

Evaluation of Knowledge, Attitude and Perception Towards Photogrammetry in Implant Dentistry among Dental Cohorts

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Abstract: ***Background:** Digital dentistry is one of the outcomes of modern technology where the traditional workflow of dentistry has been transformed and made more efficient and accurate. A developing technology, 'Photogrammetry' is emerging as an alternative to conventional implant impression techniques. **Objectives:** To evaluate the knowledge, attitude, and clinical perceptions regarding photogrammetry in implant dentistry among various institutional dental cohorts. **Methods:** A cross-sectional questionnaire-based survey was distributed among dental students and faculty. A sample size of N= 100 responses was obtained. Data was evaluated analytically based on clinical experience. **Result:** While theoretical interest in photogrammetric devices was strong across all levels, clinical hands-on experience was extremely limited among dental students and faculty. Therefore, introducing digital impressions and photogrammetric ideas during preclinical training could help reduce this educational gap.*

Keywords: Digital Dentistry, Photogrammetry, Implant Dentistry, Digital Impressions, Dental Education

1. Introduction

In present-day implant prosthodontics, the shift from traditional workflows to digital techniques has significantly improved clinical efficiency and prosthesis accuracy. [1] Conventional full-arch implant impressions often include dimensional inaccuracies caused by impression material deformation, stone expansion, and micro movements of transfer copings during the splinting process. [2, 3]

In order to tackle these errors, digital impression techniques using intraoral scanners and photogrammetric systems, have been introduced. [4, 5, 6] Photogrammetry in implant dentistry uses scan bodies and multiple cameras to determine spatial coordinates and angulation of implants in a three-dimensional plane. This technique drastically decreases the physical errors mentioned above. [7, 8]

However, institutional training, curriculum integration, and student awareness are required for clinical use of advanced technologies like photogrammetry. [9, 10] The accuracy of digital impression methods is well known [11, 12], but there is still a lack of information regarding the knowledge and skill level of the future dental staff. Thus, the purpose of this cross-sectional survey was to evaluate a group of dental students and faculty members' knowledge, general attitudes, and clinical impressions about photogrammetry in implant dentistry.

2. Methods

A cross-sectional, questionnaire-based survey was distributed among institutional dental students and faculty.

Sample Size (N): A total of 100 fully completed responses were gathered.

Demographic Stratification (Fig.1): The sample population was categorized based on their clinical experience:

Preclinical Students (69%)

Clinical Students (18%)

Interns (10%)

Faculty members (3%)

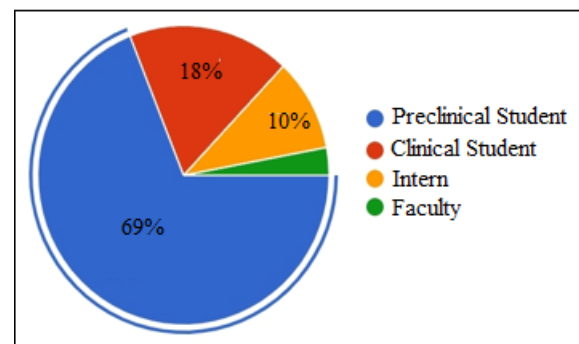
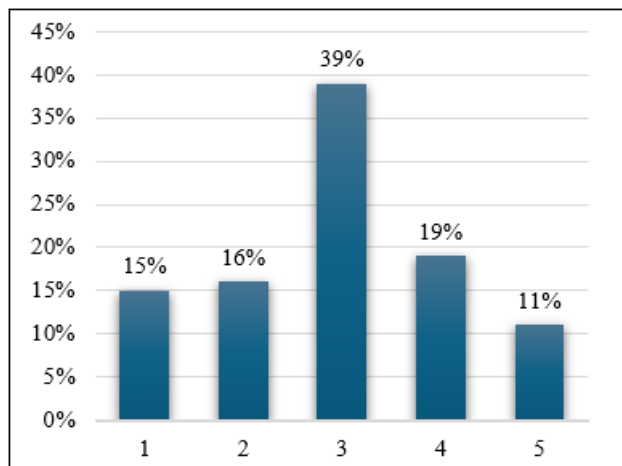


