

ORIGINAL ARTICLE

TRENDS IN COMPLETE DENTURE IMPRESSIONS IN PAKISTAN

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Background: Multiple materials and techniques have been reported for complete denture impressions in literature. The aim of the study was to assess the trends in complete denture impression materials and techniques among general dental practitioners (GDP) and specialists (SP) in Pakistan. **Methods:** In this cross-sectional study, self-designed-structured questionnaires were distributed among 500 dentists in Pakistan. The three-part questionnaire enquired about the demographic features, preferred impression materials, impression techniques and related procedures commonly used in their clinical practice. A comparison between the responses of SP and GDP was also drawn. Frequency distribution and Chi-square test were performed to compare the responses. **Results:** A total of 294 questionnaires were completed at a response rate of 58.8%. 75% of GDP used alginate for primary impressions and 66% of SP preferred impression compound for the same. A majority of both SP and GDP favoured the used of custom trays (SP 81%, GDP 85%) and selective pressure technique (SP 84%, GDP 53%) for final impression. However, 85% of GDP used zinc-oxide eugenol and 62% of SP favoured elastomeric materials for the same. Most of the SP and GDP used chemical cured resin custom trays (SP 54%, GDP 75%), however, 86% of SP used spaced trays and almost 60% of GDP preferred close-fitting trays. **Conclusions:** The practice of GDP and SP with regards to CD impression materials and techniques differed significantly. Continued education and training for GDP and SP with respect to procedures and techniques related to CD is recommended.

Keywords: Practice, Complete denture, Impression materials, Impression techniques, General dental practitioner, Specialist

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INTRODUCTION

Conventional complete dentures (CD) are the most commonly used tooth replacement option for the edentulous patients. As the number of edentulous geriatric patients have increased due to healthy ageing¹, the importance of conventional complete denture fabrication procedures (clinical and laboratory) has become more critical. One similar step is impression making (impression materials, trays, pouring and disinfection) of edentulous ridges, which is considered central to the function and clinical success of complete dentures.²

Traditionally, impressions for edentulous patients involve a primary impression resulting in a primary cast, on which a custom tray for final impression is fabricated. A master cast is prepared from the final impression, upon which the denture is fabricated. Both primary and final impressions must be disinfected and poured with dental stone for the denture fabrication procedure. This multi-step process potentially incorporates inaccuracies in the final prosthesis. As a consequence, multiple reports have been published justifying the use of different impression materials and techniques for improving the success of complete dentures in different clinical scenarios.³⁻⁶

Conventionally, the primary impressions are recorded in stock and the final impressions in custom trays. The design and spacing for the custom tray depends on the material to be used for final impression. Traditionally, the recommended final impression material has been zinc-oxide eugenol paste (ZnOE)⁵, however more recently polyvinyl siloxanes (PVS) have been suggested⁷. For primary impressions of CD, use of impression compound has long been taught in undergraduate curriculum; however there have been reports in support for the use of alginate material.^{8,9} Furthermore, multiple techniques for CD impressions are employed subject to the clinical scenario, categorized as, mucostatic, muco-compressive and selective pressure.

In a survey among the dentals schools of United States, selective pressure technique was found to be the most preferably practiced method along with the use of impression compound (border moulding) and perforated light cured custom trays.¹⁰ In a further study among prosthodontists (specialist) and general dental practitioners (GDP), a variation of materials and techniques were found to be used for CD impressions. Moreover, increasing trends of PVS and polyether being used as materials for border moulding of custom trays (final impression) was observed.¹¹ However, in recent study among the

dental graduates of Pakistan¹², primary impression using impression compound and final impression in acrylic custom tray with ZOE was preferred by more than 95% of the respondents. Such variation in procedures for the construction of CD tempts us to speculate the trends in the practice of GDP and specialist (SP) in Pakistan. Furthermore the question originates, is there a difference in practice between SP and GDP with regards to the CD impressions and related procedures. To date no studies have reported these comparative trends (SP and GDP) in relation to CD impressions. Hence the aim of this study was to assess and compare the trends in CD impressions (materials, techniques, impression pouring and impression disinfection) between SP and GDP.

MATERIAL AND METHODS

It was a cross sectional study conducted among general GDP and specialist (SP) in Pakistan. GDP included in the study were the ones who graduated as dentist and had completed minimum one-year internship. SP were those who have completed a postgraduate specialist programme in prosthodontics and/or master's degree. Participants also had to be currently engaged in dental practice, teaching or both. The contact details of the clinicians were obtained from the office of Pakistan Dental Association. The ethical committee of College of Dentistry, Ziauddin University, approved the study protocol.

