RESEARCH ARTICLE

Current trends in complete denture education in undergraduate dental colleges of Pakistan

Muneeb Ahmed Lone[1], Bharat Kumar[2], Hira Musharraf[3], Maham Muneeb Lone[4], Mohid Abrar Lone[5], Muhammad Saad Shaikh[6], Ahsan Inayat[7], Muhammad Abbas[8]

Abstract

Objective: To determine the current trends in complete denture education in undergraduate dental colleges.

Method: The survey-based study was conducted in April and May 2020 at undergraduate dental colleges of Pakistan, and comprised heads of the Prosthodontics Department at all dental colleges across Pakistan having at least one batch of final year dental students. Data was collected using an online predesigned questionnaire that explored theoretical and practical teaching patterns of complete denture prosthodontics in the undergraduate years, and the materials and practices of students when constructing complete dentures in the clinics. The participants were given the option of choosing more than one option where needed. Data was analysed using SPSS 23.

Results: Of the 49 subjects approached, 40(81.6%) returned the forms duly filled; 11(27.5%) from public-sector institutions and 29(72.5%) from the private sector. There were 26(65%) institutions which required that their undergraduate students fabricate 2-4 conventional complete dentures. In all 40(100%) colleges, faculty gave live clinical demonstrations before students fabricated conventional complete dentures in the outpatient departments. Teaching strategy included small group discussions in 25(62.5%) institutions. Green stick 40(100%), zinc oxide eugenol 40(100%) and impression compound 39(97.2%) were the materials of choice for various steps of impression making. In all the 40(100%) institutions, students fabricated conventional complete dentures during their prosthodontics rotation. Immediate, copy and overdentures were constructed by students in 8(20%), 3(7.5%) and 8(20%) institutions, respectively.

Conclusions: Majority of the dental schools used similar impression materials and techniques for fabricating conventional complete dentures. Didactic teaching of conventional and unconventional complete dentures was being carried out at a majority of the dental institutions studied.

Keywords: Current trends, Complete dentures, Undergraduate dental education. (JPMA 73: 2029; 2023)

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Introduction

Edentulism is a state of the jaws after the loss of entire dentition, thus it is considered to be a final indicator of disease burden of oral health.[1,2] In 2013, a study conducted to assess global burden of diseases reported that oral disorders accounted for 1.65 million people living with disability, with edentulism liable for one-third of afflictions.[3] Even though this may not be a fatal disease, it has various deleterious social, aesthetic and functional effects.[4] In order to rehabilitate the function and aesthetics in such cases, provision of conventional complete dentures (CD) is one treatment option.[4-6] Since these dentures are generally given to the aging population, it is necessary to provide them with the best possible prosthesis that fulfils their needs and reduces the burden on their already compromised and debilitating physiological condition.[5] To provide patients with the best care, it is necessary that dentists providing this service are well-trained and knowledgeable regarding this treatment modality.[5,7] To ensure this, it is essential that dentists are adequately trained and educated in the field of removable prosthodontics from an undergraduate level before they start to provide services to their patients in independent clinical settings.[7,8]

Even though there is still a need to provide patients with dentures and, therefore, dentists with required skills are required, but a declining trend towards importance of teaching CDs at the undergraduate level has been

[1,7]Department of Prosthodontics, Dr. Ishrat-ul-Ebad Khan Institute of Oral Health Sciences, Dow University of Health Sciences, Karachi, Pakistan; [2]Department of Prosthodontics, Dow International Dental College, Dow University of Health Sciences, Karachi, Pakistan; [3]Department of Prosthodontics, Dow Dental College, Dow University of Health Sciences, Karachi, Pakistan; [4]Department of Operative Dentistry, Sindh Institute of Oral Health Sciences, Jinnah Sindh Medical University, Karachi, Pakistan; [5]Department of Oral Pathology, Sindh Institute of Oral Health Sciences, Jinnah Sindh Medical University, Karachi, Pakistan; [6]Department of Oral Biology, Sindh Institute of Oral Health Sciences, Jinnah Sindh Medical University, Karachi, Pakistan; [8]Department of Prosthetic Dental Sciences, College of Dentistry, Jouf University, Kingdom of Saudi Arabia.

