



Awareness of Dental Students on the Application of PRF in Dental Practice - A Survey

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Authors' contributions

This work was carried out in collaboration among all authors. Author KS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors DG and RD managed the analyses of the study. Author RD managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Platelet-rich fibrin (PRF) is a fibrin matrix in which platelet cytokines, growth factors, and cells are trapped and may be released after a certain time and that can serve as a resorbable membrane. In other words, it is an increased concentration of platelets suspended in a matrix which can serve as a vehicle to carry cells involved in tissue regeneration. This survey aimed at assessing the knowledge and awareness of Platelet-rich fibrin among dental students. The study was done in an online setting among the dental students of the Chennai population. The sample size of 150 participants of the age group 20-23 years, both males and females were selected by a simple random sampling method. Both descriptive (frequency of the responses) and inferential statistics (Chi-square tests) were done and the results were presented in the forms of graphs. According to this survey-based study, it was noted that the majority of participants were comprised of females (67%). It was observed that 87% of the population participated in the study were aware of the term PRF (ie. platelet-rich fibrin) whereas 13% of the population was not aware of the term. The statistical association between gender and the awareness of PRF, its advantages, and components was found to be significant ($p < 0.05$), with females having more awareness than males. Within the limitations of this study, we can conclude that while dental students are aware of PRF they do not

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have extensive knowledge of its components and its application in various procedures. It was also observed that there was a disparity in awareness between the genders where females were much aware compared to males. We propose to include this knowledge of PRF in the curriculum to ensure increased awareness of PRF among dental students.

Keywords: Awareness; gender; growth factors; platelet-rich fibrin.

1. INTRODUCTION

Platelet-rich fibrin (PRF) is a fibrin matrix in which platelet cytokines, growth factors, and cells are trapped and may be released after a certain time and that can serve as a resorbable membrane. In other words, it is an increased concentration of platelets suspended in a matrix which can serve as a vehicle to carry cells involved in tissue regeneration. A patient's own blood is collected and without the use of an anticoagulant, is made to undergo the process of centrifuging at a speed of 3000rpm. It separates into 3 different layers i.e Top-most layer consisting of cellular plasma, PRF clot in the middle, and Red corpuscle base at the bottom. After this, it is necessary to put the PRF clot in a sterile cup for approximately 10 minutes to allow the release of the proper serum contained within [1]. PRF may be obtained only in dry glass tubes or glass-coated plastic tubes without the use of any outside agent. Moreover, there is no risk of cytotoxicity compared with, for example, the bovine thrombin used for PRP preparation [2].

Platelets play a fundamental role in hemostasis and are a natural source of growth factors. Growth factors, which are stored within platelet α -granules, include platelet-derived growth factor (PDGF), insulin-like growth factor (IGF), vascular endothelial growth factor (VEGF), platelet-derived angiogenic factor (PDAF), and transforming growth factor-beta (TGF- β) [3]. The release of these growth factors is triggered by the activation of platelets that can be initiated by a variety of substances or stimuli such as thrombin, calcium chloride, or collagen. Growth factors are involved in key stages of wound healing and regenerative processes including chemotaxis, proliferation, differentiation, and angiogenesis.

PRF matrix [1,4] is composed of a tetra molecular structure, with cytokines, platelets, cytokines, and stem cells within it [5], which acts as a biodegradable scaffold [6] that favors the development of micro vascularization [7]. Also, PRF has a sustained release of growth factors [8] in a period between 1 and 4 weeks,

stimulating the environment for wound healing in a significant amount of time [9].

In surgical procedures, PRF could serve as a resorbable membrane for guided bone regeneration [10], preventing the migration of non-desirable cells into bone defect and providing a space that allows the immigration of osteogenic and angiogenic cells and permits the underlying blood clot to mineralize [11]. Some studies [12,13] have demonstrated that PRF is a healing biomaterial with a great potential for bone and soft tissue regeneration, without inflammatory reactions and may be used for promoting hemostasis, bone growth, and maturation.

Previously our department has published extensive research on various aspects of prosthetic dentistry [14–24], this vast research experience has inspired us to conduct a survey to evaluate the knowledge and awareness of platelet-rich fibrin among dental students.

2. MATERIALS AND METHODS

The study was done in an online setting among the dental students of the Chennai population. Institutional review board approval was obtained for this survey-based analysis. 2 reviewers [Primary investigator & guide] were involved in this study. The survey-based study was conducted from December 1, 2019, to December 31, 2019.

The sample size of 150 participants of the age group 20-23 years, both males and females were selected by a simple random sampling method. To fulfill the inclusion criteria of the survey, the study participants were dental students who were studying in their third year, fourth year, or were completing their clinical residency. Randomization [for all variables] was followed to minimize the bias. Tested questionnaires where the internal validity was the homogenization and replication of the experiment. Cross verification with existing studies was the external validity of this study.

The set of questionnaires which includes gender, questions on awareness were circulated among the participants through an online link. The results were collected and tabulated. Then the results were exported for statistical analysis to SPSS statistical software. Both descriptive (frequency of the responses) and inferential statistics (Chi-square tests) were done and the results were presented in the forms of graphs.

