Impression Materials and Techniques Used in Fabrication of Complete Denture, Fixed Partial Denture and Dental Implants: A Questionnaire Survey

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ABSTRACT

Introduction: Dental impression is a negative imprint of intraoral structures that is to be used for production of dental prosthesis. There are various materials like irreversible hydrocolloid, polyvinylsiloxane and polyether for making impression in complete denture, fixed partial denture and dental implants. Various techniques of impression making are used in above listed parts of prosthodontics. The aim of our research is to know commonly practiced materials and impression techniques in prosthodontics by registered dental practitioners of Nepal.

Methods: A descriptive cross- sectional online study with census sampling technique was done in Patan Academy of Health Sciences from November – December 2024 after ethical approval from institutional review committee. Standard google questionnaire form was distributed through various web links and 251 respondents agreed to participate. Closed ended anonymous questionnaire consisted of three sections which included questions regarding techniques and materials used in fixed partial denture, complete denture, and dental implants respectively. Collected data from google form was received from participants and descriptive statistical analysis was performed for frequency and percentage of various type of materials and techniques used.

Results: Out of 251 respondents, 76.9% of them were practicing FPDs, among them 73% were using stock tray, 19.9% were using custom tray impression technique and 7.1% were using digital impression. 65.3% of respondents were practicing complete denture, 61.5% were using alginate for primary impression and 72.3% were using zinc oxide eugenol for final impression and 96.9% of respondents were using green stick for border molding. Dental implants were practiced by 41.4% of respondents, among them 61.7% were using open tray technique and majority of respondents 84.5% were using poly vinyl siloxane for impression.

Conclusion: There is rise in popularity of digital impression however the habit of conventional impression material and techniques have not faded out as maximum number of our study population are using conventional impression materials and techniques in various part of prosthodontics like complete denture, fixed partial denture, and dental implants.

Key words: Complete denture, Dental Implants, Fixed Partial Denture, Impression materials, impression techniques.

INTRODUCTION

Dental Impression is a "negative imprint or a positive digital image display of intraoral anatomy; used to cast or print a 3D replica of the anatomic structure that is to be used as a permanent record or in the production of a dental restoration or prosthesis".[1] There are various materials used for making impression in

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complete denture (CD) which include irreversible hydrocolloid, metallic oxide impression paste, polysulfide, polyether, and polyvinylsiloxane.[2] In case of fixed partial denture (FPDs) materials like alginate, agar agar, polysulphide, polyether and polyvinyl siloxane are commonly used for fabricating impression.[3] Similarly, in cases of dental implants (DI) polyether, polyvinyl siloxane and vinyl siloxanether are used.[4]

Various techniques while making impression for CD can be categorized according to pressure applied, type of tray used and position of mouth while making impression.[5] However, for the FPDs stock tray technique, custom tray techniques and digital impression are commonly used.[3]Accordingly, In DI closed tray and open tray techniques are commonly utilized.[4]

Petrie et al.[2] surveyed techniques and materials used in CD where they concluded that there is a trend for increasing use of poly vinyl siloxane and polyether for border molding procedures and impressions of CD. Moldi et al.[3] assessed impression materials and techniques in FPD among the practitioners in India, where they concluded that the ideal materials and techniques are utilized for the long term success of the treatment. Bhocchibhoya et al.[6] surveyed materials and techniques in CD impression where they found that majority used alginate with stock tray technique for alginate impression and for final impression zinc oxide eugenol was used.

Recent trends of digital impression have changed impression making procedure due to its various advantages like three-dimension pre-visualization, cost effectiveness and reduced time consumption. Thus, increasing its popularity in impression making in various field of dentistry like CD, FPDs, DI.

The aim of this research is to know frequently used materials and techniques utilized in commonly practiced prosthodontic works by the registered dental practitioners of Nepal.

METHODS

A descriptive cross- sectional online study was done with census sampling technique in PAHS in November-December 2024. Standard google questionnaire form was distributed to registered dental practitioners in Nepal through various web links, which was then sent out through different social media including emails, Viber, messenger, and WhatsApp and handed out personally, whenever possible. Email address and contact details was retracted from the Nepal dental association directory. Respondent who had agreed to participate in the google form was considered as the consent for participation in the research. Among these distributed forms 251 people agreed to participate and responded to google form.

