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Original article: Evaluation of Dental Students' Knowledge on Platelet-Rich Fibrin and Its Clinical Applications

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ABSTRACT

Introduction: Platelet-Rich Fibrin (PRF) is an autologous biomaterial widely used in regenerative dentistry due to its biocompatibility and ability to promote tissue healing. Despite its clinical relevance, the level of knowledge among dental students regarding PRF remains underexplored. This study aimed to assess the knowledge of dental students at Guilan University of Medical Sciences about PRF and its clinical applications.

Materials and Methods: An analytical cross-sectional study was conducted during the 2023–2024 academic year among 105 fifth- and sixth-year dental students selected through stratified sampling. Data were collected using a researcher-developed, validated questionnaire **(**Cronbach's alpha = 0.94, ICC = 0.96) distributed electronically. The survey assessed demographic characteristics, familiarity with PRF, and knowledge of its composition, safety, cost, and clinical uses. The Shapiro-Wilk test, independent-samples t test, and Pearson correlation analysis were used for data analysis. $P < 0.05$ was considered statistically significant.

Results: The mean age of participants was 25.18 ± 1.70 years. Overall, 39% of students were familiar with PRF, but knowledge regarding its clinical applications, safety, and cost was limited. The mean knowledge score was 2.89 ± 2.59 (range: 0–9). A significant positive correlation was found between age and knowledge scores ($P = 0.004$, $r = 0.28$), and sixth-year students scored significantly higher than fifth-year students ($P = 0.016$). No significant gender difference was observed.

Conclusions: The findings highlight substantial educational gaps in PRF knowledge among dental students, suggesting the need for curriculum reforms and targeted training to enhance clinical readiness in regenerative dentistry.

1. Introduction

Platelet-rich fibrin (PRF) has emerged as a widely studied biomaterial in contemporary dentistry, recognized for its autologous origin, biocompatibility, and regenerative potential. As a second-generation platelet concentrate derived from the patient's blood without anticoagulants, PRF forms a fibrin scaffold enriched with platelets, leukocytes, and a reservoir of growth factors such as platelet-derived growth factor (PDGF), transforming growth factor beta (TGF-β), and vascular endothelial growth factor (VEGF). These bioactive components contribute to tissue repair, angiogenesis, and osteogenesis, making PRF particularly beneficial in periodontal therapy, oral surgery, and endodontic regeneration (1-3).

Numerous clinical and preclinical studies have demonstrated PRF's ability to enhance healing, regulate inflammation, and promote soft and hard tissue regeneration, especially in the treatment of intrabony defects, gingival recessions, and alveolar ridge preservation (2, 4, 5). Despite its growing use in dental practice, evidence remains limited regarding its long-term effectiveness in hard tissue regeneration and implant osseointegration, indicating a need for additional high-

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quality trials (2, 6, 7). Nonetheless, its ease of preparation, cost-effectiveness, and reduced immunogenicity have positioned PRF as a valuable adjunct in regenerative dentistry (5, 8).

In parallel with its clinical advancement, attention has turned toward the educational coverage of PRF in dental curricula. As future clinicians, dental students must be adequately trained in both the theoretical foundations and practical applications of regenerative materials such as PRF. However, recent literature suggests a disconnect between awareness and applied knowledge (7, 9). In a study involving 150 dental students, while 87% recognized the term PRF, the majority lacked an in-depth understanding of its components, preparation methods, and clinical indications (7). In their study, the female students demonstrated higher awareness compared to males, suggesting potential gender-based educational disparities (7).

Systematic reviews and descriptive studies consistently highlight this gap between familiarity with the terminology and the ability to implement PRF in practice (9, 10). These findings support the recommendation for integrating comprehensive PRF training into dental education, including structured theoretical content and practical demonstrations. By bridging this gap, future dentists can be better equipped to apply PRF safely and effectively in clinical settings.

This study aims to assess the knowledge of dental students at Guilan University of Medical Sciences regarding PRF and its clinical applications. In doing so, it seeks to identify specific educational deficiencies and inform targeted strategies for curriculum development and training enhancement in regenerative dental medicine.

2. Materials and Methods

This analytical cross-sectional study was conducted during the 2023–2024 academic year at Guilan University of Medical Sciences to evaluate the knowledge and awareness of PRF among final-year dental students.

