International Journal of Psychosocial Rehabilitation, Vol. 23, Issue 06, 2019
ISSN: 1475-7192

KNOWLEDGE AWARENESS AND PRACTICE OF VARIOUS IMPLANT PROSTHETIC OPTIONS PREFERRED BY DENTAL PRACTITIONERS

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ABSTRACT

Introduction:*Modern dentistry helps to restore the normal contour, function, esthetics, speech, and health regardless of the atrophy, disease, or injury of the stomatognathic system . However with traditional dentistry it becomes very difficult to achieve the above when the number of teeth remaining are less. With the advent of implant supported prosthesis and the long term success rates high quality treatment can be given to patients .*

Aim*: To evaluate the awareness and practice of various implant prosthetic options preferred by dental practitioners in India.*

Material and methods: *A cross-sectional survey was formulated for the dentists of India. 306 volunteers participated in this study between January to February of 2020. A validated questionnaire consisting of 16 close ended questions intended to solicit the level of participants' knowledge concerning various options in treatment planning for implant prosthesis was circulated using online social media. Majority of questions were graded using the 'Even scale method'. The responses were collected using web protocol forms that enabled quick and secure access to data.*

Results: *It was found that 62.7% dentists preferred a customized abutment over a prefabricated abutment. For customized abutment 37.3% preferred a ti-base casting, 23.5% milled abutments, 23.5% 3D printed customization whereas only 15.7% preferred a conventional casting. The preferred abutment material for anterior teeth was Zirconium (62.7%) rather than cobalt chromium (4%) or titanium (33.3%). 70.5% dentists*

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preferred to splint the prosthesis. Regarding the splinting, 47.1% preferred sexant-wise splinting, 27.5% full arch splinted whereas 25.5% quadrant wise.

Conclusion: *Within the limitations of the current study, it can be concluded that dentists do not regularly adhere to prosthetic principles in implant dentistry. More awareness through CDE programs, seminars etc are needed to increase knowledge among practitioners for implant prosthesis.*

Keywords: *Implantprosthesis, dental implants, prosthetic options, abutments, dental professionals, implant dentistry.*

I. INTRODUCTION

Modern dentistry helps to restore the normal contour, function, esthetics, speech, and health regardless of the atrophy, disease, or injury of the stomatognathic system (1). However with traditional dentistry it becomes very difficult to achieve the above when the number of teeth remaining are less (2). With the advent of implant supported prosthesis and the long term success rates high quality treatment can be given to patients (3).

Implant-supported prosthetic restorations play an important role in contemporary prosthetic dentistry(4,5). The survival rates for dental implants range more than 90% after 10 years of clinical service (4,6)(7). However, mechanical and biological complications are regularly observed in implant-supported restorations(8). Technical complications include loosening or fracture of abutment screws, problems with the associated prosthetic superstructure such as chipping of the veneering, porcelain fracture, chipping of acrylic in hybrid denture cases , wear and loss of retention in attachment systems, fracture of the abutment or fractures of the implant body itself (9,10). For both fixed and removable implant-supported denture prostheses, numerous prosthetic treatment options are available. Those include abutment preference (prefabricated or customised), abutment material (titanium, zirconia, metal ceramic, metal), type of prosthesis (screw retained or cement retained), whether to splint or not to splint the prosthesis or the preference for a tooth implant supported prosthesis, for full mouth cases decision to go for a cement retained, malo bridge, hybrid prosthesis and many more .

Although mechanical complications cannot be totally avoided, the frequency of mechanical complications depends on the patient condition, economic factors, individual treatment concept as well as the materials and components used for the fabrication of the restorations(11). Although there is an array of published studies on implant treatments, little is known about the type of implants prosthesis preferred among dentists in various countries for the support of fixed and removable dental prostheses. Moreover, choice of materials for implant-supported fixed and removable dental prostheses varies between dentists and also between countries depending on factors such as insurance systems and national standard of care guidelines. The objective of this study was to assess different options for implant prosthesis preferred by dentists in India .

II. MATERIALS AND METHODS

A cross-sectional questionnaire survey was conducted among general practitioners, post graduate students and other specialists in India between January to February of 2020.

