of <0.0001 & <0.055 was considered as very highly significant.

Tables and Graphs were drawn by exporting the data from Google Sheets, MS excel 2021.

Statistical analysis was performed by using SOCIAL SCIENCE STATISTICS software.

Results

Basic clinical and demographic details of patients are listed in (Table-1). We analyzed data of 122 patients.

Table 1: Patient Demographics

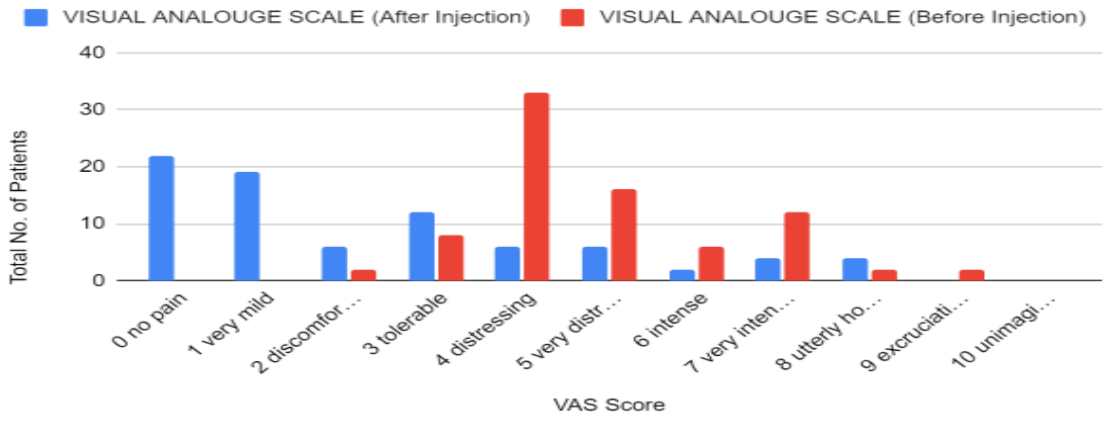
VARIABLE	**n%**
GENDER	
Male	29(35.8%)
Female	52(64.2%)
AGE	
Mean , sd ±	52.7, ±10.8
Median;	53
EDUCATION	
Illiterate	19(23.5%)
Literate	62 (76.5%)
SOCIAL HABITS	
Smoking	4(4.9%)
Alcoholics	11(13.6%)
Tobacco chewer	1(1.2%)
LOCALITY	
City	36(44.4%)
Town	16(19.8%)
Village	29(35.8%)

Visual Analogue Scale (Before Injection) Vs Visual Analogue Scale (After Injection)

The graph describes about the distribution of VAS- After injection vs VAS- Before injection. That showing the results of varying number of patients got decrease in pain latter the injection and some patients are not got benefited.

Based on the VAS score we are examining that the PRP injection as cured patients from the pain. Showing the distribution of VISUAL ANALOUGE SCALE (Before Injection) Vs VISUAL ANALOUGE SCALE (After Injection) in figure.

Fig. 1 Visual Analogue Scale (Before Injection) Vs Visual Analogue Scale (After Injection)



WOMAC (Western Ontario and McMaster Universities Osteoarthritis Index)

Table 2: Pain subscale score with number of patients

Pain sub scale[0-20]	Patients
0: No pain	8
1-4: Mild pain	35
5-9: Moderate pain	30
10-14: Severe pain	12
15-20: Extreme pain	0

Above table describes about the WOMAC pain score with the pain subscale (score range: 0-20), where most of the patients have mild- moderate pain.

Table 3: Stiffness subscale score with number of patients

Stiffness sub scale[0-20]	Patients
0: No Stiffness	6
1-2: Mild Stiffness	51
3-4: Moderate Stiffness	16

5-6: Severe Stiffness	8
7-8: Extreme Stiffness	0

Above table describes about the WOMAC pain score with the pain subscale (score range: 0-20), where most of the patients have mild- moderate pain.