A self-designed structured questionnaire in English language was used as an instrument for data collection. The questions included in the survey form were finalized after a pilot distribution of thirty primary questionnaires within the college of dentistry, Ziauddin University. The study questionnaire was divided into three parts.

The first part of the questionnaire enquired about the respondent's demographic features along with, category of practice and years of experience. The second section involved six questions related to the preferred materials used in complete denture impressions. These included materials for preliminary and final impressions, type and materials for impression trays and impression pouring and disinfection materials.

In the last part of the questionnaire, participants were required to express their practice of preferred techniques for complete denture impressions. These included techniques for final impression and posterior palatal seal, preferred pre-pouring and disinfection times and design and storage of impression trays.

A total of 500 questionnaires were randomly distributed by hand, email or both between GDP and SP in the major cities of Pakistan. The contact details of the dentists were obtained from Pakistan Dental

Association (PDA). Data entry and statistical analysis was performed using SPSS version 16 SPSS Inc., Chicago, IL, USA). Frequency distribution along with assessment of statistical significance between GDP and SP, for each question was performed using Chi-Square test, considering $p < 0.01$ to be statistically significant.

RESULTS

A total of 294 questionnaires were completed out of the 500 distributed (response rate 58.8%). 17% (50) of the responses were from SP and 83% (244) from GDP. The percentage of female participants among SP and GDP groups was 14% (7) and 27.8% (68) respectively. 28.5% (84) of responding dentists were working in private sector, 44% (129) belonged to teaching hospitals and 27.5% (n=81) were practicing at both private and teaching facilities. Regarding clinical experience of participants, almost 51.3% (151) had less than 1 year, 35% (103) had one to five years, 9.5% (28) had five to ten years and 4% (12) having more than 10 years (Table-1).

Regarding different materials used in procedures related to CD impressions, the responses by SP and GDP significantly differed in five out of six questions (Table-2). The preferred material for primary impressions was impression compound for specialists (66%, 33) and alginate for GDP (75%, 185). A majority of both SP (84%, 42) and GDP (67%, 164) favoured type III stone for pouring primary impressions. With statistical similarity, both SP (82%, 41) and GDP (85%, 209) favoured the use of custom trays over stock trays for final impression. Although a majority of SP (54%, 27) and GDP (75%, 185) used chemical cured acrylic resin custom trays, 36% (18) of SP utilized visible light cured (VLC) resin trays. 85% (n=209) of GDP used zinc oxide eugenol paste (ZOE) as the material of choice for final impression. However, 46% (23) and 32% (16) of SP preferred polyvinyl-siloxanes (PVS) and ZOE respectively. Sodium hypochlorite (NaOCl) was the alginate disinfectant of choice for both SP (76%, 38) and GDP (52%, 127).

Table-3 presents a numerical summary of participant responses related to techniques and procedures in CD impressions. In this section, the responses of SP and GDP in six out of eleven questions (55%) differed significantly. Although 61% (150) of GDP pour primary alginate impressions immediately, 84% (42) of SP preferred to pour these impressions within 15 minutes. Almost 70% of both groups [(SP,35) and (GDP,180)] requested L shaped handles for the impression trays and 58% (29) and 72% (176) of SP and GDP respectively, did not use occlusal stops in the custom trays. Furthermore, 86% (43) of SP used spaced impression trays; in contrast, 46% (146) of GDP used close-fitting trays. More than

80% of participants in both groups responded negatively to the practice of storage of resin trays in water. Use of selective pressure impression technique was selected by 53% (130) of GDP and 84% (42) of SP. Lastly, for the recording of posterior palatal seal (PPS), 40% (99) of GDP used arbitrary scrapping technique, however, 74% (37) of SP preferred conventional technique. Significant difference ($p < 0.01$) existed between the practice of GDP and SP in relation to the techniques used for final impression and recording of PPS.

Table-1: General characteristics of participants

Features		GDP % (n)	SP % (n)	p-value
Gender	Male	72.1 (176)	86 (43)	0.01
	Female	27.8 (68)	14 (7)	
Work	Private	31.9 (78)	10 (5)	<0.01
	Teaching hospital	47.9 (117)	26 (13)	
	Both	20.0 (49)	64 (32)	
Experience	≤ 1	56.9 (139)	24.0 (12)	<0.01
	>1-5	33.1 (81)	44.0 (22)	
	>5-10	5.7 (14)	28.0 (14)	
	>10	4.0 (10)	4.0 (2)	

GDP: General dental practitioners, SP: Specialist

Table-2: Participant responses in relation to complete denture impression material