A structured online questionnaire was formulated online comprising 16 close ended questions regarding the participants demographic data (name,age and gender) and knowledge about various implant prosthetic options. The majority of questions were graded using 'Even scale method' to avoid central tendency bias and social desirability bias. Validation was done among postgraduate students and staff of the Department of Prosthodontics in Saveetha Dental College, Chennai, India. Changes in the questions regarding implant prosthetic preferences was done according to the suggestion of the validation committee.

Sample size calculation was done using a survey sample size calculator with a 95% confidence interval and 5% margin error, with an estimated 20% dropout, which was up to 384 samples. The survey questionnaire was sent online to 420 dentists among different states all over India selected using simple random sampling. Out of 420, 306 participants voluntarily participated in the survey . The responses were collected using web protocol forms that enabled quick and secure access to data.

Ethical clearance was obtained from SRB Saveetha Dental College, Chennai, India. All ethical guidelines specified by WHO and the Declaration of Helsinki, 1954 were satisfied.

All the collected data was then tabulated and analysed usingSPSS Statistics software for windows, version 20.0. Descriptive data was obtained. Chi square test was done for frequency analysis and Pearson's correlation coefficient was done for comparison of awareness between professions.

III. RESULTS

Questionnaires were sent to 420 dentists among different states in India. 306 questionnaires

were returned, which relates to a response rate of 72.85%. Dentists participating in the survey had a mean age of 32- 35 years out of which 39.2% were pursuing post graduation, 23.5% general practitioners, 27.5% were prosthodontists, 5.9% oral surgeons and 3.9% periodontists. 62.7% dentists preferred a customized abutment over a prefabricated abutment. For customized abutment 37.3% preferred a ti-base casting, 23.5% milled abutments, 23.5% 3D printed customization whereas only 15.7% preferred a conventional casting.

The preferred abutment material for anterior teeth was Zirconium (62.7%) rather than cobalt chromium (4%) or titanium (33.3%). 58.8% dentists preferred a screw retained prosthesis whereas 41.2% preferred cement retained prosthesis. The reasons for those favoring screw retained were its easy retrieval (62.8%), no residual cement (23.3%), insufficient inter occlusal space (11.6%) and others (2.3%); whereas the reasons for those favoring cement retained were esthetic benefit without screw access hole (46.2%), Easier achievement of passive fit (25.6%), intact inter occlusal table and easier control of occlusion (20.5%) and others (7.7%).

For the final prosthesis the material preferred by the majority dentist was zirconium (64.7%) followed by metal ceramic (27.5%) and lithium disilicate (7.8%). For an implant supported full mouth

rehabilitation 51% of dentists chose hybrid prosthesis, 29.4% cement retained, 19.6% chose malo bridge. 70.5% dentists preferred to splint the prosthesis. Regarding the splinting, 47.1% preferred sexant-wise splinting, 27.5% full arch splinted whereas 25.5% quadrant wise. Majority of the dentists preferred a tooth implant supported prosthesis (62.7%) with a non rigid connector (60.8%).

The results of the survey are given in Table 1.

Table 1 : All the questions of the survey, options for the responses, the percentage of responses according to profession, cumulative percentage of responses, chi square value and p value have been tabulated.

Question	Options	General Practitioner (%)	PG Student (%)	Prosthodontist (%)	Periodontist(%)	Oral Surgeon (%)	Other Speciality (%)	Chi square value	p Value
1. What kind of abutment would you prefer for implant prosthesis ?	PrefabricatedCustomised	41.7 58.3	35.0 65.0	42.9 57.1	50.0 50.0	0.0 100.0	0.0 0.0	13.510	0.009*
If customised, what would you prefer ? 2.	Conventional CastingTi-base casting 3D printed customisation Milled abutment	25.0 41.7 25.0 8.3	15.0 30.0 25.0 30.0	7.1 42.9 14.3 35.7	50.0 0.0 50.0 0.0	0.0 66.7 33.3 0.0	0.0 0.0 0.0 0.0	60.283	0.000*
3. Preference of abutment material for anterior teeth ?	TitaniumCobalt-chromium Zirconia	66.7 8.3 25.0	30.0 5.0 65.0	21.4 0.0 78.6	0.0 0.0 100.0	0.0 0.0 100.0	0.0 0.0 0.0	72.806	0.000*