3. RESULTS

A total of 150 respondents took part in this survey-based study. It can be observed that more females (66%) participated in the survey than males (34%) (Fig. 1). It was noted that the majority (87%) of the study population were aware of the term platelet-rich fibrin (Fig. 2).

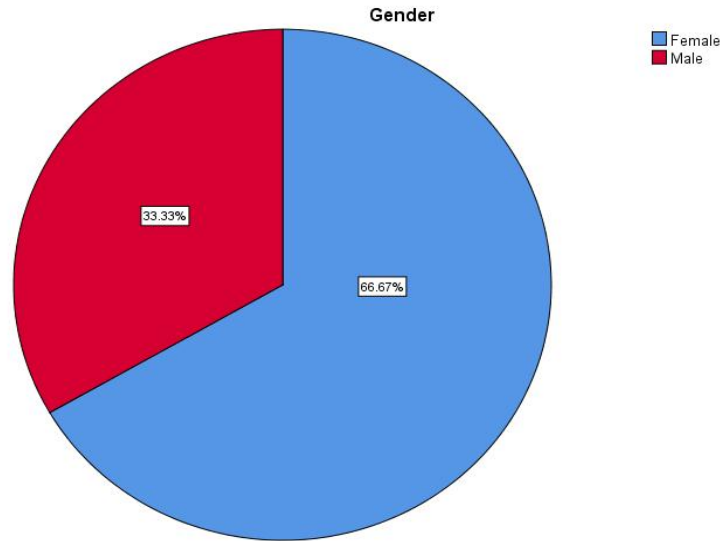


Fig. 1. Pie chart showing percentage gender distribution of the study population; where 67% were females (Blue) and only 33% males (Red) in the study. N=150. females have participated in higher numbers in this survey

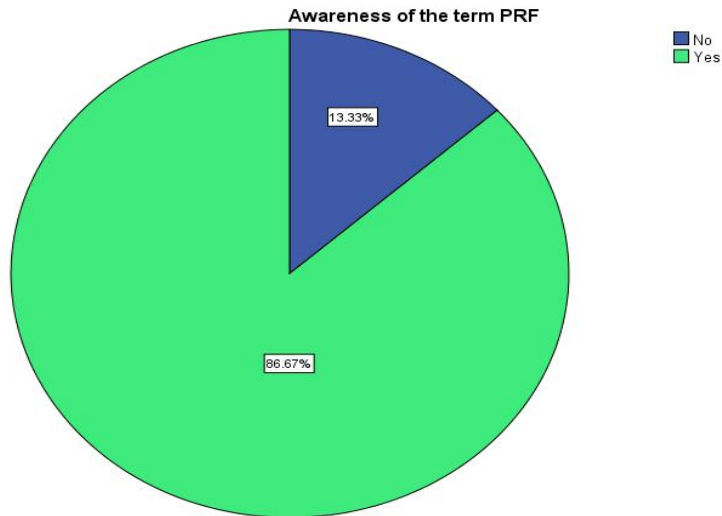


Fig. 2. Pie chart showing percentage distribution of the awareness of the term PRF (Platelet Rich Fibrin) among the study population; where 87% were aware of the term (Green) and only 13% were not aware of the term (Navy blue). Majority of the participants were aware of the term PRF

When questioned about the application of platelet-rich fibrin in the different fields of dentistry, 28% of the population opted for Periodontics, followed by 20% who opted for Oral surgery, 13% who opted for endodontics, and 13% who opted for Implantology. Only 26% of the population was aware of the application of PRF in all the fields, showing a disparity in the awareness of the application of platelet-rich fibrin (Fig. 3). Surprisingly 53% of the study population when asked was not aware of the components of platelet-rich fibrin while 47% were aware of its components (Fig. 4). The majority (66%) of the population was aware that centrifuging was the method of preparation of platelet-rich fibrin (Fig. 5). 59% of the population was aware of the relative safety and compatibility of platelet-rich fibrin while 41% were unaware (Fig. 6). Regarding the advantages of platelet-rich fibrin over platelet-rich plasma, about 57% of the respondents were aware of the advantages (Fig. 7). When asked about the types of platelet-rich fibrin, 33% of the participants were not aware of the types of PRF while 67% of the participants were aware of the types (Fig. 8). About 32% of

the population was not aware of the injectable type of platelet-rich fibrin (Fig. 9). Regarding platelet-rich fibrin treatment of joint diseases, 57% of the respondents were aware of its application (Fig. 10). The majority of the participants were not aware of novel Titanium prepared platelet-rich fibrin (T-PRF) (Fig. 11).

The association of gender and awareness of platelet-rich fibrin among the participants was statistically significant with a p-value of 0.007 (Fig. 12). The association of gender and awareness of the advantages of Platelet-rich fibrin versus platelet-rich plasma among the participants was statistically significant with a p-value of 0.000 (Fig. 13). The association of gender and awareness of the components of platelet-rich fibrin among the participants was found to be statistically significant with a p-value of 0.000 (Fig. 14). The association of gender and awareness of the application of an Injectable form of platelet-rich fibrin among the participants however was not statistically significant with a p-value of 0.265 (Fig. 15).