Question	Response options	GDP % (n)	SP % (n)	p-value
Which material do you use for primary impressions?	Imp. Compound	24.1 (59)	66.0 (33)	<0.01
	Alginate	75.7 (185)	34.0 (17)	
Which material do you use for pouring impressions?	Type II stone	20.9 (51)	16.0 (8)	<0.01
	Type III stone	67.2 (164)	84.0 (42)	
	Type IV stone	11.4 (28)	0.0 (0)	
Which type of tray do you use for final impression?	Plastic stock	2.0 (5)	11.8 (6)	0.01
	Metal stock	11.4 (28)	5.7 (3)	
	Custom	85.6 (209)	82.0 (41)	
Which material do you use for custom tray fabrication?	Chemical-cure acrylic resin	75.8 (185)	54.0 (27)	<0.01
	Light cure acrylic resin	6.5 (16)	36.0 (18)	
	Not known	17.2 (42)	10 (5)	
Which material do you use for final impression?	Alginate	4.5 (11)	6.0 (3)	<0.01
	ZOE	85.6 (209)	32.0 (16)	
	PVS	4.9 (12)	46.0 (23)	
	Polysulphide	4.9 (12)	16.0 (8)	
Which material do you use for Alginate impression disinfection?	H ₂ O ₂	2.0 (5)	6.0 (3)	<0.01
	1% NaOCl	52.0 (127)	76.0 (38)	
	2% Gluteraldehyde	39.3 (96)	2.0 (1)	
	CHX	2.0 (5)	18.0 (9)	
	No known	4.5 (11)	2.0 (1)	

GDP: General dental practitioners, SP: Specialist Imp: Impression, ZOE: Zinc oxide eugenol, PVS: Polyvinyl siloxane, H₂O₂: Hydrogen peroxide, NaOCl: Sodium hypochlorite, CHX: Chlorhexidene

Table-3: Participant responses in relation to complete denture impression and related techniques

Question	Response options	GDP% (n)	SP% (n)	p-value
Do you make primary impressions?	Yes	86.8 (212)	94.0 (47)	0.08
	No	13.1 (32)	6.0 (3)	
When do you pour alginate impression?	Immediately	61.4 (150)	4.0 (2)	<0.01
	Within 15 minutes	30.7 (75)	84.0 (42)	
	After an hour	7.7 (19)	12.0 (6)	
What type of custom tray do you use?	Close fitting	59.8 (146)	14 (7)	<0.01
	Spaced	25.8 (63)	86 (43)	
	Not known	14.3 (35)	0.0 (0)	
Do you request handle for the custom tray?	Yes	82.7 (202)	96 (48)	<0.01
	No	17.2 (42)	4 (2)	
Which type of handle do you request?	L shaped	73.7 (180)	70.0 (35)	<0.01
	Stubs (in centre)	5.7 (14)	6.0 (3)	
	Stubs (in premolar region)	10.6 (26)	22.0 (11)	
	Not known	9.8 (24)	0.0 (0)	
Do you store acrylic trays in water to avoid warpage?	Yes	12.7 (31)	18 (9)	0.2
	No	87.2 (213)	82 (41)	
Do you use occlusal stops in custom trays?	Yes	27.8 (68)	42 (21)	0.03
	No	72.1 (176)	58 (29)	
Do you disinfect impressions in clinics?	Yes	66.8 (163)	82 (41)	0.01
	No	33.1 (81)	18 (9)	
Which technique do you use for final impression?	Muco-compressive	6.9 (17)	4 (2)	<0.01
	Muco-static	21.7 (53)	12 (6)	
	Selective pressure	53.2 (130)	84 (42)	
	Not known	18.0 (44)	0.0 (0)	
Which method do you use for posterior palatal seal?	Arbitrary scrapping method	40.5 (99)	14 (7)	<0.01
	Physiologic method	21.7 (53)	12 (6)	
	Conventional	37.7 (92)	74 (37)	

GDP: General dental practitioner, SP: Specialist

DISCUSSION

The study presents a unique data comparison of practice of CD impressions between SP (prosthodontics) and GDP in Pakistan. The overall response rate was 58.8%. Although low, response rates of around 50–55% have been reported before for paper surveys.¹³ Some of the reasons attributed to the fewer participants could possibly include inactivity of PDA members, members belonging to different dental specialty and members failing to update contact details. In terms of clinical experience of participants, the majority groups for GDP (56%,139) and SP (44%,22) were less than one year and one to five years respectively. This statistical difference in participant experience renders the practice comparison for CD impressions and related procedures weak. Only 25.5% (75) of study participants were female. This simply reflects the fewer female dental practitioners in contrast to the high percentage of female dental graduates.