Table 4: Physical Function subscale score with number of patients

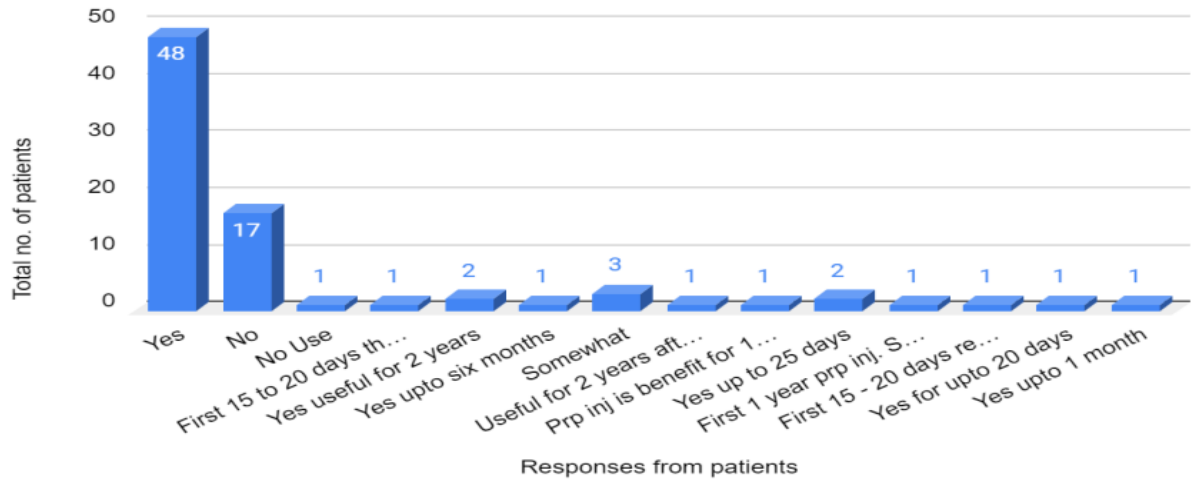
Physical Function Subscale (Score Range: 0-68):	**PATIENTS**
0-10: Little to no difficulty in physical function	41
11-20: Mild difficulty	12
21-30: Moderate difficulty	21
31-40: Severe difficulty	7
41-68: Extreme difficulty or inability to perform activities	0

Above table describes about the WOMAC pain score with the physical function subscale (score range: 0-68), where most of the patients have little to no difficulty in physical function

Responses from patients about PRP injection

The figure describes about the Responses of the patients after taking the PRP therapy where most of the members were relived from the pain.

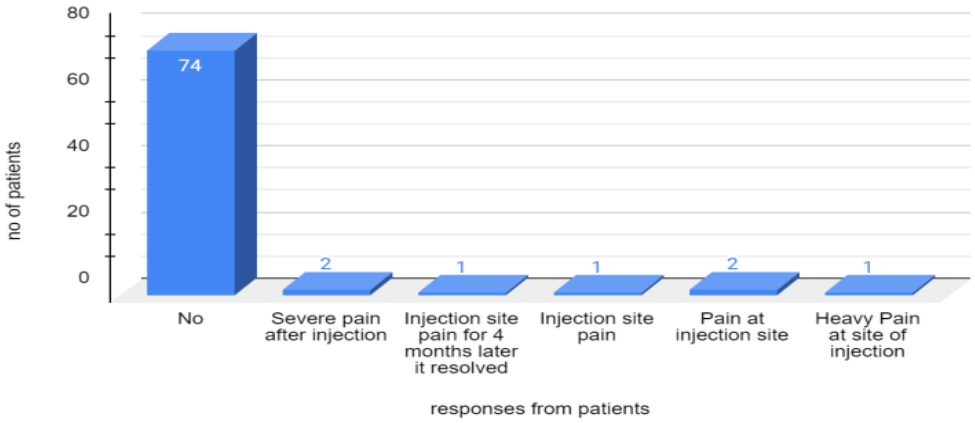
Fig: 2 Responses of the patients after taking the PRP therapy



Adverse drug reactions with the PRP injection

According to the figure most of the patients does not have any adverse effects or side effects

Fig: 3 Responses from patients regarding adverse effects



WOMAC Scale Physical Activities Vs Pain Scores

The distribution of PAIN Subscale (Score Range: 0-20) where it describes about physical activities with their pain scores