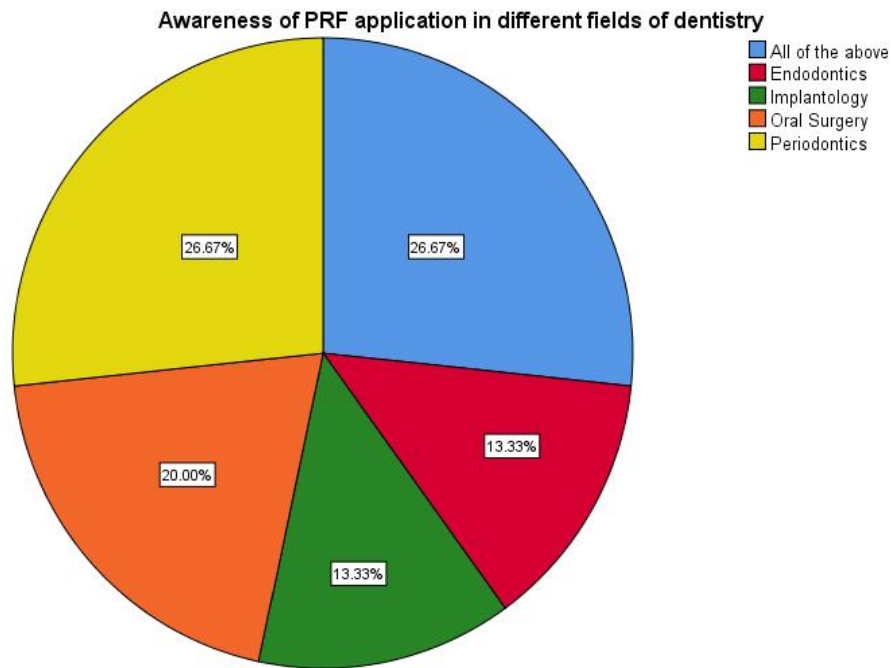


Fig. 3. Pie chart showing percentage distribution of the awareness of the application of Platelet rich fibrin in different fields of dentistry. 28% of the population opted for Periodontics (Yellow), followed by 20% opted for Oral surgery (Orange), 13% who opted for endodontics (Red) and 13% who opted for Implantology. Only 26% of the population was aware of the application of PRF in all the fields (Blue). Majority of the study population are not aware of all the applications of PRF

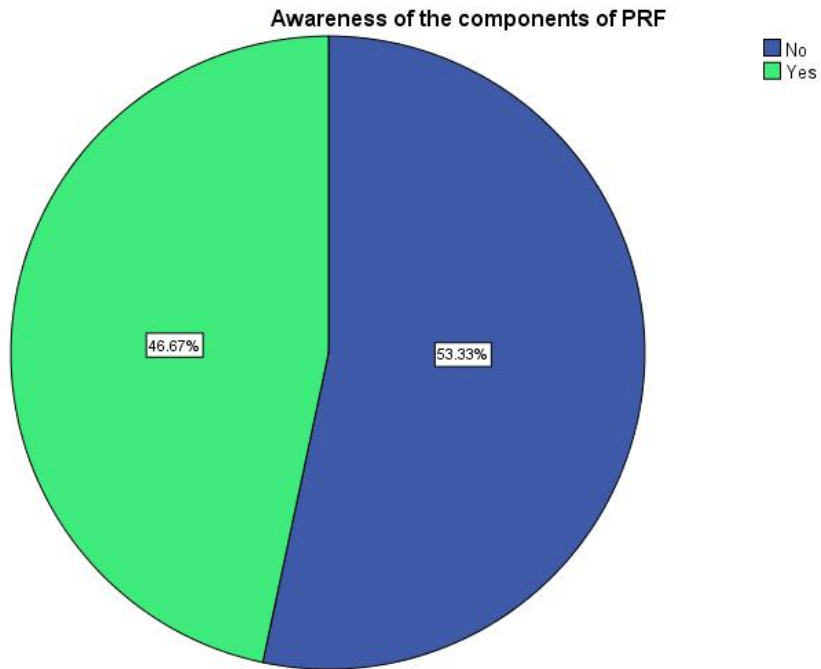


Fig. 4. Pie chart showing percentage distribution of the awareness of the components of PRF(Platelet Rich Fibrin) among the study population; where 53% were not aware of the components of PRF(Navy blue) and only 47% were aware of the components(Green). Majority of the participants were not aware of the components of PRF