Figure 1: Demographic stratification

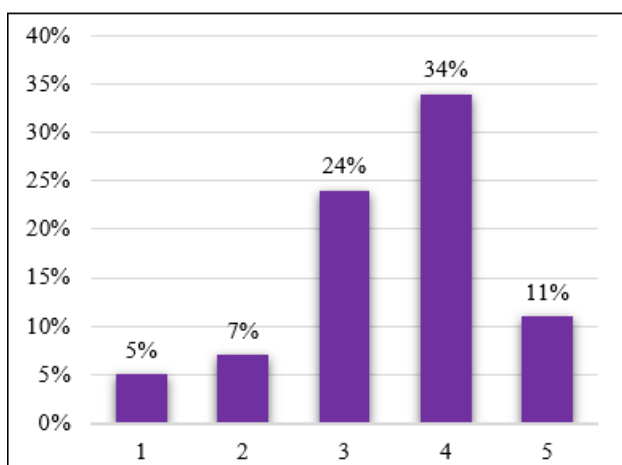
Survey Result Matrix (N=100)

S. No.	Question	Options/ Responses	Count/ Percent
1.	Clinical experience	Preclinical student Clinical student Intern Faculty	69 18 10 3
2.	In your current clinical work, how often do you utilize digital tools [intraoral scanners, 3D printing or CAD/CAM]?	Daily Occasionally Rarely Never	7 17 24 52
3.	Are you familiar with the term 'Scan bodies' used to transfer implant positions?	Yes No Heard the term	32 50 18
4.	Which of the following best describes 'Passive Fit' in implant Prosthodontics?	Tension free relationship between framework and implants Tight connection between crown and gum An aesthetic alignment of teeth None of these	67 19 9 5
5.	To your knowledge, which technology is designed to calculate 3D coordinates using multiple photographic angles?	Photogrammetry Intraoral scanners CBCT Face scanners	47 43 9 1
6.	Have you heard of "Photogrammetry" as an alternative to traditional implant impressions?	Yes No	52 48
7.	Are you aware of the "PIC camera" or "MicronMapper" systems mentioned in digital dentistry?	Yes No	42 58
8.	Do you think photogrammetry is the same as using a standard intraoral scanner?	Yes No	39 61
9.	Do you believe digital photogrammetry is more accurate than conventional splinted impressions?	Yes Not sure No	48 40 12
10.	What would be the primary reason for you to switch to a digital workflow?	Patient comfort Accuracy Modernizing practice image	77 48 42
11.	If you are presented with a full arch implant case, what is your current preferred method for the final impression?	Photogrammetry Digital IOS Open tray pickup Closed tray	45 25 17 13
12.	What do you believe in the main barrier to using this technology in clinics?	High cost Lack of training Complexity	80 41 30
13.	If cost were not the factor, would you prefer using photogrammetry in your clinical practice?	Definitely, yes Possibly No, I prefer traditional methods	58 40 2
14.	What do you perceive as the biggest advantage of photogrammetry?	Accuracy Patient comfort Reduced chair time Micron level precision No needs for jigs	61 56 54 34 20
15.	Would you be interested in a hands-on workshop for photogrammetry devices?	Yes No	85 15
16.	Do you feel that digital implantology topics should be introduced earlier in the BDS curriculum?	Yes No	88 12

17) How certain are you that, in full arch situations, a digital workflow can match the precision of a "verified" splinted impression?



18) How much do you think digital dentistry will take over conventional techniques during the next five years, on a scale of 1 to 5?



3. Result

The shift from pixels to prosthesis needs both strong educational base and technical accessibility. The most notable result of this study is the very interesting demographic distribution i.e. preclinical students made up 69% of the respondents.

This offers a very useful parameter about the awareness levels of the new dental personnel, even if it initially seems to limit the clinical generalizability of the data.

4. Discussion

According to our data, despite having a strong interest in theory behind digital workflow technology such as photogrammetry, practical implementation is only possible at postgraduate level or by faculty members.

Most of the “Never” responses in question related to usage of digital devices in regular practice highlight an evident curriculum deficiency wherein advanced concepts are taught during internships or towards the end of clinical rotation period.^[10]

Moreover, we identified an important source of confusion within our cohort, with 39% of participants falsely assuming

that photogrammetry works identically to a standard intraoral scanner. This highlights the significant educational gap; as the current literature states stereophotogrammetry is more accurate than a standard intraoral scanners for complete-arch implant prostheses.^[12]

However, despite this lack of clarity, 61% of the respondents mentioned accuracy as the main advantage of photogrammetry and clearly understood the achievement of a tension-free passive fit is of major significance from a clinical standpoint to avoid mechanical complications such as screw loosening or biological complications such as marginal bone loss, a goal which is commonly achieved with photogrammetry much better than with traditional splinted impressions.^[8]

Furthermore, while 80% of respondents selected expensive initial expenses as the main barrier to clinical and institutional adoption, 88% of the cohort specifically stated that digital implantology topics should be incorporated much earlier in the BDS curriculum, as students feel underprepared by traditional curriculum models.