Which type of prosthesis do you prefer ? 4.	Cement retained Screw retained	25.0 75.0	50.0 50.0	42.9 57.1	50.0 50.0	33.3 66.7	0.0 0.0	12.577	0.014*
5. If screw retained, then why ?	Easy retrieval No residual cement Insufficient inter occlusal space Others	75.0 8.3 16.7 0.0	65.0 30.0 0.0 5.0	42.9 28.6 28.6 0.0	50.0 50.0 0.0 0.0	66.7 0.0 33.3 0.0	0.0 0.0 0.0 0.0	71.838	0.000*
If cement retained, then why ? 6.	Easier achievement of passive fit Intact occlusal table, easier control of occlusionEsthetic benefit without screw access hole Others	8.3 58.3 25.0 8.3	30.0 10.0 45.0 15.0	42.9 7.1 50.0 0.0	0.0 50.0 50.0 0.0	0.0 0.0 33.3 66.7	0.0 0.0 0.0 0.0	162.195	0.000*

What kind of material would you prefer for the prosthesis ?	Metal ceramic Zirconia Lithium disilicate	33.3 58.3 8.3	20.0 70.0 10.0	35.7 57.1 7.1	0.0 100.0 0.0	33.3 0.0 66.7	0.0 0.0 0.0	16.119	0.041*
7. What prosthesis do you prefer for full mouth rehabilitation ?	Malo bridge Hybrid prosthesisCement retained	8.3 66.7 25.0	25.0 40.0 35.0	21.4 50.0 28.6	0.0 0.0 100.0	33.3 33.3 33.3	0.0 0.0 0.0	29.150	0.000*
8. Would you prefer	Splinted prosthesis Non splinted prosthesis	58.3 41.7	65.0 35.0	85.7 14.3	50.0 50.0	100.0 0.0	0.0 0.0	26.220	0.000*
9. If splinted, how would you splint ?	Sexant-wise Quadrant-wise Full arch splinted	25.0 41.7 33.3	65.0 10.0 25.0	42.9 21.7 50.0	50.0 50.0 0.0	33.3 66.7 0.0	0.0 0.0 0.0	62.237	0.000*
10. Do you prefer tooth implant supported prosthesis ?	Yes No	66.7 33.3	70.0 30.0	64.3 35.7	50.0 50.0	0.0 100.0	0.0 0.0	34.411	0.000*
If If yes then which type of connector ?	Rigid Non rigid	16.7 83.3	60.0 40.0	42.9 57.1	0.0 100.0	0.0 100.0	0.0 0.0	56.927	0.000*

*The chi square statistic is significant at the 0.05 level.