Participants were able to answer questionnaire only after agreeing to the informed consent. Data collection was started after ethical approval from institutional review committee PAHS (Ref: drs190541252).

The questionnaire was framed by reviewing various studies carried out across various part of world on complete denture[2], fixed partial denture[3] and dental implants[7]. Multiple submissions were avoided by asking participants to enter their email address and Nepal Medical Council registration number. Closed ended anonymous questions were designed to access basic tenets for impression; questionnaire included three sections where first section included questions regarding materials and techniques used in FPDs, second and third sections included same for complete denture and dental implants respectively. Total of 20 questions were framed for the study. Data collected was entered in Microsoft Excel, descriptive statistical analysis was performed for frequency and percentage of various type of materials and techniques used in CDs, FPDs and dental implants.

RESULTS

251 responses from dental practitioners were received from questionnaire sent via various online means. Among these 251 responses 41.8% were general dental practitioners and 54.6% were dental specialists in various fields. Out of these 54.6% specialists, 42.2% were Prosthodontist and 57.8% were from other specialization of dentistry. Among these maximum respondents i.e.,43.8% were working since 1-5years, 25.1% were in practice for 6-10 years others were practicing for more than 16 years.

The first part of questionnaire was about FPDs. Among 251 respondents, 76.9% of them were practicing FPDs and among 76.9% of them 73% were using stock tray (double mix single impression technique), 19.9% were using custom tray (single mix) impression technique and 7.1% were using intra oral scanner for digital impression technique. Routinely used material for impression in FPDs was addition silicone (56.3%) and Alginate (51.8%),the percentage add up to more than 100% because respondents could select multiple materials used. Respondents who have opted digital impression technique (84.4%) had shifted to digitalization recently i.e., since a year and other were using for 2-5 years.

As the second part of questionnaire was about practicing complete denture, among 251 respondents 65.3% were in practice. Out of 251 respondents, 31 people had recently shifted for 1 year from conventional impression technique to digital impression techniques.

In conventional technique maximum respondent (89.5%) were using open mouth technique utilizing selective pressure technique for impression. Majority of individuals opted functional method (69.6%) of manipulation technique while making impression followed by hand (18.5%) and functional (11.9%) method of manipulation. Primary material used for making primary impression for CD was alginate (61.5%) followed by impression compound (36.2%) and elastomers (2.3%). For border molding 96% of respondents were using green stick and other remaining were using elastomers.

Last part was about impression making in dental implants, out of 251 respondents 41.4% of people were practicing dental implants. Among these 115 respondents practicing implants, 61.7% were using open and closed tray impression technique followed by open tray (16.5%), closed tray (12.2%) and 8.7% were utilizing digital impression technique. While using conventional technique among 100 respondents, 84.5% were using poly vinyl siloxane and 15.5% were using polyether. For the 32 respondents who had opted digital impression, 80.5% had just started to use digital impression for 1 year and other 19.5% were using it in the last 2-5 years.