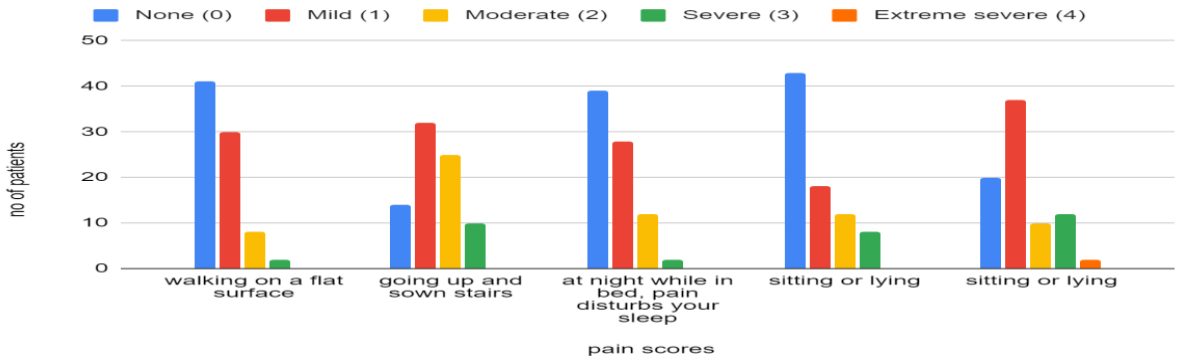
Table 5: Activities Vs Pain Scores

Activities Vs Pain Scores	Walking On A Flat Surface	Going Up And Sown Stairs	At Night While In Bed, Pain Disturbs Your Sleep	Sitting Or Lying	Standing Upright
None (0)	41	14	39	43	20
Mild (1)	30	32	28	18	37
Moderate (2)	8	25	12	12	10
Severe (3)	2	10	2	8	12

Extreme severe (4)	0	0	0	0	2

Above table describes that the interference of OA in the daily activities of the patients and their related pain scores. Here the higher populations are under the none and mild scores. And the comparison between activities and pain scores we got statistically significant with P value <0.00001. The result is significant at p <0.05.The f ratio value is 15.6879.

Fig: 4 Pain scores vs number of patients



WOMAC Scale Physical Activities Vs Function Scores

The distribution of Physical function Subscale (Score Range: 0-68) where it describes about physical activities with their scores.

Table 6: Physical activities/Scores

PHYSICAL ACTIVITIES/ SCORE	Descending stairs	Ascending stairs	Rising from sitting	Standing	Bending to the floor	Walking on flat surface	Getting in and out of car, or off the bus	Putting on your socks or stockings	Lying in bed	Getting in or out off the bath	Sitting	Getting in or out off the toilet	Performance heavy domestic duties	Performance light domestic duties
None (0)	30	6	24	26	8	47	20	46	43	30	33	16	6	14
Mild (1)	33	41	29	31	45	20	37	23	26	35	34	41	37	41
Moderate (2)	16	24	20	11	18	14	14	10	8	12	10	18	26	22
Severe (4)	2	10	8	13	10	0	10	2	4	4	4	6	12	4

Above table describes that the interference of OA in the daily activities of the patients and their related scores. Here the higher populations are under the none and mild scores.
And the comparison between activities and scores we got statistically significant with P value <0.00001. The result is significant at p <0.05.
The f ratio value is 25.71325
The distribution in graph of where it describes about physical activities with their scores