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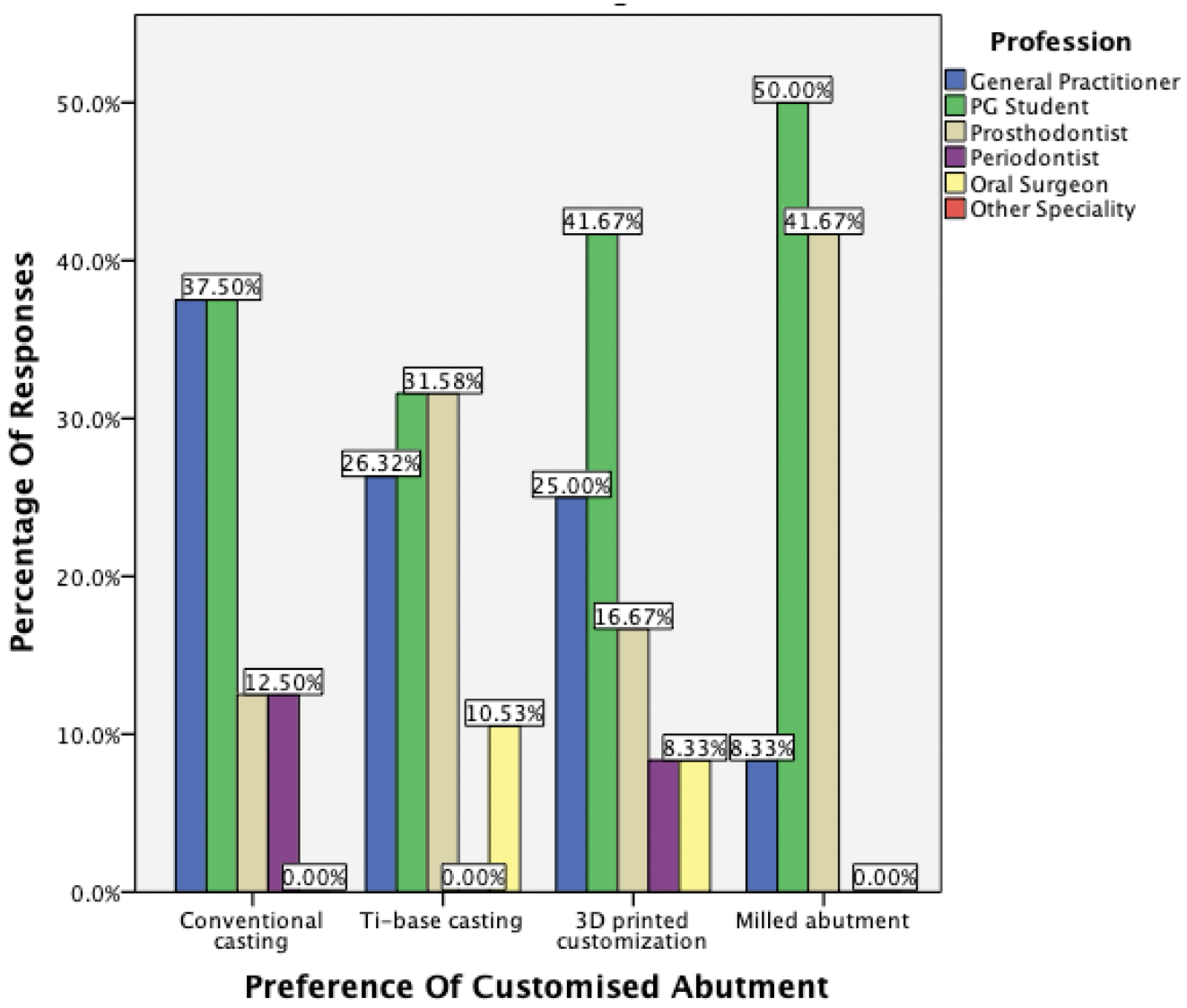

FIGURE 1 : Bar graph showing preference of customised abutment on the X axis and percentage of responses by professionals on the Y axis. Blue colour represents general practitioner , green colour represents PG student, cream -prosthodontist, purple-Periodontist, yellow-oral surgeon, and red colour represents other speciality. Majority of the prosthodontists and PG students preferred a milled abutment over the other options (Chi-square value-60.283; p value- 0.000).