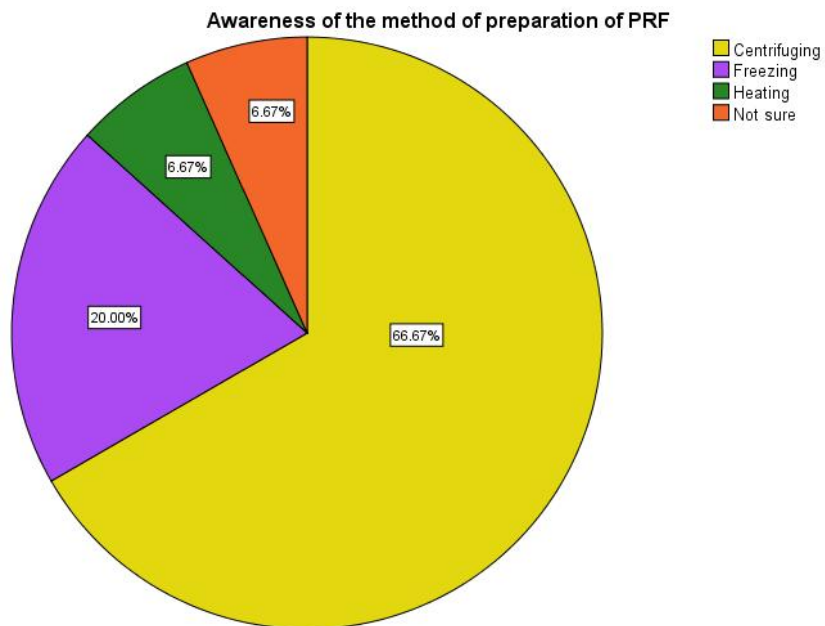


Fig. 5. Pie chart showing percentage distribution of the awareness of the preparation of Platelet rich fibrin.66% of the population opted for Centrifuging(Yellow) , followed by 20% opted for Freezing(Violet), 7% who opted for Heating(Green) and 7% who were not sure (Orange).Majority of the study population are aware of the method of preparation of PRF

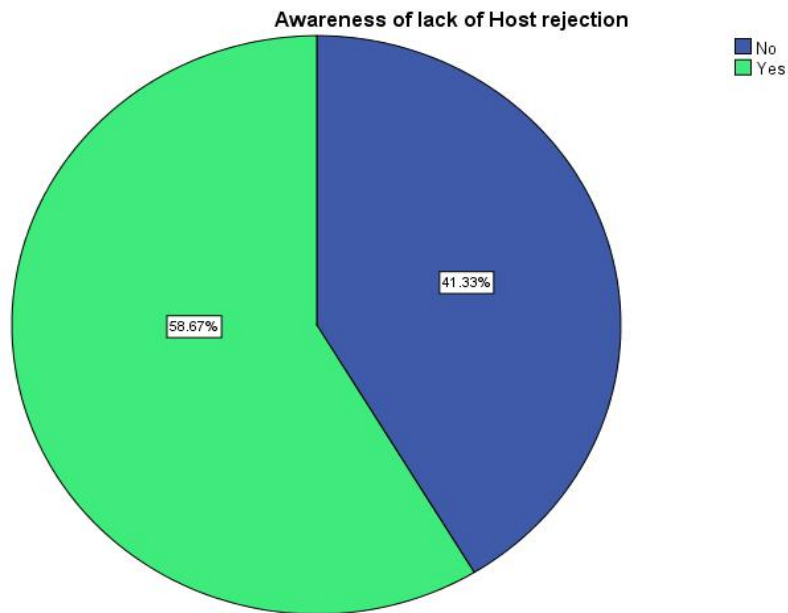


Fig. 6. Pie chart showing percentage distribution of the awareness of the compatibility of PRF(Platelet Rich Fibrin) among the study population; where 41% were not aware of the compatibility of PRF(Navy blue) and 59% were aware of the compatibility(Green). There was greater awareness of the safety and host response to PRF

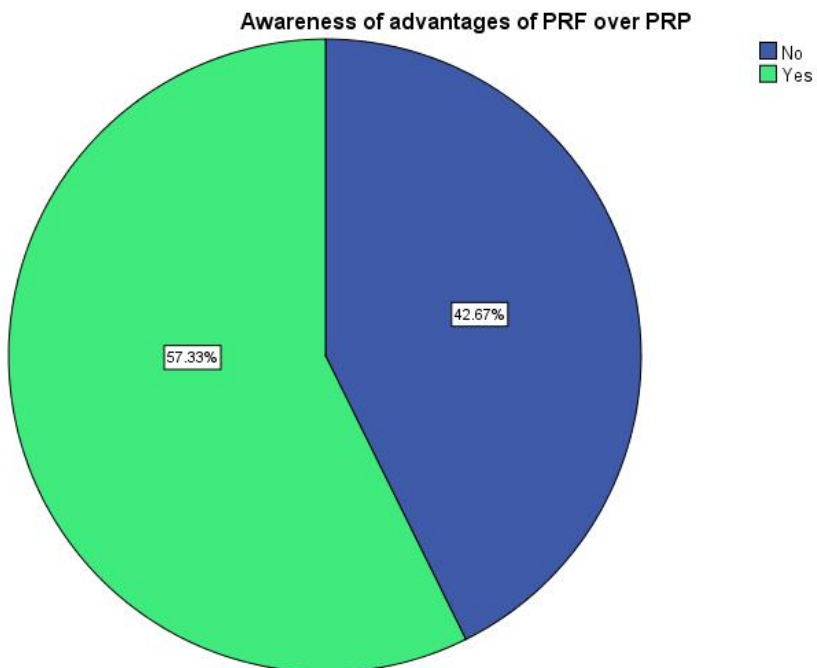


Fig. 7. Pie chart showing percentage distribution of the awareness of the advantages of PRF (Platelet Rich Fibrin) over PRP(Platelet rich plasma among the study population; where 43% were not aware of the advantages of PRF(Navy blue) and 57% were aware of the advantages(Green). There was greater awareness of the advantages of PRF