Fig:5 Pain during activities vs no of patients

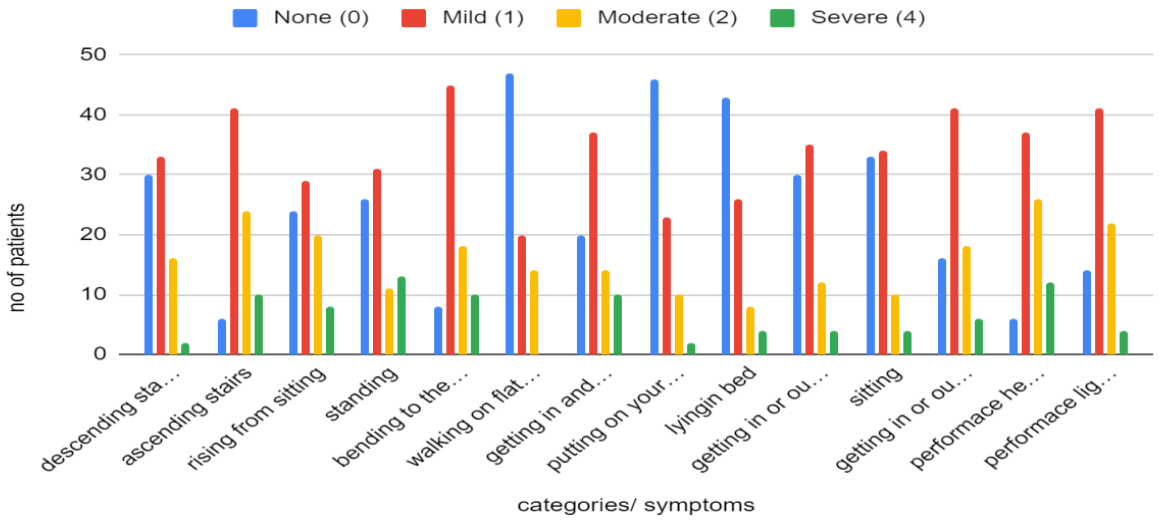


Table 7: Gender Vs VAS Score before Injection

The distribution of gender vs VAS score of different pains

Gender Vs VAS Score Before Injection	0 No Pain	1 Very Mild	2 Discomforting	3 Tolerable	4 Distressing	5 Very Distressing	6 Intense	7 Very Intense	8 Utterly Horrible	9 Excruciating Unbearable	10 Unimaginable Unspeakable
Male	0	0	1	5	20	10	4	10	1	1	0
Female	0	0	1	3	13	6	2	2	1	1	0

Above table describes that the gender vs vas score before injection.

And the comparison between gender and scores we got statistically significant with P value <0.000928. The result is significant at p <0.05.
The R value is 0.9268

The distribution in figure of where it describes about of Gender vs VAS score of different pains