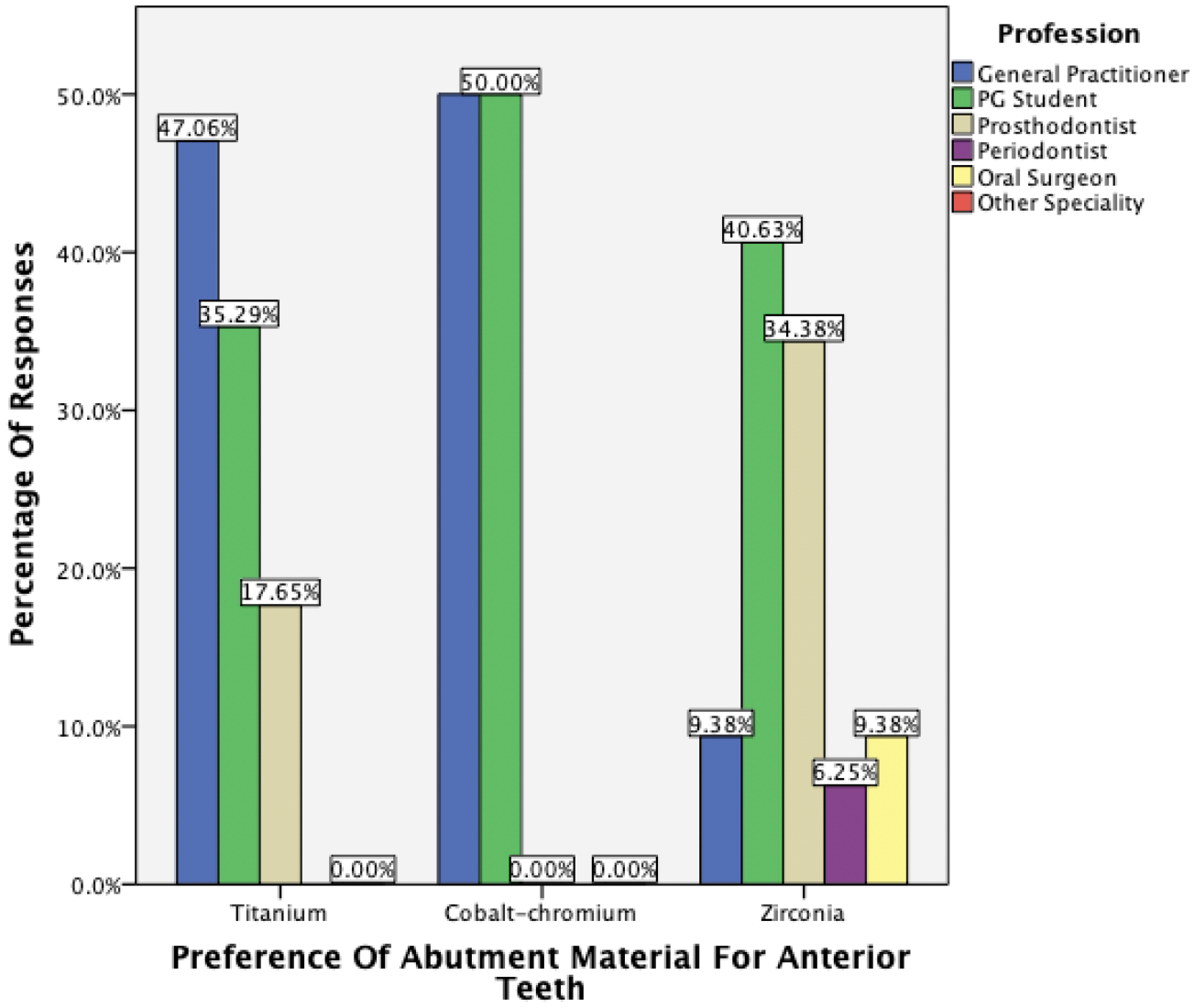

FIGURE 2 : Bar graph showing preference of abutment material for anterior teeth on the X axis and percentage of responses by professionals on the Y axis. Blue colour represents general practitioner , green colour represents PG student, cream -prosthodontist, purple-Periodontist, yellow-oral surgeon, and red colour represents other speciality. The preferred abutment material for anterior teeth was Zirconium rather than cobalt chromium or titanium (Chi-square value-72.806; p value- 0.000).