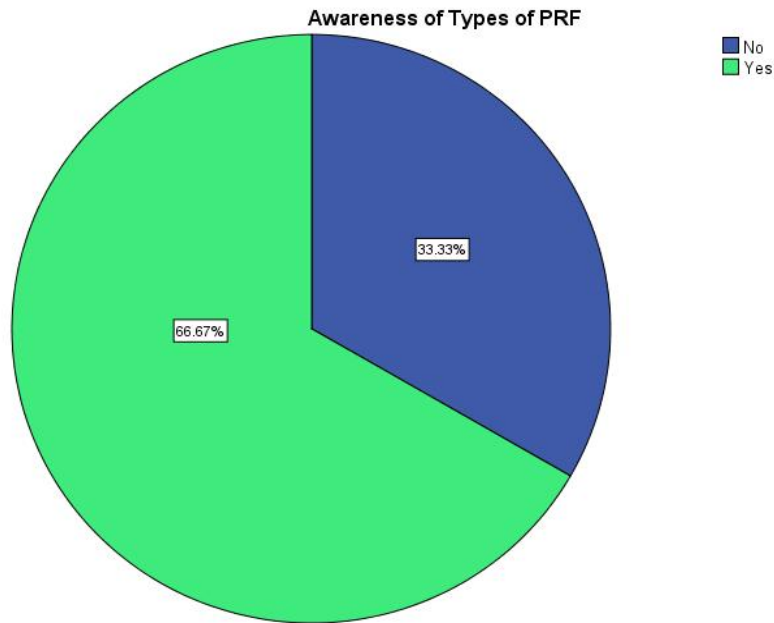


Fig. 8. Pie chart showing percentage distribution of the awareness of the types of PRF(Platelet Rich Fibrin) among the study population; where 33% of the participants were not aware of the types of PRF(Navy blue) while 67% of the participants were aware of the types(Green). There was greater awareness of the types of PRF

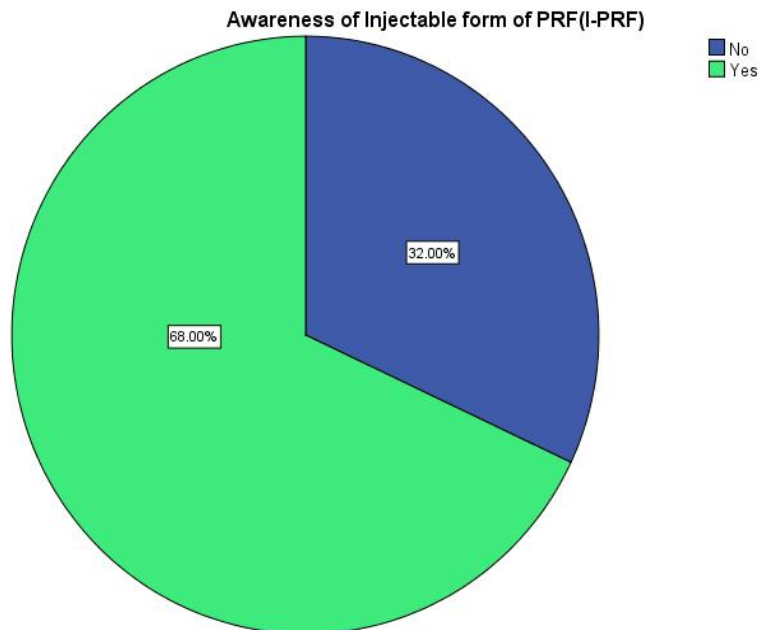


Fig. 9. Pie chart showing percentage distribution of the awareness of the Injectable type of PRF (Platelet Rich Fibrin) among the study population; where 32% were not aware of I-PRF (Navy blue) and 68% were aware of the I-PRF (Green). There was greater awareness of I-PRF among the participants

