SURVEY OF IMPRESSION MATERIALS AND TECHNIQUES USED IN FIXED PROSTHODONTICS AMONG NEPALESE DENTISTS

Binita Pathak,[1] Sukriti Dahal,[1] Anju Khapung[2]

[1]Department of Prosthodontics, Nepal Medical College, [2]Department of Community Dentistry, Nepal Medical College, Attarkhel, Gokarneshwor-8, Kathmandu, Nepal

ABSTRACT

There is variation in fixed prosthodontics practice and many studies have concluded that clinicians definitely deviate from the recommended clinical protocols. If this happens during treatment with fixed prosthesis, the quality of fixed prostheses is compromised which affects it's long term survival. Therefore, the aim of this study was to evaluate the use of impression materials and techniques in fixed prosthodontics among Nepalese dentists and to compare the findings on the basis of educational level and years of experience. A cross-sectional, questionnaire-based online survey was done amongst the Nepalese Dentists through google forms. Data from the completed questionnaires were analysed using the SPSS version 16. All statistical analyses were carried out at a significance level of $P < 0.05$. Out of 129 participants, 68 (52.7%) dentists often made diagnostic impression for fabrication of study cast. 85(65.9%) dentists used Addition silicone, 11(8.5%) used Condensation silicone and 33(25.6%) used Alginate for final impression making. Most commonly used elastomeric impression technique was Putty Wash single stage (56.2%), 40.7% used Putty Wash two stage, 3.1% used Single mix (Monophase) technique. Regarding retraction cord, 63.5% of dentists used Plain gingival retraction cord and 35.7% of dentists used Chemical impregnated retraction cord. Conclusion: The study found that most of the responses on use of impression materials and techniques were significantly associated with the level of education and clinical experience.

KEYWORDS

Fixed prosthesis, Impression materials, Impression technique, Retraction cord

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CORRESPONDING AUTHOR

Dr Binita Pathak,
Lecturer,
Department of Prosthodontics, Nepal Medical College,
Attarkhel, Gokarneshwor-8, Kathmandu, Nepal
Email: drbinitapathak@gmail.com
Orcid No: https://orcid.org/0000-0002-9552-0724
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INTRODUCTION

Restoration and replacement of damaged or missing teeth can be achieved by placing fixed prosthesis in order to regain the form, function and aesthetics of the damaged or lost dentition.[1] The success of fixed prosthodontics treatment is dependent on many factors such as selection of patients, diagnosis and treatment planning, impression making, cementation of prosthesis, communication with the dental laboratory, satisfaction of the patients, and proper follow-up.[2] Since the quality of construction of fixed prostheses directly affects its long-term survival, it is essential that the dental practitioner follows all the fundamental clinical guidelines for longevity of the treatment.[3] Several materials and techniques are involved in the successful implementation of these procedures. Most of the dental practitioners pay more attention to patient's flow, cost, and treatment time and less focus towards the appropriate technique, material, and armamentarium which are required for long-term success for fixed partial denture.[4] Materials and technological advances in fixed prosthesis keep changing with more accuracy every day.[5] There are numerous techniques described for making fixed partial denture impressions, including copper band technique, mono-phase technique, single-step technique, or the double-step technique and several types of impression materials that can be used in fabricating fixed dental prostheses, which include Alginate, condensation silicone, polysulfides, polyethers, and polyvinyl siloxane.[6]

Most dentists place a substantial number of fixed dental prosthesis each year.[7] As more patients demand crown and bridges for the replacement of missing teeth and endure a high cost, the quality of crown and bridge therapy becomes of increasing professional and public concern.[8] As fixed prosthodontic procedures are widely practiced for dental rehabilitation, it is very important to evaluate the details of basic steps in the field of fixed prosthodontics and the way of practicing this important branch of dentistry. Therefore, knowledge of dental professionals regarding materials and techniques used is important for successful outcome of fixed prosthesis.[9]

MATERIAL AND METHODS

A cross-sectional, questionnaire-based online survey was conducted among Nepalese Dentists from 12th July to 12th August, 2021. The protocol was submitted to the Institutional Review Committee and Ethical clearance was obtained from Institutional Review Committee, Nepal Medical college (Ref. No.: 070-077/078) prior to commencement of the study.