Correspondence: Ahsan Inayat. e-mail: ahsan_inayat@hotmail.com
ORCID ID. 0000-0001-8327-8320

reported.[8] This problem was highlighted as early as in 1970.[9] This is because of the belief that with improved preventive dentistry, there will be very few edentulous patients in the future, thereby the requirement of conventional CDs will diminish.[8,10] Today, however, we live in a time where increased life expectancy is anticipated, thus edentulism and its related sequelae are likely to be relevant public health issues.[4,11] This means that knowledge and skills regarding the management of edentulous patients will be of prime importance as the century progresses. A recent study in Karachi, Pakistan, reported that a large majority of dentists still experience an 'increasing' trend of conventional CD provision in clinical practice.[12] This practice may be justified due to the decreased cost and reduced treatment time associated with the provision of conventional CDs for treating edentulous patients compared to other unconventional treatment options. Therefore, it is a necessity that dental schools continue to evaluate the curricula of removable prosthodontics to make sure that recent clinical techniques and treatment modalities are being taught to undergraduate students.[13] This is of utmost importance so that they are competent to address dental health needs of CD patients after graduation from dental schools.

Over the years, studies have been conducted in developed countries to evaluate methods employed in teaching CD prosthodontics, theoretically and practically, in undergraduate dental schools.[7,8,10,14] Formal lectures and seminars / tutorials are the mainstay of teaching, with innovative teaching by e-learning and problem-based learning also used sparingly to impart theoretical knowledge.[8,14] Extensive literature search led to no study that has assessed current teaching and clinical practice in Pakistan. The current study was planned to fill the gap by determining the current trends related to CD teaching at undergraduate level, including the materials and techniques used in different dental colleges.

Subjects and Methods

The survey-based study was conducted in April and May 2020 at undergraduate dental institutes of Pakistan after taking approval from the ethics review committee of Fatima Jinnah Dental College, Karachi (Ref # AUG-2019-PRSO1), and comprised heads of the Prosthodontics Department at all dental colleges across Pakistan having at least one batch of final year dental students. Dental colleges established less than four years and not having a final year batch of students were excluded.

Data was collected using a questionnaire on the basis of extensive literature search of similar studies done internationally.[7,8,10] It was subsequently modified according to local settings. Two content experts were asked to go through the compiled questionnaire, and the opinion of a medical education expert was sought regarding its layout and clarity. As a pilot study, the faculty of Prosthodontics at a dental college was asked to fill in the questionnaire. All opinions were evaluated and necessary changes were incorporated. The questionnaire included questions related to theoretical and practical teaching of CD prosthodontics in undergraduate dental curriculum and the materials and practices of students when constructing CDs in the Prosthodontic out-patient department (OPD) clinics.

The first section of the questionnaire is related to demographic details of the participants. They had the option of stating the province where they were located in case they wanted to maintain institutional anonymity. Section II of the questionnaire included questions related to theoretical and practical teaching of CD prosthodontics. Section III had questions inquiring about the materials and practices of students when constructing CDs in dental OPDs. The participants had the option of choosing more than one option where needed.

A list of dental colleges approved by the Pakistan Medical and Dental Council (PMDC) was acquired and the questionnaire was sent online using Google Forms. An informed consent form was part of the questionnaire. The participants were sent a reminder after 2 weeks if they had not responded by then. The email address of the primary investigator was provided in case the participants had any queries or ambiguities. Data was analysed using SPSS 23.

Results

Of the 49 subjects approached, 40(81.6%) returned the forms duly filled; 11(27.5%) from public-sector institutions and 29(72.5%) from the private sector. Majority of the colleges were located in the Punjab province (Figure 1).