5. Conclusion

This study highlights the fact that undergraduate dental education severely limits hands-on clinical exposure, even as institutional awareness of photogrammetry’s capabilities grow.

To keep pace with global digital standards, the dental curriculum must evolve. Updating coursework will ensure future practitioners to shift smoothly from preclinical theory into advanced digital clinical environments.^[1,9,10]

References

- [1] Auduc C, Douillard T, Nicolas E, El Osta N. Fully Digital Workflow in Full-Arch Implant Rehabilitation: A Descriptive Methodological Review. *Prosthesis*. 2025 Jul;7(4):85. doi: 10.3390/prosthesis7040085
- [2] Cappare P, Sannino G, Minoli M, Montemezzi P, Ferrini F. Conventional versus Digital Impressions for Full Arch Screw-Retained Maxillary Rehabilitations: A Randomized Clinical Trial. *Int J Environ Res Public Health*. 2019 Mar 7; 16(5): 829. doi: 10.3390/ijerph16050829
- [3] Joda T, Brägger U. Patient-centered outcomes comparing digital and conventional implant impression procedures: a randomized crossover trial. *Clin Oral Implants Res*. 2016 Dec;27(12):e185-e189. doi: 10.1111/clr.12600
- [4] Róth I, Czigola A, Joós-Kovács GL, Dalos M, Hermann P, Borbély J. Learning curve of digital intraoral scanning - an in vivo study. *BMC Oral Health*. 2020 Oct 19; 20: 287. doi: 10.1186/s12903-020-01278-1
- [5] Negreiros W, Akhondi S, Quiles HK, Hamilton A. Photogrammetry in Implant Dentistry. *Australian Dental Journal*. 2025 Dec;70(S1). doi: 10.1111/adj.70028
- [6] Pozzi A, Laureti A, Tawil I, Chow J, Azevedo L, Fehmer V, Sailer I. Intra Oral Photogrammetry:

- Trueness Evaluation of Novel Technology for Implant Complete-Arch Digital Impression In Vitro. Clin Implant Dent Relat Res. 2025 Jun; 27(3): e70049. doi: 10.1111/cid.70049
- [7] Gómez-Polo M, Gómez-Polo C, Del Río J, Ortega R. Stereophotogrammetric impression making for polyoxymethylene, milled immediate partial fixed dental prostheses. J Prosthet Dent. 2018 Apr;119(4):506-510. doi: 10.1016/j.prosdent.2017.04.029
- [8] Park JS, Alshehri YFA, Kruger E, Villata L. Accuracy of digital versus conventional implant impressions in partially dentate patients: A systematic review and meta-analysis. J Dent. 2025 Sep; 160:105918. doi: 10.1016/j.jdent.2025.105918
- [9] Çakmak B, Yıldız E, Tortop T. Evaluation of dental students' awareness about intraoral scanners. PLoS One. 2025 Oct 30; 20(10): e0335940. doi: 10.1371/journal.pone.0335940
- [10] Schwindling FS, Deisenhofer UK, Porsche M, Rammelsberg P. Establishing CAD/CAM in Preclinical Dental Education: Evaluation of a Hands-On Module. Journal of Dental Education. 2015 Oct;79(10):1215-1221. doi:10.1002/j.0022-0337.2015.79.10.tb06015.x
- [11] Papaspyridakos P, Gallucci GO, Chen CJ, Hanssen S, Naert I, Vandenberghe B. Digital versus conventional implant impressions for edentulous patients: accuracy outcomes. Clin Oral Implants Res. 2016 Apr;27(4):465-472. doi: 10.1111/clr.12567
- [12] Abuduwaili K, Huang R, Song J, Liu Y. Comparison of photogrammetric imaging, intraoral scanning and conventional impression accuracy of full-arch dental implant rehabilitation: an in vitro study. BMC Oral Health. 2025 May;25(1). doi:10.1186/s12903-025-06029-8