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"The Role of Platelet-Rich Plasma in Knee-joint Osteoarthritis in a Multicenter Study"

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Abstract
Background: *Osteoarthritis (OA) is a disorder involving joints characterizedby cell stress and extracellular matrix degradation. Several methods are used to alleviate the symptoms of knee OA, including analgesics, physical therapy,exercise as well as intra-articular injections like glucocorticoids and/or hyaluronic acid. Some recent studies have focused on modern therapeutic methods that stimulate cartilage healing process and improve the damage, including the use of platelet-richplasma (PRP) as a complex of growth factors. We have not enough research-based data regarding the role of platelet-rich plasma in osteoarthritis of knee-joint.*
Aim of the study:*The study aimed to assess the role of platelet-rich plasma in osteoarthritis of knee-joint.*
Methods: *This was a multicenter prospective observational study which was conducted in the TMSS Medical College &RafatullahCommunity Hospital, Bogura and LABAID Diagnostic Bogura, Bangladesh, during the period from July 2020 to June 2021. As study subjects, in total105 patients with grade-I and grade-II arthritis ofknee-joint were included in this study. To each of the patients 3 PRP injections were injected in a 4 weeks interval. The patients were followed up and their conditions of physical activities and pain associated with arthritis were evaluated by WOMAC (Western Ontario and McMaster) arthritis index score at the time of induction and at the 6 months interval.All data were processed, analyzed and disseminated by MS Office and SPSS version 20 programs.*
Results:*In this study, we observed, majority of the participants suffered from several signs and symptoms of osteoarthritis in knee joints for more than 2 years which was 72%. As per the WOMAC scoring system, in assessing the final outcomes of the participants by treating platelet-rich plasma (PRP) we observed that, at the baseline period the mean (±SD) WOMAC score was 3.76±0.59. On the other hand, at the follow-up stage, the WOMAC score was fond as 1.41±0.52. So, platelet-rich plasma (PRP) ensured extremely significant reduction of WOMAC score where the P value was found as <0.0001.*
Conclusion: *As per the findings of this study, we can conclude that, in treating osteoarthritis of knee-joint, the consecutive use of platelet-rich plasma (PRP) may be considered as an effective treatment option.The results of this current study may be helpful in further similar researches and in the treatment arena of osteoarthritis. We would like to recommend for wider use of platelet-rich plasma (PRP)in treating osteoarthritis of knee-joints.*
Keywords: *Osteoarthritis,Platelet-rich plasma (PRP),Knee joint, WOMAC scoring system.*

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I. Introduction

Osteoarthritis (OA) is one of the leading causes of severe long-term pain as well as disability affecting approximately 10% population globally. On the other hand, knee osteoarthritis (OA) is a chronic progressive disease affecting more than 20% of people older than 45 years. [1] As per the survey of the causes of productive work time loss in the USA (United States), OA is the second most common cause of work performance loss after low back pain. [2]OA is the most commonly seen as joint disorder in all around the world especially >60 years of age [3]. As per the definition OA; it includes heterogeneous group of signs and symptoms caused by

joint cartilage disorders and carries on with periarticular and bony changes [4].The long-term treatment plan of OA should aim to reduce the joint damage and improve the quality of life [5].First studies about platelet rich plasma (PRP) revealed quite satisfying results especially in younger ages of patients by reducing pain and improving function and quality of life. Some studies comparing PRP and HA, concluded in favor of PRP [6, 7]. Now a day, as modern treatment option, physicians are using platelet-rich plasma (PRP) for the management of osteoarthritis even in knee joints. PRP derived from the 'autologous blood' containing growth factors is claimed to activate the 'healing process' in the damaged cartilage and it helps in tissue regeneration. [8]Recent research has found a number of key biochemical pathways that could be targeted therapeutically through biological intervention [9].New evidence recommends that, PRP has the potential to have a 'regenerative effect oncertain body tissues' in along with the main role platelet plays in haemostasis [10].As platelet-rich plasma is an autologous blood product [11], there is no risk of immunological reactions and disease transfer, but as it is an injection procedure, there will be some possibility of infection, local anaesthesia reaction and bleeding.