The target population included all fifth- and sixth-year undergraduate dental students enrolled at the institution. A total sample size of 105 students was calculated using Cochran’s formula for a finite population, assuming a 95% confidence level and a 5% margin of error based on the findings of the study by Naram et al. (11). To ensure proportional representation, a stratified sampling method was employed based on academic year. Students were eligible to participate if they were currently enrolled in the final two years of the dental program, provided informed consent, and were able to complete the questionnaire independently. Those who submitted incomplete responses or chose to withdraw at any point were excluded from the final analysis. Ethical approval for the study was obtained from the Research Ethics Committee of Guilan University of Medical Sciences (approval number: IR.GUMS.REC.1403.090), and the study was conducted in full accordance with the Declaration of Helsinki.

Data were collected using a structured, self-administered questionnaire developed by the research team following an extensive review of relevant literature. The content validity of the questionnaire was evaluated using the content validity index (CVI) and content validity ratio (CVR). A panel of experts specializing in periodontics, medical education and biostatistics individually assessed each questionnaire item for relevance and clarity. The calculated CVR and CVI values were 0.73 and 0.82, respectively, indicating satisfactory content validity. The questionnaire's internal consistency was evaluated using Cronbach's alpha coefficient. Data from 10 dental students yielded a Cronbach's alpha value of 0.94, signifying excellent internal consistency among the questionnaire items. Test-retest reliability was assessed by administering the questionnaire to a subgroup of 10 students on two occasions, separated by a two-week interval. Analysis using the Intraclass Correlation Coefficient (ICC) indicated strong agreement between the two administrations, with an ICC value of 0.96, demonstrating the high stability of the questionnaire over time.

Feedback obtained during the pilot phase was used to make minor revisions prior to final distribution. The finalized questionnaire consisted of two sections: the first included demographic items such as age, gender, and academic year; the second contained 10 items assessing knowledge and awareness of PRF. The items covered terminology, composition, safety, clinical indications, cost, and the willingness to pursue further training in PRF-related techniques. Questions were presented in a mix of Yes/No and multiple-choice formats, with only one correct answer for each. Participants received one point for each correct answer and zero points for incorrect ones. The total score was calculated by adding the scores from all questions, with a minimum score of zero and a maximum score of ten.

The questionnaire was distributed electronically using official university communication channels, including mailing lists and WhatsApp academic groups. Students were asked to complete the questionnaire during a scheduled online session under supervision to reduce external influences and ensure standardized conditions. Participation was anonymous and voluntary, with no incentives provided, and digital informed consent was obtained prior to access.

Data were analyzed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including means, standard deviations, medians, and frequency distributions, were used to summarize demographic data and questionnaire responses. Data normal distribution was evaluated using the Shapiro-Wilk test. Pearson correlation coefficients were calculated to examine relationships between the knowledge score and participants’ age. The relationship between the knowledge scores and participants’ gender and academic year was evaluated using independent-samples t-test. A P value

lower than 0.05 was considered statistically significant.

3. Results

A total of 105 dental students participated in the study, with a mean age of 25.18 ± 1.70 years (range: 22–32). Of the participants, 47 were male (44.8%) and 58 were female (55.2%). In terms of academic year, 50 students (47.6%) were in their fifth year and 55 (52.4%) in their sixth year, providing balanced representation of the target population. Familiarity with PRF was reported by 41 students (39.0%), whereas the majority (61.0%) were unfamiliar with the term. When asked about the composition of PRF membranes, 42 students (40.0%) correctly identified that red blood cells are not a primary component. Knowledge regarding PRF's use in medicine was similarly limited, with only 30 participants (28.6%) accurately stating that PRF is not typically used in the treatment of third-degree burns.

In the context of dental applications, 48 students (45.7%) correctly recognized PRF's role in reducing postoperative pain in gingival recession procedures. However, only 39 students (37.1%) accurately identified that PRF is not commonly employed in the treatment of generalized aggressive periodontitis. Additionally, 47 students (44.8%) were aware that PRF can accelerate bone regeneration when compared to conventional techniques. Regarding the distinction between PRF and Platelet-Rich Plasma (PRP), only 21 respondents (20.0%) correctly stated that the use of thrombin as a coagulant is not an advantage of PRF. Awareness of treatment cost was notably low, with only six participants (5.7%) able to approximate the cost of PRF procedures. When evaluating safety knowledge, 30 students (28.6%) recognized that PRF is considered a safe procedure with no known risk of infection (Table 1).