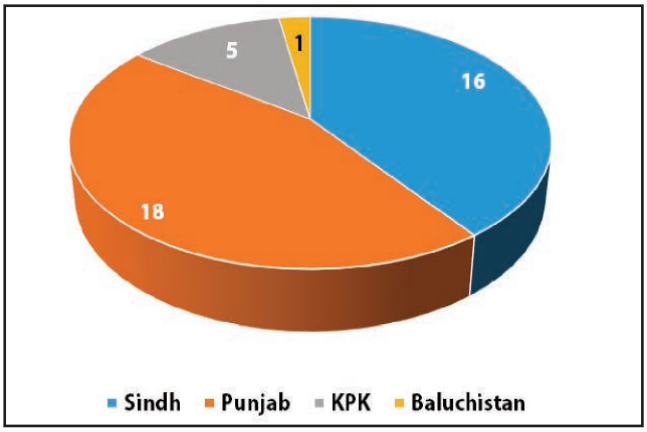

Figure-1: Institutions' distribution according to provinces.
KPK: Khyber Pakhunkhwa.

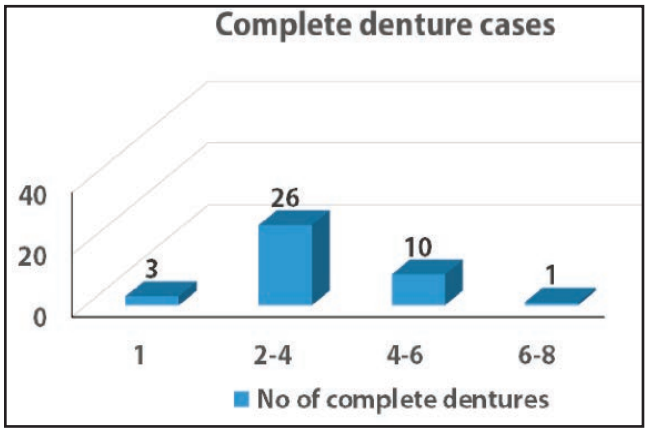

Figure-2: Number of complete denture cases fabricated by undergraduate dental students

There were 26(65%) institutions which required that their undergraduate students fabricate 2-4 Complete dentures (Figure 2).

In all 40(100%) colleges, faculty gave live clinical demonstrations before students fabricated Complete dentures in the OPDs, 38(95%) colleges taught CDs in the final year of dental college, 2(5%) in the second academic year, and pre-clinical Prosthodontics was taught in 35(87.5%) colleges. Teaching strategy included small group discussions (SGDs) in 25(62.5%) institutions (Table 1).

All 40 dental colleges recommended Complete Denture Prosthodontics by Zarb as the text book of choice for CDs. Text book by John Joy Manapallil was recommended by 16(40%) and that by Sheldon Wrinkler was recommended by 11(28%) colleges. Only 12(30%) colleges recommend journals to their students along with textbooks.

Students of all 40(100%) colleges carried out laboratory work of CD fabrication by themselves. Green stick 40(100%), zinc oxide eugenol 40(100%) and impression compound 39(97.2%) were the materials of choice for various steps of impression making (Table 2).

Selective pressure was the most commonly employed technique for final impressions 35(87.5%) colleges, followed by mucocompressive 11(27.5%) and mucostatic 8(20%).

The most popular material used by students for fabrication of record bases was heat cure acrylic resin in 35(87.5%) colleges. Students at all 40(100%) dental colleges used extraoral measurements to establish the occlusal vertical dimension (OVD). Facial aesthetics were used to assess OVD at 21(52.5%) colleges along with extraoral measurements. Students of 6(15%) colleges also used speech along with other methods to determine OVD. To record centric relation, the common chosen methods were thumb and finger manipulation along with tongue placed in posterior aspect of palate at 24(60%) colleges. Taking eccentric interocclusal records was practiced at 3(7.5%) colleges. At 27(52.5%) colleges, modelling wax used as an interocclusal record medium, while students at 12(30%) colleges used both wax and bite registration paste.

Table-1: Methods used for teaching complete denture to undergraduate students.

Teaching methods	n (%)*
Lectures	40 (100)
Live clinical demonstrations	40 (100)
Small group discussions	25 (62.5)
Hands-on on models	19 (47.5)
E-learning/ Videos	5 (12.5)

*As more than one method is used by each dental college, the total percentage is more than 100.