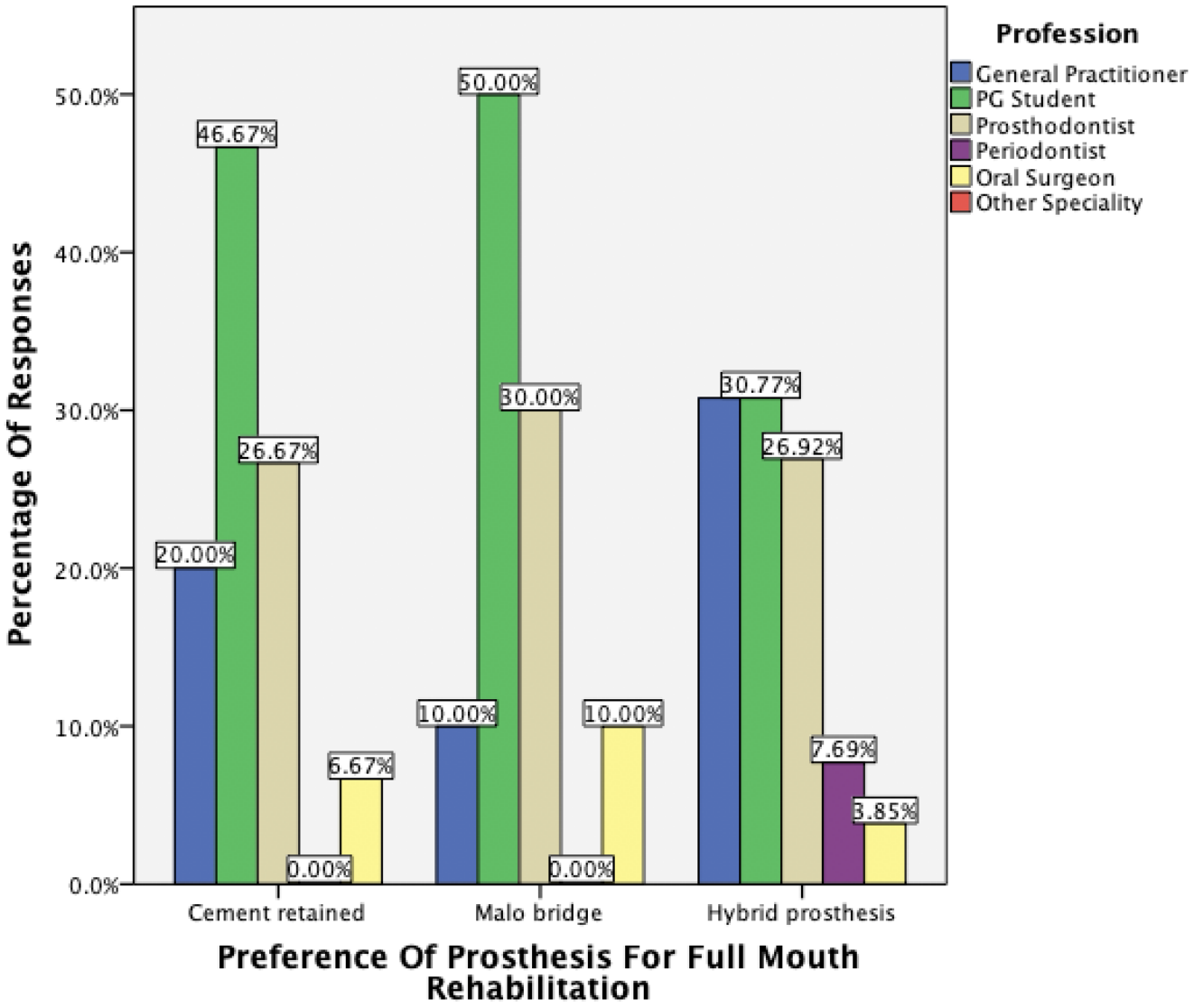

FIGURE 3 : Bar graph showing preference of prosthesis for full mouth rehabilitation on the X axis and percentage of responses by professionals on the Y axis. Blue colour represents general practitioner , green colour represents PG student, cream -prosthodontist, purple-Periodontist, yellow-oral surgeon, and red colour represents other speciality. (Chi-square value-60.283; p value- 0.000).