Table 1. PRF knowledge assessment by domain

Knowledge Domain	Correct Responses n (%)	Incorrect Responses n (%)
PRF terminology awareness	41 (39.0%)	64 (61.0%)
PRF components	42 (40.0%)	63 (60.0%)
Medical applications	30 (28.6%)	75 (71.4%)
Postoperative pain reduction	48 (45.7%)	57 (54.3%)
Dental applications	39 (37.1%)	66 (62.9%)
Bone regeneration	47 (44.8%)	58 (55.2%)
PRF vs PRP advantages	21 (20.0%)	84 (80.0%)
Cost awareness	6 (5.7%)	99 (94.3%)
Safety considerations	30 (28.6%)	75 (71.4%)

Despite the limited knowledge scores across several domains, a substantial proportion of students—70 out of 105 (66.7%)—expressed interest in attending workshops or seminars to improve their knowledge of PRF, suggesting strong demand for enhanced educational opportunities in this area. The overall mean knowledge score was 2.89 ± 2.59, with scores ranging from 0 to 9. Statistical analysis revealed a significant positive correlation between age and knowledge scores ($P = 0.004$, $r = 0.28$), indicating that older students tended to demonstrate greater understanding. No statistically significant difference in mean knowledge scores was observed between male (2.74 ± 2.61) and female (3.02 ± 2.60) students ($P = 0.595$). However, a significant difference was found between academic years ($P = 0.016$), with sixth-year students (3.47 ± 2.65) performing significantly better than fifth-year students (2.26 ± 2.40; Table 2).

Table 2. Association of participants' gender and academic year with knowledge score

Variable		Mean ± SD	P value
Academic year	Fifth year	2.26 ± 2.40	0.016*
	Sixth year	3.47 ± 2.65	
Gender	Male	2.74 ± 2.61	0.595
	Female	3.02 ± 2.60	

P values from independent-samples t-test (two-tailed); significance threshold $P < 0.05$

4. Discussion

This study examined the knowledge and awareness of dental students at Guilan University of Medical Sciences regarding PRF and its clinical applications. The results indicated that only 39% of students were familiar with PRF, and fewer demonstrated adequate understanding of its composition, safety, cost, or clinical use. These findings reveal a notable educational gap and are consistent with the broader literature assessing biomaterials knowledge among dental students.

While 39% of participants reported being aware of PRF, the majority remained unfamiliar with the term. This is lower than findings from similar studies (11-14). Naram et al. (11) reported that 74% of dental students in Chennai, India, were aware of PRF. Another study by Babayigit et al. (12) indicated that 92% of fifth-grade students and 50% of fourth-grade students had encountered the PRF term. However, their knowledge of its clinical indications and variations such as T-PRF and I-PRF was limited. These findings support the conclusion that awareness does not necessarily translate to clinical understanding or readiness. Stephen et al. (13) also reported that 90.4% of the oral surgeons in the state of Tamil Nadu, India had knowledge and awareness about

the role of PRP. In Maharashtra, a survey showed that 97.4% of dentists were aware of platelet-derived growth factors (PDGF), which are related to PRP and PRF (14). Conversely, Dharmasanam et al. (15) reported only 45% awareness among their participants. The differences in findings across these studies may be attributed to variations in curricula and dental practices in different countries. Additionally, the use of platelet concentrations in routine dental practice varies globally. In Iran, 2007 marked the first year that PRP was utilized to treat mandibular molar furcation (16). Therefore, the early stage of integrating these approaches into dental practices may help explain the relatively low knowledge scores observed among the participants in this study. In the current study, students demonstrated only moderate familiarity with PRF's clinical applications, with 45.7% identifying its role in postoperative pain reduction and 44.8% recognizing its benefit in accelerating bone regeneration. Correspondingly, Naram et al. (11) reported that only 38% of participants recognized PRF's role in regenerative procedures, despite 62% being familiar with the term. Dharmasanam et al. (15) also found that while 45% of participants knew the term "PRF," only 8% understood its application in socket preservation. These findings underscore that even among those familiar with PRF, there is often a substantial gap in knowledge regarding its clinical applications. This is likely due to a lack of structured training and hands-on exposure during dental education.