The questionnaire that was used for data collection has been adopted from a study[10] with first section pertaining to personal and demographic information of the participants, second and third section assessing the use of impression material and techniques used in Fixed Prosthodontics. These questions were developed in Google forms and survey questionnaire was posted to the dentists through groups in Facebook. Dentists willing to take part in this study were requested to fill up and submit the questionnaire form. Informed consent was taken from all the participants via google form. The consent was included in the beginning of the questionnaire. The participants were able to answer the questionnaire only after agreeing to informed consent. Multiple submissions were avoided by asking the participants to enter the email address and NMC registration number. A reminder was sent at the end of every week for the entire data collection duration.

The minimum sample size calculated was 125. 129 dentists responded to the questionnaire sent via google form within the time frame of the data collection. Data was collected in spreadsheet and exported to Microsoft Excel. Data was then analyzed using SPSS version 16. Data was presented in the form of Frequency, Percentages and Fisher exact test was applied to find the association of the various responses with years of practice and level of education.

RESULTS

Sociodemographic distribution of participants are shown in Table 1. Out of 129 participants, 54.3% were males and 45.7% were females. Majority of them (46.5%) had been in clinical practice for 1-5years. Most of the respondents (65.1%) were currently practicing in Bagmati province, followed by Gandaki province (10.9%). Almost half of the respondents (51.2%) worked in private clinics whereas 31.7% worked in Dental/Medical colleges. Out of all the respondents, 50.4% were specialists holding MDS degree and 48.8% were dentists with BDS degree.

The responses of participants regarding the use of impression techniques in Fixed Prosthodontics is summarized in Table 2. Majority of dentists 68 (52.7%) responded that they often made diagnostic impression for fabrication of study cast. There are 4.7% of practitioners who never made diagnostic impressions and proceed with the tooth preparation after the clinical intraoral examination. 49.6% of dentists always took a preoperative radiograph for the abutment tooth/ teeth and only 10.9% of dentists always did vitality test for restored abutment before tooth preparation.

Table 1: Socio demographic distribution of study participants

Variables		n	%
Gender	Male	70	54.3
	Female	59	45.7
Age group	23-32	71	55
	33-42	56	43.4
	43-52	2	1.6
Education	BDS	63	48.8
	MDS	65	50.4
	BDS with special trainings on Fixed prosthodontics	1	0.8
Years of experience	1-5 years	60	46.5
	6-10 years	50	38.8
	11-15 years	17	13.1
	More than 16 years	2	1.6
Place of work	Private clinics	66	51.2
	Dental/ Medical colleges	41	31.7
	Government hospitals	20	15.5
	Community hospitals	2	1.6
Current residence	Province 1	11	8.5
	Province 2	8	6.2
	Bagmati province	84	65.1
	Gandaki province	14	10.9
	Lumbini province	7	5.4
	Karnali province	1	0.8
	Sudurpaschim province	4	3.1

Table 3: Association of use of materials in Fixed Prosthodontics with level of education and years of experience.

Questions	Responses	no.	%	Years of experience (p-value)	Level of education (p-value)
Type of gingival retraction cord used routinely (n=129)	Chemical impregnated retraction cord	46	35.7	0.004*	<0.001*
	Plain retraction cord	82	63.5		
	I don't use retraction cord	1	0.8		
Type of impression tray used for final impression (n=129)	Custom made acrylic tray	8	6.2	0.06	0.05
	Stock tray	86	66.7		
	Both of them	35	27.1		
Impression material routinely used for final impression (n=129)	Addition silicone	85	65.9	0.002*	<0.001*
	Alginate	33	25.6		
	Condensation Silicone	11	8.5		
Materials used for interocclusal records (bite) for multiple teeth replacement (n=116)	Modelling wax	85	73.3	0.001*	0.001*
	Putty elastomer	3	2.6		
	Reinforced wax	9	7.8		
	Silicone Bite registration material	19	16.3		

Fisher-Freeman-Halton Exact Test, p value<0.05 statistically significant

Table 2: Association of use of impression techniques in Fixed prosthodontics with level of education and years of experience.