Impression compound allows for soft tissue compression, which is desired in primary impressions for CD. However, there has been a decline in its use in primary impressions due to difficult workability and unreliable sterilization in case of re-use. Conversely, the availability and working properties of high viscosity alginates has favoured its use as a primary impression material.^{14–16} Therefore, one possible explanation for the preferred use of impression compound and alginate by SP (66%, 33) and GDP (75%, 185) in the study could be the difference in teaching and training of pre and post-doctoral students.

The use of custom trays for final impression has been established as gold standard in CD procedures. And studies have reported their extensive use in CD impressions ranging from 75–98% of participating dentist.^{10,17} In the present study, both GDP and SP showed more than 80% use of custom trays for final impression. Furthermore, 36% (18) of SP favoured the use of VLC custom trays. VLC resin has been introduced for tray fabrication since the 1990s and offer advantages of rigidity, biocompatibility, accuracy and ease of fabrication over chemically cured trays.^{10,18} A study by Khan and Geerts (2009)¹⁹, showed improved flexural strength and fracture toughness for VLC trays in comparison to chemically cured trays. In the study investigating the trends of final impressions techniques among dental schools, 70% of dentists used VLC trays for final impressions.¹⁰ Thirty six percent of SP using VLC trays reflects the change in trends among SP in Pakistan towards evidence-based dentistry.

ZOE is the traditional material for CD final impressions as it provides good surface detail, allows

additions and is cost-effective. However ZOE fails to record undercuts, which has shifted the trend towards increased use of elastomeric materials including, PVS, polysulphide (PS) and polyethers. In a recent study by Mehra *et al.*,¹⁸ PVS (42%) was shown to be the most common material for final impression followed by PS (32%). Interestingly in the present study, 62% (31) of SP (46% PVS & 16% PS) favoured the use of elastomeric materials for final impression in comparison to 10% (24) of GDP (4.9% PVS & 4.9% PS). Reasons for this difference between GDP and SP reflect the increased exposure and long-term training of SP leading to a much contemporary and evidence-based practice. A finding of note for alginate impression disinfection was the use of 1% sodium hypochlorite [(GDP 52%,127) & (SP 76%,38)] and 2% glutaraldehyde [(GDP 39%,96) & (SP 2%,1)] as commonly used disinfectants. Similar results have been shown by Ferreira *et al* previously.²⁰

Alginate impressions undergo syneresis (loss of water) and imbibition (uptake of water) during storage, resulting in dimensional changes of cast. The present study showed that, almost 90% (n=269) of participants pour alginates within 15 minutes of recording impression, which is the recommended protocol.²¹ Materials used for impression influence tray designs. ZOE impressions are made using close fitting trays and are the material of choice for GDP, hence most GDP use these trays. The reason for increased used of spaced trays by SP is similar, as impression elastomers require space within trays. Tray handle is a vital part of tray and if not designed properly can interfere with oral musculature position; therefore some dentists instead of L shaped handles use stubs in the central or premolar regions of the tray (especially mandibular). In the present study, participants believed that L shape was the most commonly used tray handle design.

It is believed that storage and transport of trays made of acrylic resin should be done in the presence of water is to avoid war page.²² Surprisingly, more than 80% of both GDP (213) and SP (41) did not store the acrylic custom trays in water, increasing the potential for inaccuracies in the final impression. A high percentage of dentists [(GDP 72%, 126) & (SP 58%, 29)] also disapproved of using stops in custom trays in the present study. Absence of occlusal stops makes it impossible to standardize material thickness during impression, hence rendering the impression inaccurate. One reason for this could be due to the clinician's preference of different impression techniques, as all techniques do not require occlusal stops.

Selective pressure impression with compound border moulding of spaced custom tray

(Boucher's technique), is believed to be the most commonly taught and applied final impression technique and the results of the present study are consistent with the previous studies.^{10-12,14, 15,17} A disappointingly high number of GDP (40%,99) favour using arbitrary scraping technique, for incorporation of PPS in dentures. While being convenient this method is mostly inaccurate, resulting in defective retention and stability of maxillary prosthesis. However, majority of SP used the more accurate, conventional technique for PPS record. This suggests a weakness in the practice of GDP and elevates the pressing need for improved training and teaching of graduating dentists with respect to complete dentures.

CONCLUSIONS

General dental practitioners showed preference towards traditional materials and techniques for CD procedures, including alginate and ZOE materials, chemical cured custom trays and selective pressure impression technique. SP showed greater utilization of contemporary trends in CD procedures and techniques, including VLC trays and elastomeric impression materials. Both GDP and SP displayed clinical practices deviating from established standards, including dry storage and lack of occlusal stops in trays and use of arbitrary scraping method for PPS. The practice of GDP and SP with regards to CD impression materials and techniques differed significantly.

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