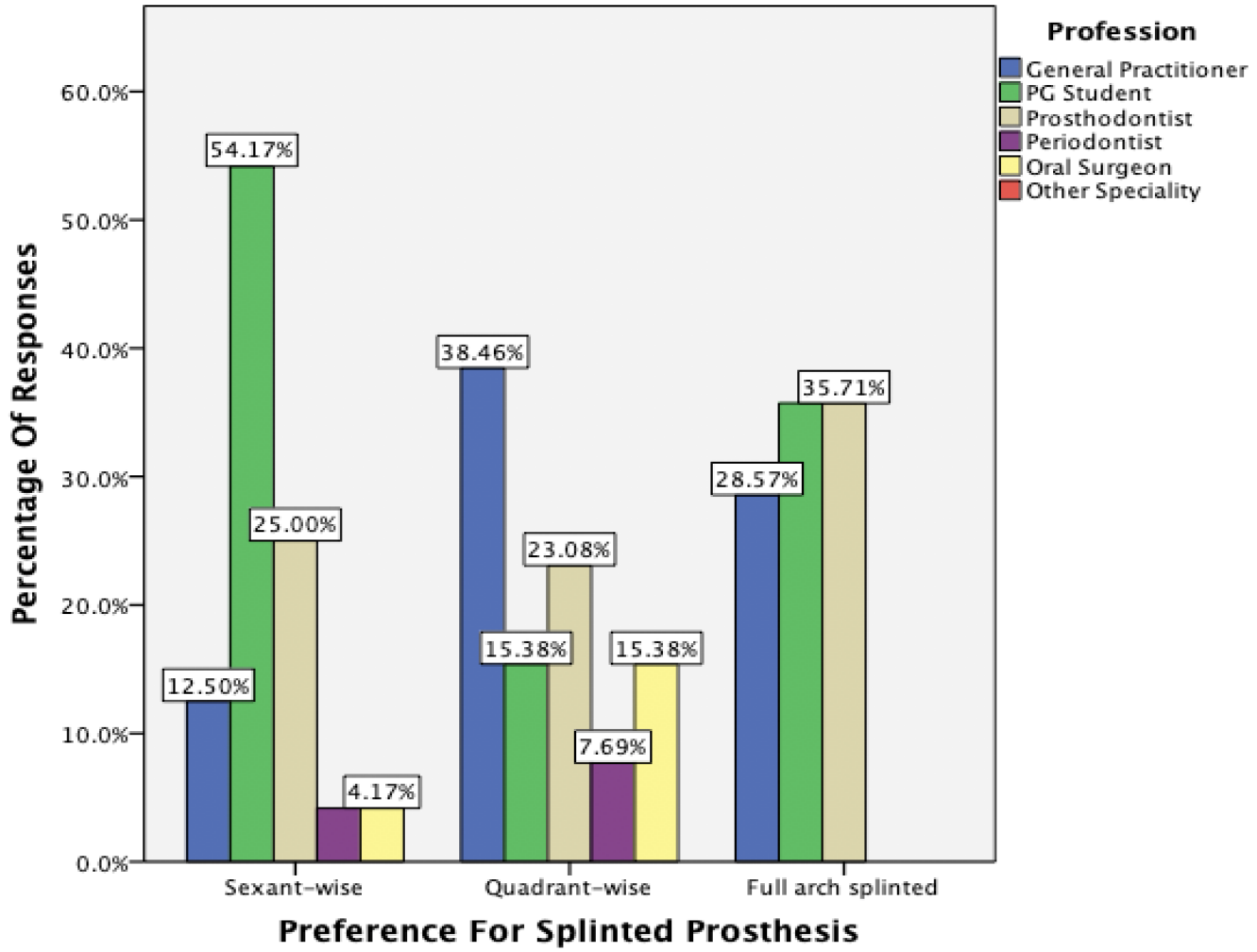

FIGURE 4 : Bar graph showing preference of customised abutment on the X axis and percentage of responses by professionals on the Y axis. Blue colour represents general practitioner , green colour represents PG student, cream -prosthodontist, purple-Periodontist, yellow-oral surgeon, and red colour represents other speciality. (Chi-square value-60.283; p value- 0.000).

IV. DISCUSSION

The data of the current study help outline the concepts and procedures that are currently applied by dentists regarding planning and fabrication implant-supported prosthetics .The results of this survey are based on 306 responses, the sample size can be increased to generalize the concepts among dentists regarding implant prosthesis. A response rate of 72.85% was noted which is fairly good compared to that of 17.7% - a study done in Germany wherein out of 320, 62 questionnaires were returned relating to a response rate of 17.7% ; 22.7% as noted to a study performed in a district of Bavaria wherein the response rate was 22.7% (12)(13). In previous investigations, many returned questionnaires were not fully completed, indicating that the questionnaires might have been too extended or complex to answer. Majority of the dentists were females, this may be due to the fact that there are more female dentists in India. The mean age of the participating dentist was 30 years indicating that the outcome of the current study might be different in those with older dentists as a few concepts have