II. Methodology

This was a multicenter prospective observational study which was conducted in the TMSS Medical College &RafatullahCommunity Hospital, Bogura and LABAID Diagnostic Bogura, Bangladesh, during the period from July 2020 to June 2021. In total 105 patients with grade-I and grade-II (Kellgren–Lawrence) [12] arthritis ofknee-joints was included in this study as the study people.Proper written consents were obtained from all the participants before data collection. A pre-designed questioner was used to collect patient data. In this study, to each of the patients, 3 PRP injections were injected in a 4 weeks interval. The patients were followed up and their conditions on theirphysical activities and pain associated with arthritis were evaluated by WOMAC (Western Ontario and McMaster) [13] arthritis index score at the time of induction and at the 6 months interval.Blood samples were collected in bags containing anticoagulant agents. Then the blood samples were transferred into a tube and centrifuged at a constant acceleration to separate the RBCs from the whole blood volume.It separates blood in three different layers. The upper most layer along with superficial buffy coat are centrifuged again in a 'new sterile tube' sufficient enough to form the soft pellets at the bottom. The upper two-thirds of the centrifuged volume of sample was discarded while the remaining 'lower one-third' was homogenized to produce platelet-rich plasma. Platelet-rich plasma was dispensed in a sterile syringe. It was injected in the knees of the patients through 'supra-lateral approach' in supra-patellar pouch.After injection, all the patients were observed for 20 minutes and discharged home with instructions regarding signs of infection, warmth,pain, redness as well as inability to bear weight. Patients were then prescribed paracetamol to reduce pain and advised not to take NSAIDs and/or steroids. The WOMAC scores were calculated at the time of induction and at 6 months interval to evaluate the effects of PRP. All data were processed, analyzed and disseminated by MS Office and SPSS version 20 as per need.

III. Result

The total participants of this study were105 in number who had completed the full tenure of the intervention with proper documentation. In analyzing the gender of the participants, we observed, among total participants, 39% (n=41) were male and the rest 61% (n=64) were female. So, female participants were dominating in number and the male-female ratio was 1:1.56. We observed that, the highest number of participants were from 41-50 years' age group which was 39%. Besides this, 9%, 25%, 20% and 8% participants were from <30, 31-40, 51-60 and >60 years' age groups respectively. The mean height of the total participants was 165.84 cm and the mean weight was 68.73 Kg. In this study, in analyzing the baseline clinical status of the participants we observed, majority of the participants suffered from several signs and symptoms of osteoarthritis in knee joints for more than 2 years which was 72%. On the other hand, only 28% participants suffered from several signs and symptoms of OA in knees. According to the WOMAC scoring system, in analyzing the final outcomes of the participants by treatingplatelet-rich plasma (PRP) we observed that, at the baseline period the mean (±SD) WOMAC score was 3.76±0.59. On the other hand, at the follow-up stage the WOMAC score was fond as 1.41±0.52. So, PRP ensured extremely significant reduction of WOMAC score where p value was found as <0.0001.

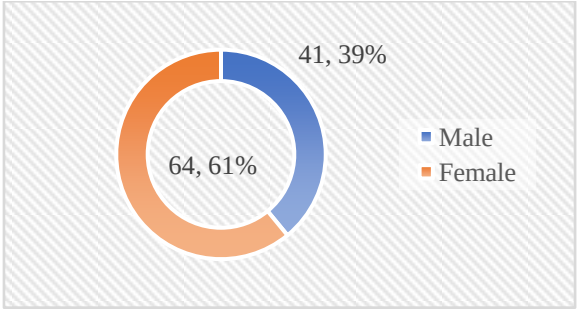

Figure1: Gender distribution of participants(N=105)

Table 1: Age distribution of participants (N=105)

Age (Year)	n	%
<30	9	9%
31-40	26	25%
41-50	41	39%
51-60	21	20%
>60	8	8%

Table 2: Mean height and weight distribution of participants (N=105)

Mean height and weight	
Height (cm)	165.84
Weight (Kg)	68.73

Table 3: Baseline clinical status of participants (N=105)

Characteristics	n	%
Duration of symptoms		
≤ 2 Years	29	28%
> 2 Years	76	72%
Kellgren–Lawrence grade		
Mean (±SD)	3.76±0.59	

Table-3: Final outcomes among the participants as per WOMAC score (N=105)

Period	Mean (±SD) Score	P value
Baseline	3.76±0.59	<0.0001
At follow-up	1.41±0.52	