Fig:6 Gender vs VAS score before injection

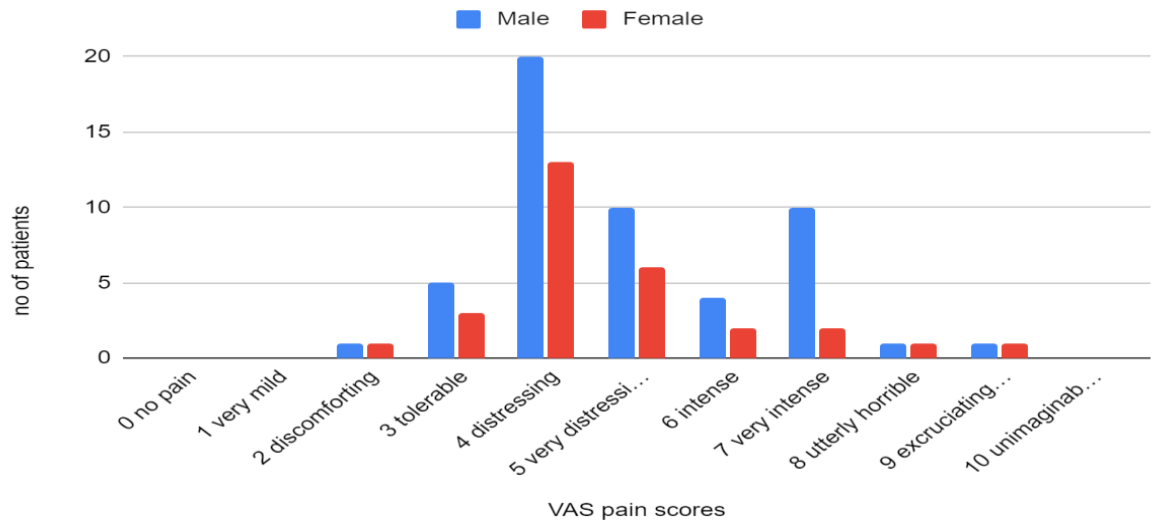


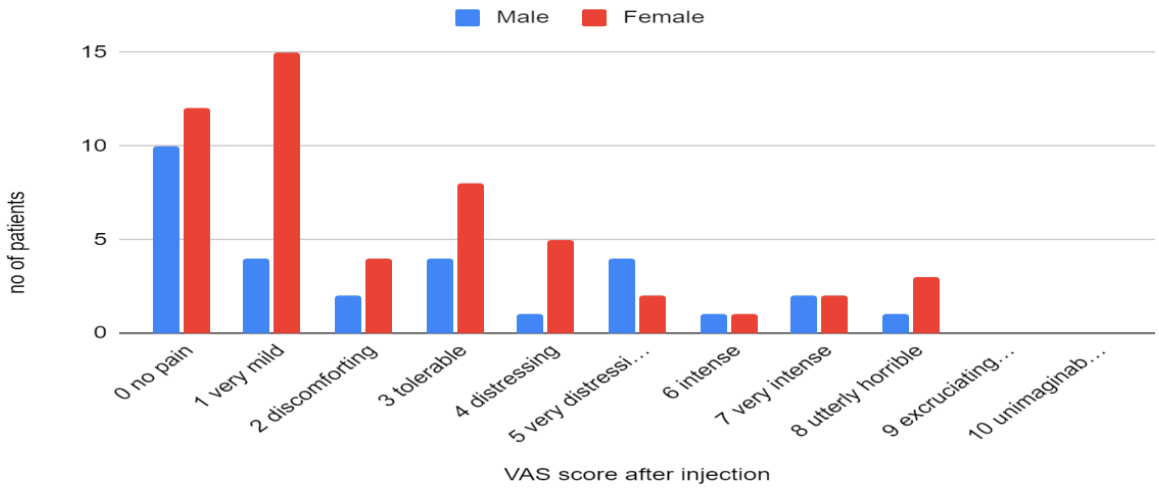
Table 8: Gender vs VAS score after injection

The table describes that the gender vs vas score after injection.

Gender vs VAS score after injection	0 no pain	1 very mild	2 discomforting	3 tolerable	4 distressing	5 very distressing	6 intense	7 very intense	8 utterly horrible	9 excruciating unbearable	10 unimaginable unspeakable
Male	10	4	2	4	1	4	1	2	1	0	0
Female	12	15	4	8	5	2	1	2	3	0	0

And the comparison between gender and scores we got statistically significant with P value <0.055327. The result is significant at p <0.10.
The R value is 0.6554

Fig:7 Gender vs VAS score after injection



Discussion

This study provides an Ambispective analysis of Platelet-Rich Plasma (PRP) therapy's efficacy, safety, and impact on the quality of life in patients with knee osteoarthritis (OA). The findings align with existing literature, demonstrating PRP's potential in significantly improving clinical outcomes and overall quality of life for OA patients.

Gender Distribution: 64.2% females and 35.8% males underwent PRP therapy. This aligns with Bansal et al., 2021[1] but contrasts with Kikuchi et al., 2021[2], which reported a balanced gender distribution.

Age Profile: Mean age is 52.7 years, median 53 years, consistent with Sarath and Rao et al., 2020[5] and Saita et al., 2021[4], but slightly younger than Rai et al., 2021[6].

A) Clinical Efficacy

Pain Relief: VAS Scores Before Injection: Most patients reported moderate to severe pain, with scores primarily in the 4 (33 patients), 5 (16 patients), and 6 (6 patients) range.

VAS Scores after Injection: Significant reduction in pain, with many patients reporting scores of 0 (22 patients), 1 (19 patients), and 2 (6 patients).

These results align with Bansal et al., 2021[1], which emphasized the critical dose for long-term efficacy of PRP in knee OA treatment.

Stiffness Reduction: The stiffness sub-scale indicates a reduction in stiffness post-PRP therapy. This reduction in stiffness is consistent with the observations of Wickramarachchi et al., 2023[7], who noted improved joint mobility and reduced stiffness after PRP treatment.

Post-therapy, 51 patients reported mild stiffness (scores 1-2), 16 reported moderate stiffness (scores 3-4), and 6 had no stiffness (score 0). This improvement is consistent with Saita et al., 2021[4].