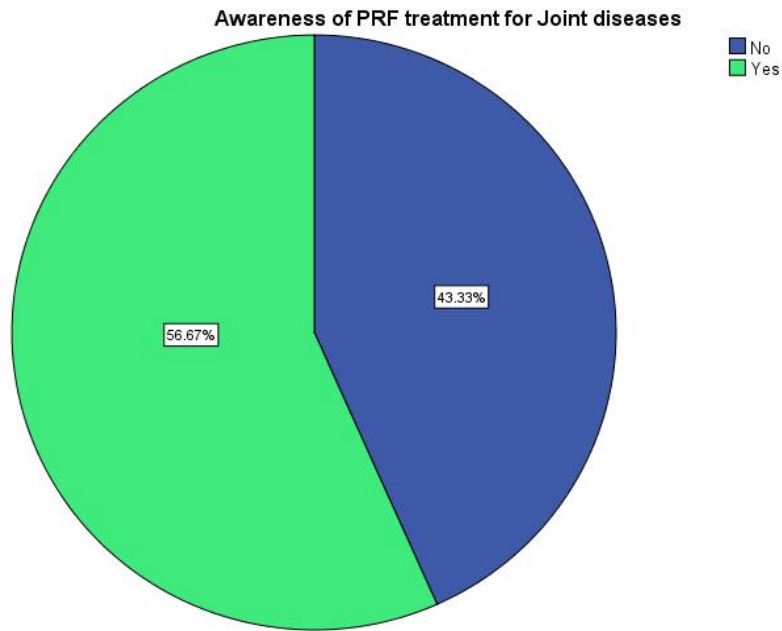


Fig. 10. Pie chart showing percentage distribution of the awareness of PRF(Platelet Rich Fibrin) treatment for joint diseases among the study population; where 43% were not aware of PRF treatment (Navy blue) and 57% were aware of the PRF treatment(Green). There was greater awareness of PRF therapy for joint diseases

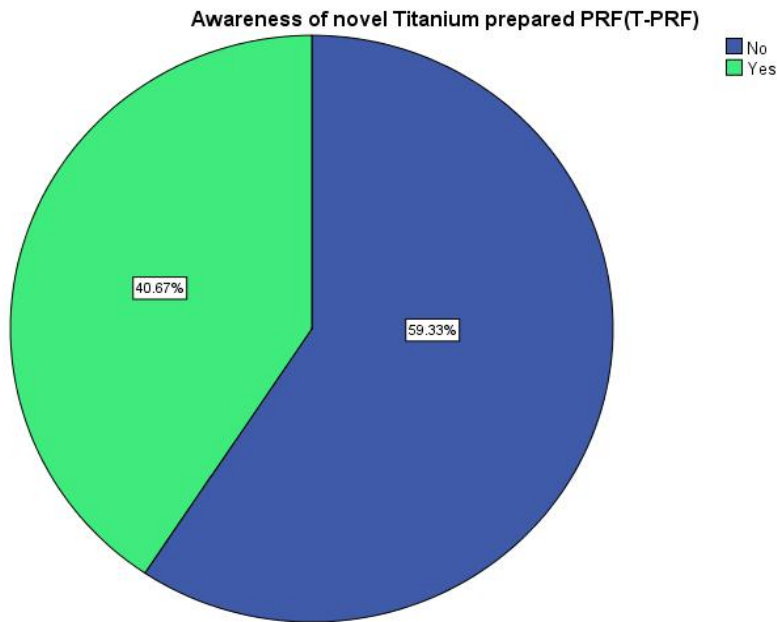


Fig. 11 Pie chart showing percentage distribution of the awareness of the Titanium prepared PRF (Platelet Rich Fibrin) among the study population; where 59% were not aware of T-PRF (Navy blue) and only 41% were aware of the T-PRF(Green). There is less awareness of T-PRF among the participants

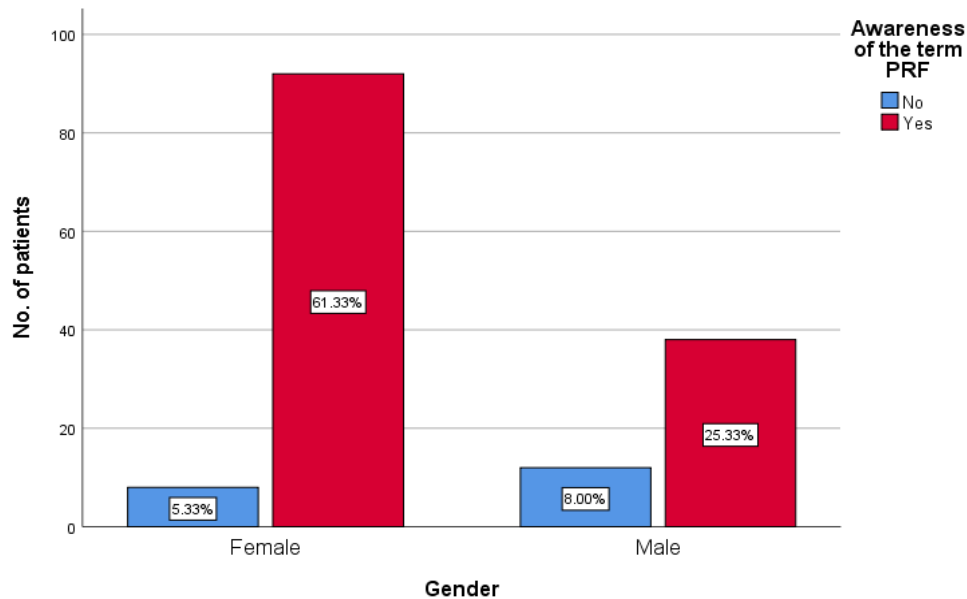


Fig. 12. The bar graph represents the association of gender and awareness of platelet rich fibrin among the participants. The X - axis represents the gender and the Y - axis represents the number of participants with their responses. Among the total participants, 61% of the females were aware of platelet rich fibrin. The association was statistically significant.(Pearson Chi square value:7.385,df=1 p=0.007(<0.05))