Questions	Responses	no.	%	Years of experience (p-value)	Level of education (p-value)
Make diagnostic impression for fabrication of study cast (n=129)	Always	23	17.8	0.005*	0.32
	Never	6	4.7		
	Often	68	52.7		
	Rare	32	24.8		
Take a preoperative radiograph for the abutment tooth/ teeth (n=129)	Always	64	49.6	0.19	0.01*
	Never	3	2.3		
	Often	46	35.7		
	Rare	16	12.4		
Do vitality test for restored abutment before tooth preparation (n=129)	Always	14	10.9	0.26	0.06
	Never	13	10.1		
	Often	46	35.6		
	Rare	56	43.4		
Retract gingiva before final impression (n=129)	Always	30	23.2	0.04*	<0.001*
	Never	10	7.8		
	Often	53	41.1		
	Rare	36	27.9		
Type of impression technique if elastomeric impression material used (n=96)	Putty Wash Single Stage	54	56.2	0.40	0.02*
	Putty Wash Two Stage	39	40.7		
	Single mix (Monophase) technique	3	3.1		
Do interocclusal records (bite) for multiple teeth replacement (n=129)	Always	64	49.6	0.01*	0.05
	Never	13	10.1		
	Often	38	29.4		
	Rare	14	10.9		
Provide provisional crown or bridge after tooth/teeth preparation (n=129)	Always	58	45.0	0.09	0.006*
	Never	2	1.6		
	Often	46	35.7		
	Rare	23	17.7		
Chemically disinfect the impression after removal from the patient's mouth and before pouring it or sending it to lab (n=129)	Always	33	25.5	0.13	0.06
	Never	34	26.4		
	Often	17	13.2		
	Rare	45	34.9		
Communication method with the dental laboratory (n=129)	Both written and verbal communications	75	58.1	0.04*	0.005*
	Verbal Communication	45	34.9		
	Written Prescription	9	7.0		

Fisher-Freeman-Halton Exact Test, p value<0.05 statistically significant

23.2% of dentists indicated that they always retracted the gingiva before final impression and among the dentists who use elastomeric impression material (96), 56.2% used putty wash single stage, 40.7% used putty wash two stage, 3.1% used single mix (Monophase) technique. 49.6% of dentists always did interocclusal records (bite) and 10.1% never took interocclusal records for multiple teeth replacement. Among the dentists who did interocclusal records (116), 73.3% of them used modelling wax, 16.3% used silicone bite registratrion material, 7.8% used reinforced wax and some of them (2.6%) used putty elastomers as shown in Table 3. 45% of the respondents always provided provisional crown or bridge after tooth preparation and

17.7% rarely provided provisionals. Regarding chemical disinfection of the impression after removal from patients mouth, 25.5% dentists always disinfected the impression and 26.4% never disinfected the impression or cast. 58.1% of dentists had both verbal and written communication with the dental laboratory, 34.9% used verbal communication only while 7% of dentists used written prescription as comminication method.

Table 3 shows all the responses of materials utilized in Fixed Prosthodontics. 63.5% of dentists most commonly used plain gingival retraction cord and 35.7% of dentists used chemical impregnated retraction cord. 66.7% chose the stock tray, 27.1% chose both (stock and custom made), and 6.2% reported using a custom made tray for making final impression. Majority of dentists used addition silicone for final impression and average responses overall for each material for final impression were: Addition silicone 85(65.9%), Condensation silicone 11(8.5%), Alginate 33(25.6%).