IV. Discussion

This study aimed to assess the role of platelet-rich plasma in osteoarthritis of knee-joint.The effects of platelet-rich plasma (PRP) injection on pain management have been previously observed in many other studies and several authors [14, 15] have reported the analgesic properties of platelets. A recent meta-analysis [16] indicated that, platelet-rich plasma (PRP) reduces pain by influencing the expression of mediators (e.g., prostaglandin E2, dopamine, 5-hydroxy- tryptamine, substance P) and that the GFs, contained in the platelet-rich plasma concentrate, stimulating the growth of chondrocytes, promote the synthesis of cartilage matrix and the inhibition of the local inflammatory response [17].In our study, in analyzing the baseline clinical status of the participants we observed, majority of the participants suffered from several signs and symptoms of osteoarthritis in knee joints for more than 2 years which was 72%. On the other hand, only 28% participants suffered from several signs and symptoms of OA in knees. In a clinical trial, Sanchez et al administered platelet-rich plasma injections weekly for three consecutive weeks with greater than 50 % reduction in knee pain for 6 months.[18] Other studies have followed a similar protocol and found symptom improvement at up to 12 Months.[19, 20] Patel et al conducted a subgroup analysis of outcomes of one injection versus 2 injections 3 weeks apart and got no difference between the groups at 6 months.[21] According to the WOMAC scoring system, in this study, in analyzing the final outcomes of the participants by treating platelet-rich plasma (PRP) we observed that, at the baseline period the mean (±SD) WOMAC score was 3.76±0.59. On the other hand, at the follow-up stage the WOMAC score was fond as 1.41±0.52. So, PRP ensured extremely significant reduction

of WOMAC score where p value was found as <0.0001. In a recent study [22], it was reported that, the difference in WOMAC score at 6 months interval was significant andpatients having symptoms for less than 2 years showed more improvement in WOMAC score.A recent meta-analysis showed the superior efficacy for platelet-rich plasma as compared to hyaluronic acid (HA) in improving the clinical symptoms over a period of 2 years. They also recommended about the necessity of long-term studies for the exact effects of platelet-rich plasma. [23] Another review [13] showed that, multiple sequential platelet-rich plasma injections have better features of symptomatic relief as compared to 'hyaluronic acid' or normal saline solutions at the six month's follow- up.

Limitation of the study:

This was a single centered study with a small sized sample. So, findings of this study may not reflect the exact scenario of the whole country.

V. Conclusion & Recommendation

As per the findings of this study, we can conclude that, in treating osteoarthritis of knee-joint, the consecutive use of platelet-rich plasma (PRP) may be considered as an effective treatment option. The results of this current study may be helpful in further similar researches and in the treatment arena of osteoarthritis. We would like to recommend for wider use of platelet-rich plasma (PRP) in treating osteoarthritis of knee-joints. Health policy makers should take necessary steps to make available the facilities of this treatment method to the root levels of Bangladesh.

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Ethical approval: The study was approved by the institutional ethics committee.