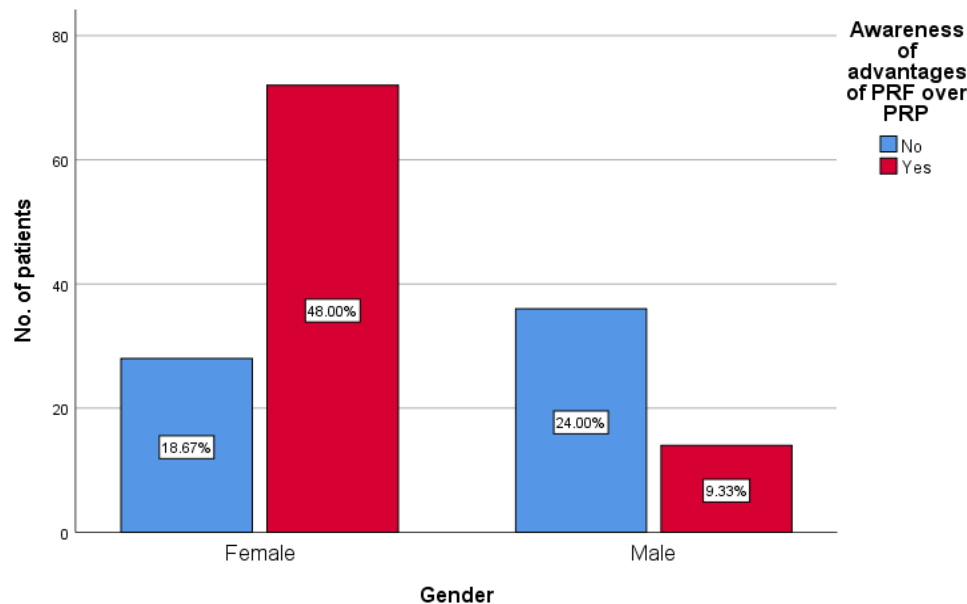


Fig. 13. The bar graph represents the association of gender and awareness of advantages of Platelet rich fibrin versus platelet rich plasma among the participants. The X - axis represents the gender and the Y - axis represents the number of participants with their responses. Among the total participants, 48% of the females were aware that platelet rich fibrin is superior to platelet rich plasma. This association was statistically significant.(Pearson Chi square value:26.381,df=1 p=0.000(<0.05))

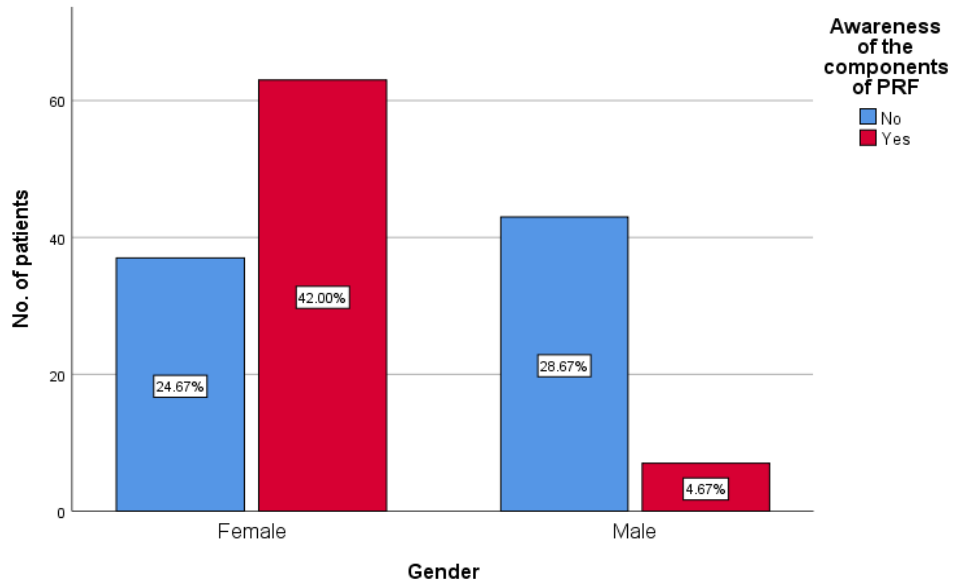


Fig. 14. The bar graph represents the association of gender and awareness of the components of platelet rich fibrin among the participants. The X - axis represents the gender and the Y - axis represents the number of participants with their responses. Among the total participants, 42% of the females were aware of the components of platelet rich fibrin. This association was statistically significant. (Pearson Chi square value:32.156,df=1, p=0.000(<0.05))