Most of the responses regarding the use of materials and techniques were correlated significantly with years of experience and level of education as shown in Table 2 and 3. Differences in selecting materials and techniques existed by level of education and years of clinical practice/experience. This study found that the response regarding use of routine final impression material was significantly associated with years of experience (p=0.002) and level of education (<0.001). Similarly, results for materials used for interocclusal records (bite) in multiple teeth replacement were also significant (p value=0.001).

DISCUSSION

Prosthodontics as a specialty has evolved abundantly in the past few years. Fixed prosthodontic treatment provides an exceptional satisfaction for both patients and dental practitioners at primary care level. Fixed prosthesis should restore the function and promote the health of the masticatory unit and provide a long service life.[11] These criteria are influenced by the quality of the clinical procedures, the standards of the laboratory work, and the oral condition prevailing in patient.[12] Fabrication of study models and evaluation of the abutment is considered as an integral part in diagnosis and treatment planning for fixed prosthodontic restorations[13,14] because it will help in assessing the treatment outcome that is planned and any other treatment if required before proceeding with the fixed partial denture treatment.[15] The current survey showed that 17.8% of participants always fabricated study models routinely before starting treatment. 64 (49.6%) of participants always used radiographs for abutment tooth evaluation. Vitality test for restored abutments were always done by 14 (10.9%) respondents only. Mohamed AB *et al.* found that the majority of the surveyed practitioners rarely used study casts 56 (38.1%) and 35.6% rarely use radiograph for the abutment tooth and 68 (46%) of surveyed practitioners never used vitality test for abutment tooth.[16] A survey among Indian dentists revealed that majority of the dentists use irreversible hydrocolloid material for diagnostic impressions.[17] A study showed that 78.3% of the participants assessed abutment tooth radiographically, also most of them (37.2%) fabricated study cast before starting crown and bridge procedures.[10]

Gingival retraction before a final impression can be very frustrating and time consuming. Many different techniques have been developed over the years to accommodate the clinician's struggle to obtain tissue control and achieve an ideal impression. The current survey showed that 23.2% of dentists always retracted the gingiva before final impression and 63.5% of dentists most commonly used plain gingival retraction cord and 35.7% of dentists used chemical impregnated retraction cord. The past survey indicates that most of private practitioners prefer to record impressions without any gingival retraction.[9] Similar study conducted in Sudan indicated that 53.69% never used the retraction cord.[16] In another study, 62% preferred the use of gingival displacement technique for successful clinical practice while 38 % of them did not follow the procedure believing it does not make major difference in clinical practice.[18] As far as the use of gingival retraction cord was concerned, most of dentists used it as compared to electrosurgery and lasers.[17]

There are numerous techniques described for making fixed partial denture impressions, including copper band technique, mono-phase technique, single-step technique, or the double-step technique and several types of impression materials that can be used in fabricating fixed dental prostheses, which include Alginate, condensation silicone, polysulfides, polyethers, and polyvinyl siloxane.[6] For final impression making, elastomeric impression materials are the most superior in terms of recording finish lines and the surface detail of the prepared teeth; the disadvantages are delayed pouring for addition silicone, difficulty in recording the arches with undercuts for polyether, and so forth.[19-24] In a study done by Keerthana *et al* in India, majority of the dental professionals chose addition silicone as the first choice when performing final impression.[17] The results of the present study revealed that addition silicone was mostly used 85 (65.9%) for making final impression followed by alginate, 33(25.6%) and

11 (8.5%) preferred to make final impression using condensation silicone. In another study, amongst the surveyed practitioners, 55.46% used irreversible hydrocolloid and 44.54% used elastomeric impression materials.[21] The results of a study done by Eriksson A *et al* showed that the fixed prosthodontics made according to the syringe-tray alginate impression method may have the same success rates after 20 years compared to that of fixed prosthodontics where other impression materials had been used.[25]