Improvement in Physical Function: The physical function subscale reveals enhanced functionality in the majority of patient's post-PRP therapy. This improvement in physical function is consistent with the findings of O'Connell et al., 2019[3], who reported enhanced mobility and physical function in patients with knee osteoarthritis following PRP treatment. Post-therapy, 41 patients reported little to no difficulty in physical function (scores 0-10), 12 reported mild difficulty (scores 11-20), and 21 reported moderate difficulty (scores 21-30). This supports findings by Crowley and Soti et al., 2023[8], highlighting PRP's positive impact on joint function.

Activities vs. Pain Scores: The activities versus pain scores illustrate the impact of pain on various physical activities. The reduction in pain levels post-PRP therapy likely contributes to improved performance in daily activities, as reported by Molnar et al., 2022[9].

Gender Differences in Pain Perception: Before injection, both male and female patients reported similar patterns of pain intensity across different VAS scores. This is consistent with previous research by Bansal et al., 2021[1], which found no significant gender differences in pain perception among osteoarthritis patients.

After injection, while both genders experienced a reduction in pain, females tended to report higher VAS scores compared to males. This aligns with the findings of Kikuchi et al., 2021[2], who observed that female patients with knee osteoarthritis generally report higher pain levels compared to males.

B) Quality of Life Measurement

Overall Quality of Life: WOMAC Scores: Post-PRP therapy, 41 patients experienced little to no difficulty (scores 0-10), and 12 reported mild difficulty (scores 11-20).

Emotional and Social Well-being: VAS Scores: Post-injection, significant reductions in pain levels contributed to better emotional and social well-being, corroborating Crowley and Sotial et al., 2023[8] .

C) Long-term Follow-up

Sustained Benefits: Long-term Efficacy: Patients reported sustained pain relief and functional improvement for up to a year post-therapy, similar to Rai et al. 2021[6].

Reduced Need for Additional Interventions: Patient Records: Fewer interventions were needed over time, indicating long-term efficacy of PRP therapy, as noted by Ghai et al., 2019[10].

D) Adverse Effects:

Safety Profile: Minimal adverse effects were reported, confirming the therapy's safety. This is consistent with findings by Molnar et al., 2022[9] and Smith et al., 2016[11].

Comparative Analysis:

Comparing these findings with existing literature underscores the complex relationship between gender and pain perception in osteoarthritis patients. While PRP therapy appears effective in reducing pain for both genders, differences in pain reporting between males and females may warrant further investigation.

Variations in pain perception and treatment response based on gender could be influenced by physiological, hormonal, and psychosocial factors, as discussed by Rai et al., 20216 and Crowley and Soti et al., 2023[8].

Conclusion

This comprehensive analysis of Platelet-Rich Plasma (PRP) therapy in osteoarthritis patients elucidates its efficacy, safety, and impact on quality of life, while integrating demographic and lifestyle considerations. The findings indicate significant improvements in pain relief, reduction of stiffness, and enhanced physical function following PRP injections. Additionally, the study emphasizes the importance of precision dosing, personalized treatment approaches, and long-term effectiveness evaluations in optimizing PRP therapy outcomes.

A notable aspect of the study is, the gender differences in pain perception, with females reporting higher pain levels both pre- and post-PRP injection compared to males. While PRP therapy was effective in reducing pain for both genders, understanding these gender-specific responses is essential for tailoring treatment strategies and maximizing therapeutic benefits.

The objectives of assessing clinical efficacy, measuring quality of life improvements, and conducting long-term follow-up were successfully met.

Clinical Efficacy: Significant reduction in pain (e.g., VAS scores reduced from 4-6 to 0-2) and improvement in physical function (e.g., 41 patients reporting little to no difficulty).

Quality of Life: Enhanced QoL with improvements in physical, emotional, and social aspects, supported by WOMAC and VAS scores.

Long-term Follow-up: Sustained benefits observed over a year, with reduced need for additional interventions. These findings support the growing body of evidence advocating for PRP therapy as a viable and effective treatment for knee OA. Further large-scale, randomized controlled trials are warranted to validate these results and refine PRP treatment protocols for optimal patient outcomes.

Moreover, the study underscores the necessity of considering diverse patient profiles, social habits, and geographic contexts in the implementation of PRP therapy. By synthesizing evidence from multiple studies, this analysis offers valuable insights into the multifaceted nature of PRP therapy and its implications for the management of osteoarthritis.

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