changed overtime. A vast majority of the dentists are using customized abutments whereas it has been proven that customized abutments may not be required in every case (14)(15). This observation suggests that dentists do not commonly adhere to the current scientific concept that the position of an implant should be planned in accordance with prosthetic principles (16). With regard to this aspect, it has recently been addressed that dental technicians play a crucial role in decision making, suggesting that the prosthetic knowledge of dentists should be steadily increased (17). Amongst those using customized abutments the percentages for those using Ti-base casting, 3D printed customization or milled abutment was similar. The percentage for conventional casting was less, indicating that many dentists are aware of errors in conventional casting procedures and the accuracy of the digital systems. Regarding the preference of material of the abutment for replacement of an anterior tooth, the majority of participating dentists used zirconia followed by titanium, cobalt chromium being least preferred. However, while all-ceramic or hybrid abutments feature advantages in the esthetic appearance of the prosthetic restoration, surprisingly many dentists favored titanium abutments or abutments fabricated from precious alloys. A recently published systematic review highlighted that both metal and ceramic abutments supporting single crowns feature high clinical survival rates, with significantly lower abutment fractures in metal abutments (18). Surprisingly, zirconia abutments were favored more frequently than hybrid abutments, which show higher fracture resistance in laboratory studies (19). With regard to the implant-supported single crown, the majority of participating dentists favored the use of all-ceramic materials, and the majority of dentists issued that they preferred veneered restorations rather than monolithic ones. With regard to this aspect, recent meta-analyses underlined that both porcelain-fused-to-metal and veneered zirconia can be reliably used for the fabrication of implant supported single crowns (20).

A smaller number of the participating dentists preferred cementation of implant-supported crowns rather than screw-retention.The reason selected by many for a screw retained was its easy retrievability followed by lack of residual cement. The recent recommendations support the application of screw retention in implant-supported restorations in the anterior area (21). While 5-year clinical survival rates are similar for both screw-retained and cemented implant-supported restorations, screw-retained restorations feature less technical and biological complications (22). However, for employing screw-retained approaches in implant dentistry, an ideal prosthetic position of the implant is required. However, for employing screw-retained approaches in implant dentistry, an ideal prosthetic position of the implant is required. As only a minority reported that they regularly employed backward planning techniques, it might be possible that screw retention was regularly not possible.The major reason for those selecting a cement retained prosthesis was esthetic benefit without screw access hole followed by an easier achievement of passive fit. Again, these considerations underline that the position of an implant should be planned in strict accordance with prosthetic principles. With regard to the choice of cement, Korsch and co-workers identified a relevant impact of excess cement in patients with cemented implant-retained restorations on the prevalence of peri implant inflammations (23)(23,24), also observing that the application of acrylic cements regularly coincides with an excess of cement (25). Prosthesis preference for full mouth rehabilitation cases was hybrid denture when compared to malo and cement retained prosthesis. Several studies underline that the system selection for full mouth rehabilitation has only little influence on patient satisfaction (26)(27) , however there are studies showing less stress to implants in hybrid dentures using acrylic and composite teeth compared to that with a cement retained ceramic prosthesis (21). If the opposing is a natural dentition in relation to single edentulous arch, damage to natural teeth is more with

ceramic prosthesis whereas the acrylic or composite gets attrited in a hybrid denture thus acts as a protective mechanism (1).

Majority of the dentists preferred splinting of the prosthesis . This is favorable as studies have shown better distribution of forces and less stress on the implants when they are splinted (28). Tooth-/implant supported fixed partial dentures were favored by 62.7% suggesting that participating dentists are aware of the clinical success of these restorations (22,29,30). This observation might be explained by mandibular flexure (31), that is the deformation of the mandibular during excursive movements, resulting in strain on combined tooth-/implant-supported restorations (32). However, recent reviews indicate that tooth-/implant-supported fixed dental prostheses have a survival rate of 90.8% after five years and 82.5% after ten years of clinical service, underlining that these constructions are a treatment option that can be recommended in partial dentition (22).

V. CONCLUSION

An evidence based practice should be followed for the proper treatment planning of implant prosthesis.Within the limitations of the current study, it can be concluded that dentists do not regularly adhere to prosthetic principles in implant dentistry. More awareness through CDE programs, seminars etc are needed to increase knowledge among practitioners for implant prosthesis. It is advisable to take a Prosthosontist's opinion for implant restoration. Understanding concepts through multiple programs will enable dentists to decide for a correct option for the implant prosthesis.

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