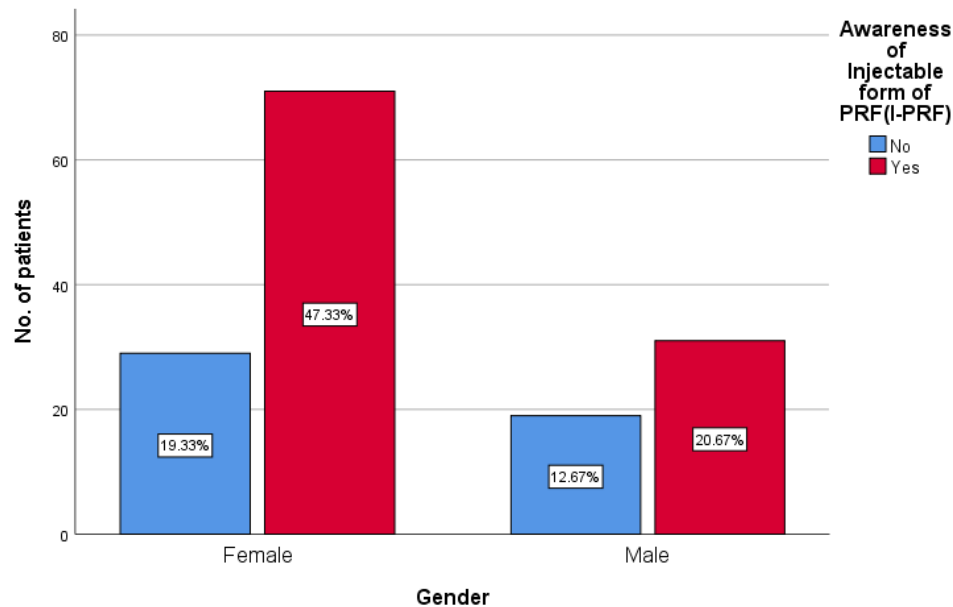


Fig. 15. The bar graph represents the association of gender and awareness of application of injectable form of platelet rich fibrin among the participants. The X - axis represents the gender and the Y - axis represents the number of participants with their responses. Among the total participants, 47% of the females were aware of fibrin sealants. This association however was not statistically significant. (Pearson Chi square value: 1.241,df=1, p=0.265(>0.05))

From the present survey-based study it was observed that while there was a greater awareness of platelet-rich fibrin there was a disparity in the knowledge between both genders with females being more aware than males. This can be attributed to the relatively smaller sample size of males.

4. DISCUSSION

Platelet-rich fibrin finds its application across various fields in dentistry. PRF was first used in 2001 by Choukroun et al. specifically in oral and maxillofacial surgery [25], and is currently considered as a new generation of platelet concentrate. Simonpieri et al. conducted a study that found regeneration through PRF membranes both the bone volume and gingival tissue. The same authors reported satisfactory clinical results related to reshaping the alveolar bone and the restoration of gingival volume and peri-implant bone, achieving adequate aesthetic properties [26]. PRF membrane has exhibited favorable clinical results in the treatment of periodontal infrabony defects [27] and protecting open wounds from the oral environment when the suture cannot bind the mucosal margins. One clinical study [28] used the PRF membrane as a sole grafting material to achieve maxillary sinus floor augmentation, presenting promising results. Other authors, including Tofter et al. [29], recommended the use of the PRF membrane to seal an undetected sinus membrane perforation during a maxillary sinus lift procedure. The main components of platelet-rich fibrin include Growth factors, which are stored within platelet α -granules, like platelet-derived growth factor (PDGF), insulin-like growth factor (IGF), vascular endothelial growth factor (VEGF), platelet-derived angiogenic factor (PDAF), and transforming growth factor-beta (TGF- β), platelets, leukocytes as well as an autologous fibrin matrix. However, the majority of the populations in the present study were unaware of the same.

Most of the respondents were aware of the method of preparation of PRF which involves centrifugation. It can be further noted that the preparation of PRF is easier compared to other platelet concentrates as it does not require the use of an anticoagulant. Awareness of the various types of PRF which include the injectable type of platelet-rich fibrin (I-PRF), leukocyte and platelet-rich fibrin (L-PRF), and advanced platelet-rich fibrin (A-PRF) [30]. However there was less awareness regarding the novel titanium prepared platelet-rich fibrin (T-PRF) which has

been found to have superior properties when compared to normal platelet-rich fibrin [31].

The awareness of PRF therapy for joint diseases is high amongst the participants of the present study. PRF, especially the I-PRF has found great significance in the treatment of osteoarthritis, TMJ internal derangement, and other degenerative temporomandibular joint diseases [32,33].

The majority of the respondents were aware of the advantages of platelet-rich fibrin over platelet-rich plasma. In a study by Chandran et al, it was found that PRF is superior to other platelet concentrates like PRP due to its ease and inexpensive method of preparation, and also it does not need any addition of exogenous compounds like bovine thrombin and calcium chloride. It also does not face host rejection as it is made from the patient's own blood and is known as a truly autologous platelet concentrate [34].

Due to its effective hard and soft tissue regeneration properties, platelet-rich fibrin is being utilized not only in dentistry but in various fields of Dermatology from chronic ulcer management to trichology and also in aesthetics [35] proving that it is essential to have extensive knowledge of all aspects of regenerative therapy.

5. CONCLUSION

From this Survey, we can conclude that while dental students are aware of PRF they do not have extensive knowledge of its components and its application in various procedures. A significant association was found between gender and the awareness of PRF, its advantages and components, with female respondents having more awareness than male respondents. The dental curriculum should include the knowledge of PRF as one of the essential criteria in the examination setting.

CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the authors.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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