References

[1]. Lawrence RC, Felson DT, Helmick CG, National Arthritis Data Workgroup, et al. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States Part II. Arthritis Rheum. 2008;58(1):23–6.
[2]. Stewart WF, Ricci JA, Chee E, Morganstein D, Lipton R. Lost productive time and cost due to common pain conditions in the US workforce. JAMA. 2003;290(18):2443–54.
[3]. Woolf, A.D. and B. Pfleger, Burden of major musculoskeletal conditions. Bulletin of the World Health Organization, 2003 Pubmed ID: 14710506.
[4]. Altman, R., et al., Development of criteria for the classification and reporting of osteoarthritis. Classification of osteoarthritis of the knee. Diagnostic and Therapeutic Criteria Committee of the American Rheumatism Association. Arthritis and rheumatism, 1986doi:10.1002/art.1780290816.
[5]. Wesseling, J., et al., CHECK (Cohort Hip and Cohort Knee): similarities and differences with the Osteoarthritis Initiative. Annals of the rheumatic diseases, 2009. 68(9): p. 1413-1419 doi:10.1136/ard.2008.096164.
[6]. Kon, E., et al., Platelet-rich plasma: Intra-articular knee injections produced favorable results on degenerative cartilage lesions. Knee Surgery, Sports Traumatology, Arthroscopy, 2010 DOI: 10.1007/s00167-009-0940-8.
[7]. Spaková, T., et al., Treatment of knee joint osteoarthritis with autologous platelet-rich plasma in comparison with hyaluronic acid. American Journal of Physical Medicine and Rehabilitation, 2012 DOI: 10.1097/PHM.0b013e3182aab72.
[8]. Smyth NA, Haleem AM, Ross KA, et al. Platelet-rich plasma may improve osteochondral donor site healing in a rabbit model. Cartilage 2016; 7(1): 104–111.
[9]. Patel S, Dhillon MS, Aggarwal S, Marwaha N, Jain A. Treatment with platelet- rich plasma is more effective than placebo for knee osteoarthritis: a prospective, double-blind, randomized trial. Am J Sports Med. 2013;41(2):356–64.
[10]. Lee KS, editor. Platelet-rich plasma injection. Seminars in musculoskeletal radiology. New York: Thieme Medical Publishers; 2013.
[11]. Ko GD. Platelet-rich plasma injection. 2010. National Institute for Clinical Excellence N. Platelet-rich plasma injections for osteoarthritis of the knee 2014. https://www.nice.org.uk/guidance/ipg491.
[12]. Andia I, Sa´nchez M, and Maffulli N. Joint pathology and platelet-rich plasma therapies. Expert Opin Biol Ther 2012; 12(1): 7–22.
[13]. Khoshbin A, Leroux T, Wasserstein D, et al. The efficacy of platelet-rich plasma in the treatment of symptomatic knee osteoarthritis: a systematic review with quantitative synth- esis. Arthroscopy 2013; 29(12): 2037–2048.
[14]. Asfaha, S.; Cenac, N.; Houle, S.; Altier, C.; Papez, M.D.; Nguyen, C.; Steinhoff, M.; Chapman, K.; Zamponi, G.W.; Vergnolle,N. Protease-activated receptor-4: A novel mechanism of inflammatory pain modulation. J. Cereb. Blood Flow Metab. 2007, 150, 176–185. [CrossRef].
[15]. Moretti, L.; Notarnicola, A.; Ostuni, A.; Pesce, V.; Maccagnano, G.; Coviello, M.; Covelli, I.; Franchini, A.; Bianchi, F.P.; Moretti,B. Umbilical cord blood platelet-rich plasma injections for epicondylitis treatment: A prospective clinical study. J. Biol. Regul. Homeost. Agents 2021, 35, 1337.
[16]. Ren, H.; Zhang, S.; Wang, X.; Li, Z.; Guo, W. Role of platelet-rich plasma in the treatment of osteoarthritis: A meta-analysis. J. Int. Med. Res. 2020, 48, 1–10. [CrossRef].
[17]. Notarnicola, A.; Tamma, R.; Moretti, L.; Panella, A.; Dell'Endice, S.; Zallone, A.; Moretti, B. Effect of shock wave treatment on platelet-rich plasma added to osteoblast cultures. Ultrasound Med. Biol. 2011, 37, 160–168. [CrossRef]
[18]. Sanchez M, Fiz N, Azofra J, Usabiaga J, Aduriz Recalde E, Garcia Gutierrez A, et al. A randomized clinical trial evaluating plasma rich in growth factors (PRGF-Endoret) versus hyaluronic acid in the short-term treatment of symptomatic knee osteoarthritis. arthroscopy. 2012;28(8):1070–8.

[19]. Filardo G, Kon E, Di Martino A, Di Matteo B, Merli ML, Cenacchi A, et al. Platelet-rich plasma vs hyaluronic acid to treat knee degenerative pathology: study design and preliminary results of a randomized controlled trial. BMC MusculoskeletDisord. 2012; 13:229–2474-13-229.
[20]. Spakova T, Rosocha J, Lacko M, Harvanova D, Gharaibeh Treatment of knee joint osteoarthritis with autologous platelet- rich plasma in comparison with hyaluronic acid. Am J Phys Med Rehabil. 2012;91(5):411–7.
[21]. Patel S, Dhillon MS, Aggarwal S, Marwaha N, Jain A. Treatment with platelet-rich plasma is more effective than placebo for knee osteoarthritis: a prospective, double-blind, randomized trial. Am J Sports Med. 2013;41(2):356–64.
[22]. Rasheed, Nusrat, et al. "Role of platelet-rich plasma in early osteoarthritis of knee joint: Experience from a tertiary care center in Pakistan." Journal of Orthopaedic Surgery 27.2 (2019): 2309499019853953.
[23]. Lana JFSD, Weglein A, Sampson SE, Vicente EF, Huber SC, Souza CV, et al. Randomized controlled trial comparing hyaluronic acid, platelet-rich plasma and the combination of both in the treatment of mild and moderate osteoarthritis of the knee. J Stem Cells Regen Med. 2016;12(2):69–78.

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