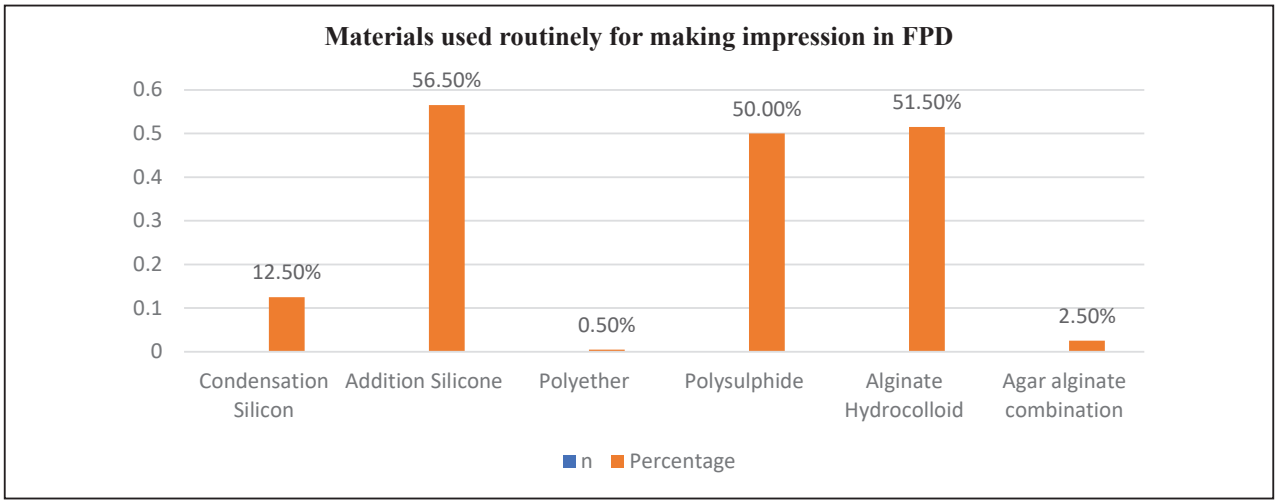

Figure 1: *Materials used routinely for making impression in FPD.*

Note: Percentage total >100% as respondents could select multiple materials routinely used in their FPD workflow.

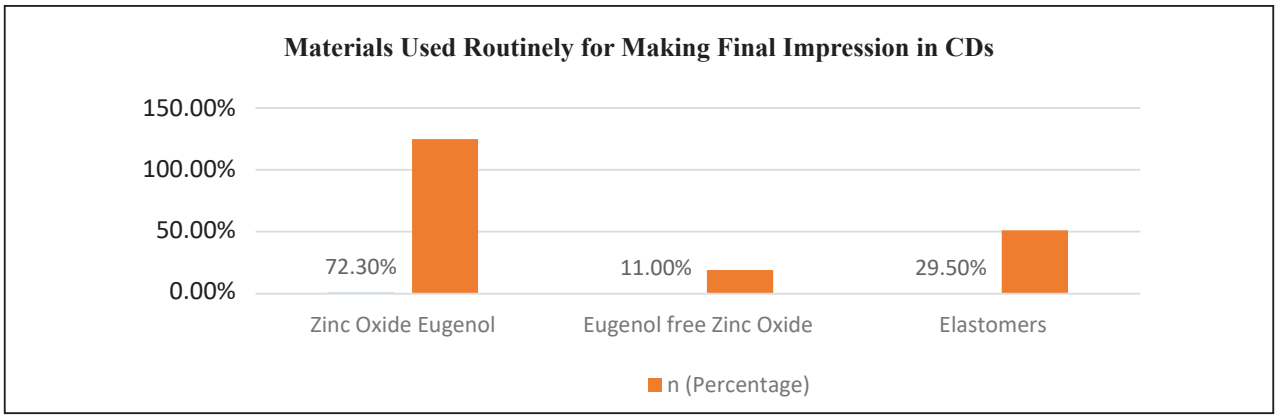

Figure 2: *Materials Used Routinely for Making Final Impression in Complete Dentures*