Notably, 67% of participants in our study expressed a desire to attend courses, workshops or seminars focused on in-depth education about PRF. Similarly, 88% of students in Naram et al. (11) indicated interest in PRF courses. Dharmasanam et al. (15) highlighted the necessity of integrating interactive learning methods, including hands-on workshops, case-based discussions, and clinical simulations, to bridge the gap between theoretical knowledge and practical skills.

In the present study, only 5.7% of our participants were aware of the approximate cost of PRF, and 28.6% understood its safety profile. In contrast, a study by Alotaibi et al. (17) revealed that 46% of dental patients viewed PRF as both a cost-effective and safe option. Therefore, limited awareness is not confined to students and may reflect a broader systemic issue within dental education and practice. This underlines the importance of incorporating cost-effectiveness and safety considerations into educational frameworks, particularly for biomaterials intended for routine clinical use.

Interestingly, sixth-year students in the present study exhibited higher knowledge scores compared to fifth-year students, aligning with the findings of Babayiğit et al. (12), which indicated that senior students possess significantly greater awareness of PRF than their junior peers. The increase in knowledge with academic progression likely reflects greater clinical exposure and curriculum coverage; however, the continued deficiencies even among final-year students suggest that current educational content on PRF remains insufficient.

In the present study, only 20% of participants were aware of the benefits of PRF over PRP, including its cost-effectiveness, simpler preparation process, and reduced reliance on practitioner expertise. PRF has distinct advantages compared to other platelet concentrates like PRP, primarily due to its straightforward and cost-efficient preparation method. Notably, it does not require the addition of exogenous compounds such as bovine thrombin or calcium chloride (18). Additionally, PRF is created from the patient's own blood, making it truly autologous and eliminating the risk of host rejection (18). Sriram et al. (7) found that 57% of participants were aware of PRF's advantages over PRP. Similarly, Babayiğit et al. (12) reported that while 92% of students in their study had heard of PRF, their understanding of its benefits over PRP and its variations, such as T-PRF and I-PRF, was notably lacking. This indicates that familiarity with PRF does not necessarily equate to a comprehensive understanding of its clinical implications.

Taken together, these findings underscore the pressing need to enhance PRF-related education within undergraduate dental programs. Although this study focused on one institution, the consistency of findings with other regional and international studies suggests that the challenge is widespread. To address these deficiencies, dental curricula should incorporate standardized modules on regenerative biomaterials such as PRF, supported by practical training opportunities and clinical exposure.

The current study had some limitations that require careful interpretation of the findings. The questionnaire used was self-reported, which may have introduced response bias. Furthermore, the study was conducted at a single dental faculty, highlighting the need for further multi-center research. Additionally, it is important to develop a comprehensive course on platelet concentrations, including PRF, and to assess its effectiveness in enhancing dental students' knowledge.

5. Conclusions

Within the limitations of the present study, the following conclusions can be drawn:

- The highest proportion of correct responses pertained to the role of PRF in reducing postoperative pain following gingival recession procedures.
- The lowest knowledge scores were observed in questions related to the cost of PRF and its advantages over PRP.
- A majority of students indicated interest in attending supplementary educational workshops or seminars on PRF.
- Sixth-year students demonstrated significantly higher knowledge scores compared to fifth-year students,

suggesting a positive correlation between academic progression and awareness.

•Overall, the findings underscore the need to incorporate structured educational modules—including hands-on workshops—on platelet concentrates such as PRF within the dental curriculum.

Ethical Considerations

Ethical approval for the study was obtained from the Research Ethics Committee of Guilan University of Medical Sciences (approval number: IR.GUMS.REC.1403.090), and the study was conducted in full accordance with the Declaration of Helsinki.

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Authors' Contributions

Alireza Razavi: Conceptualization, Writing - Original Draft **Sanaz Asadi:** Resources, Supervision, Visualization **Maryam Zohary:** Writing - Review & Editing, Methodology.

Conflict of Interests

The authors declare no conflict of interest.

Availability of Data and Material

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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