Regarding impression technique used for final impression, Puttywash techniques were mostly used by dentists 218 (75.2%) who used elastomeric impression material in one of the study.[10] Another study found that elastomeric impression technique practiced most commonly is putty reline with/without spacer (77.2%).[21] In our study, among the dentist who used elastomeric impression material (96), 56.2% used Putty wash single stage, 40.7% used Putty wash two stage, 3.1% used Single mix (Monophase) technique. Randall RC *et al* found out that 71% of schools taught and used clinically a one-stage, full arch impression technique involving stock trays, and 57% of schools a full-arch custom tray technique.[26]

Proper communication between laboratory technicians and dentists has a predictable role in success of the fixed prosthesis. In a study done in Ireland, Fixed prosthodontics laboratories revealed that the technicians are often dissatisfied with the information provided in work authorizations. Poor communication between dental practitioners and dental technicians for fixed prosthodontics was cited. Poor or no written instructions were provided in 55% of cases examined and three-quarters of written instructions for FPDs do not specify the number of pontics to be included in its design.[27] Another study conducted by Sedky evaluated how dentists were communicating with lab personnel about impression disinfection and detecting awareness about infection control practices in dental laboratories and they found the lack of communication between Prosthodontists and their dental technicians. More than 60% of technicians knew that impressions have been disinfected and 56.25% of dentists notified technicians that impressions have already been disinfected. About 64% of technicians had an agreed protocol between lab and clinic, and 40.74% of Prosthodontists notified technicians through notes on impression bags.[28] In study done by Randall *et al*, routine disinfection of impressions was taught and practised in 43% of schools.[26] Regarding chemical disinfection of the impression, the present study showed that 25.5% dentists always disinfected the impression or cast and 26.4% never disinfected the impression or cast. 58.1% of dentists had both verbal and written communication with the dental laboratory, 34.9% used verbal communication only while 7% of dentists used written prescription as comminication method in this study.

In oral rehabilitation using fixed restorations, the use of the provisional restoration is a critical phase in the treatment of the dental prosthetic patient. The prognosis of a fixed restoration greatly depends on the interim restoration, particularly if the restorations are expected to function for extended periods of time or when additional therapy is required before completion of the rehabilitation.[29] More than one third of the investigated dental practitioners (36%) in Sudan never made provisional crown and bridge restorations, and the majority of the two thirds often make it,[16] while the current study showed that 45% of the dentists always provided provisional crown or bridge and 17.7% rarely provided provisionals after tooth preparation. The utilization of properly fabricated provisional prostheses will permit a higher rate of success of the definitive treatment.[30]

Many studies were conducted to evaluate the knowledge, attitude and practice of Fixed Prosthodontics among dental practitioners in past. The Kannan *et al*. study aimed to assess the private section practitioner's knowledge, awareness level and application in clinical practice; it showed significant variation in the private section practitioners in their fixed prosthodontics practice, definitely deviating from the recommended clinical protocols.[9] High failure rates (65%) in crown and bridge work recorded in previous study done in Sudan[16] which gives an indication for the importance of the assessment of the crown and bridge work.

Within the limitation of the study, it can be concluded from the present investigation that most practitioners fabricated study models, used vitality test and took preoperative diagnostic radiographs for abutment evaluation. The addition silicone (65.9%), stock trays (66.7%) and Putty Wash single stage technique (56.2%) were mostly used for making final impression. 23.2% of dentists always retracted the gingiva before final impression and 63.5% of dentists used plain gingival retraction cord and 35.7% of dentists used chemical impregnated retraction cord. 49.6% always used inter-occlusal records for multiple teeth replacement and modelling wax was the most used material for records. Among 129 dentists, 34(26.4%) never disinfcted their final impression before fabricating cast or sending it to lab and only 75 dentists (58.1%) communicated with both written prescriptions and verbal communications.

There was significant association of use of materials and impression techniques in Fixed Prosthodontics with the level of education and

years of experience. The conclusion can also be drawn that dentists had inadequate practices on some of the fixed prosthodontic procedures which were not as per the guidelines, which should be mandatory to prevent failure of treatment.

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