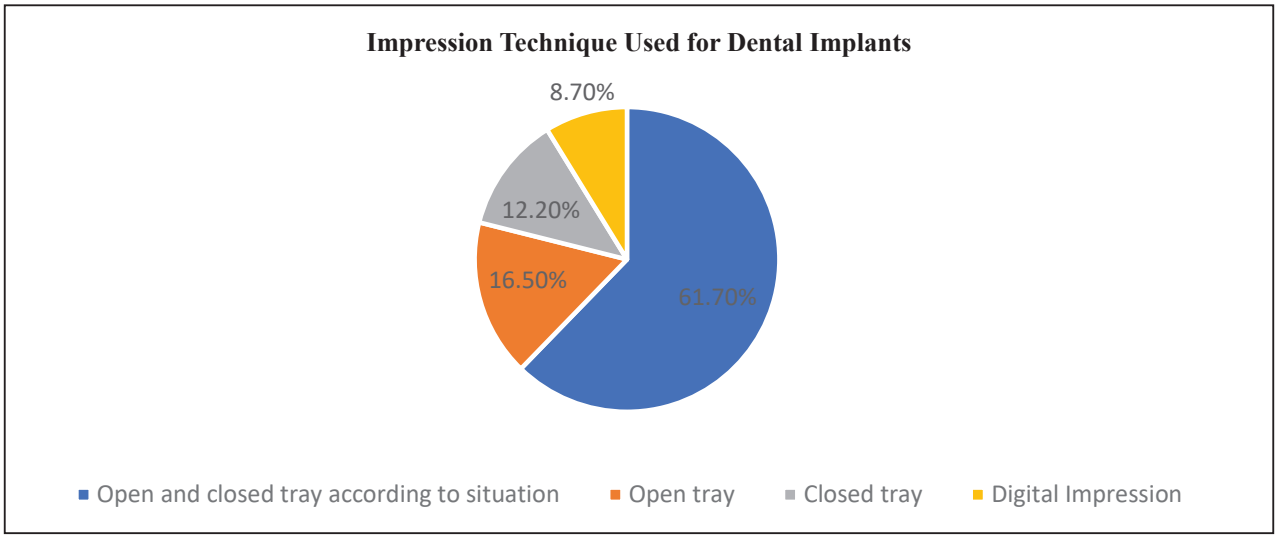

Figure 3: *Impression Technique Used for Dental Implants*

DISCUSSION

Dental impression is considered useful tool for fabrication of prosthesis and success of these impressions is usually based on materials and techniques selected. Each technique has it's own advantages and disadvantages and furthermore there has been many studies to develop more accurate impression materials and technique.[9] Since few decades conventional impression techniques were used to register teeth and its surrounding soft tissues but to overcome challenges and difficulties of this conventional impression, concept of digital impression is emerging rapidly.[10]

In our study, most of our participates who practice FPDs used addition silicone (56.3%) and alginate (51.8%) for making impression followed by condensation silicone (12.7%). Out of these respondents 73% used stock tray or dual mix single, 19.9% of them used custom tray or single mix. These data received from our study was like the study done by Niveditha et al[11] and Pathak et al[12] in 2023 and 2022 respectively for conventional impression techniques. They found that majority dental practitioners used addition silicone and alginate as primary material for impression with the stock tray. Unlike many research utilizing conventional impression, out of 251 people 69 study population had recently shifted to digital impression technique utilizing intra oral scanner since last 1 year may be due to ease, accuracy and cost effectiveness.

Among 65.3% of respondents who practiced complete denture in our study used alginate (61.5%) as a primary impression material followed by impression compound (36.2%) and elastomers. For Border molding, almost all our respondent 96% used green stick which is similar to the primary impression materials used in the study done by Alquattan et al (2016)[9] and Bochhibhoya et al (2018)[6].

However, for final impression 72.3% our population used zinc oxide eugenol followed by elastomers (29.5%). Contrasting to our study Alquattan et al[9] reports more than 75% of their participants preferred elastomers followed by zinc oxide eugenol in Saudi Arabia. Majority of our study population used hand and functional manipulation (69.6%) with selective pressure technique (88.8%) for impression whereas mucostatic impression technique was utilized in the study done by Wajdy A Alquattan et al.[9]

Among 251 respondents practicing complete denture 31 people have opted to digital impression since a year time which shows that technology embedding more and more aspects of clinical dentistry as the ability to capture digital impression adds a new level.[13]

With the advancement in clinical dentistry, use of dental implant practice has increased. In our study, out of 251 participants 41.4% of our respondents practiced dental implant, suggesting 10% increase in number of practitioners since 2021 .[14.]

In our population, the most preferred technique for implant prosthesis impression was open and closed tray according to situation (61.7%), followed by open tray (16.5%) technique which is in contrast with the study done by Omer et al(2024) where 54.2% accepted open tray technique.[15]Addition silicone was material of choice for both the study population of ours and Erbil Iraq[15] which was found to be 84.5% and 75% respectively.[15]

Among 104 people practicing dental implants, 53.7% of them has opted to digital impression since a year as adaptation to the technology.

CONCLUSION

With the advancement of technology, digital dentistry is being more popular. Simultaneously, digital impression technique is also becoming widespread among dental practitioners. However, as the popularity

of digital impression keeps on increasing, the importance of conventional impression material and techniques have not faded out as maximum number of our study population are using conventional impression materials and techniques in various parts of prosthodontics practice.

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