Table-2: Materials used for impression for complete dentures.

Step of impression making	Impression material used	n (%)
Primary impression	Impression compound	39 (97.5)
	Alginate	17 (42.5)
	Polyvinylsiloxane	1 (2.5)
Border moulding	Green stick impression compound	40 (100)
	Poly Vinyl Siloxane	1 (2.5)
Secondary impression	Zinc oxide eugenol paste	40 (100)
	Polyvinyl Siloxane	3 (7.5)
	Alginate	2 (5.0)
	Polyether	1 (2.5)

*As more than one material is employed for impression making, the total percentage is more than 100.

Table-3: Articulators used by students during complete denture fabrication.

Articulator type	n (%)
Semi adjustable	28 (70.0)
Simple hinge	19 (47.5)

*As more than one articulator is advocated at a few colleges; the total percentage is more than 100.

Table-4: Procedures practiced by students at the Department of Prosthodontics.

Procedures practiced during complete denture (CD) construction	n (%)
Use of permanent bases at jaw relationship stage	35 (87.5)
Check records, remount and occlusal adjustment of dentures using articulator at fit stage	10 (25)
Facebow transfer	5 (12.5)
None of the above	2 (5)

*As more than one procedure was practiced by each dental college, the total percentage is more than 100.

Table-5: Methods of complete denture construction taught theoretically at different colleges.

Methods of complete denture construction	n (%)
Traditional/ conventional method	40 (100)
Copy denture	35 (87.5)
Immediate denture	37 (92.5)
Over denture	36 (90)
Implant supported prosthesis	25 (62.5)
CAD/CAM fabricated complete dentures	1 (2.5)

*As more than one method is taught by each dental college, the total percentage is more than 100. CAD: Computer-aided design, CAM: Computer-aided manufacturing.

Acrylic teeth were used at all 40(100%) colleges for CD construction. Semi-adjustable articulators were used by 28(70%) colleges (Table 3).

Students of all 40(100%) colleges used the conventional compression moulding method to process the dentures. Use of permanent bases at jaw relationship stage was prevalent at 35(87.5%) colleges (Table 4).

In all the 40(100%) institutions, students fabricated conventional CDs during their prosthodontics rotation. Immediate, copy and overdentures were constructed by students in 8(20%), 3(7.5%) and 8(20%) institutions, respectively, while most colleges only taught the subject theoretically (Table 5). Regarding implant supported/ retained dentures, 36(90%) colleges reported that students were not provided clinical experience due to constraints of time, resources and patient availability.

Discussion

The current study, to the best of our knowledge, is the first to highlight teaching practices of CD prosthodontics in undergraduate dental colleges of Pakistan. The study also described the different materials and techniques used by students when constructing CDs during their Prosthodontics rotation. Even though similar studies have been conducted over the years in other parts of the world,[7,8,10,14] none was conducted in Pakistan.

PMDC regulates the license to practice dentistry in Pakistan. A fresh graduate is eligible to start an independent clinical practice after clearing the National Licensing Examination (NLE). Rashid et al.[12] reported that a large majority (82%) of dentists in Karachi still experience an 'increasing' or 'not changing' trend regarding CD provision in clinical practice. It is thus important that a dental graduate is competent to rehabilitate edentulous patients by different treatment modalities, including provision of CDs to run a successful clinical practice.

In the current study, 26(65%) colleges required that their undergraduate students fabricate 2-4 conventional CDs, whereas 3(7.5%) colleges required that students make 1 denture only. Students on an average make only 3-4 dentures during their Prosthodontics rotation. To be competent in a skill set, clinical practice is said to be the mainstay. A recent study reported that undergraduate students perceived their clinical competence in Prosthodontics proportionate to the number of cases they executed during their clinical training.[15] It is thus important that students perform clinical procedures a number of times to develop the necessary clinical skills for independent practice after graduation. The earlier they are exposed to clinical settings, the more confident they are about carrying out the skills.[16] Emphasis should therefore be placed on dental colleges to increase the number of CD cases, the undergraduate students perform during their Prosthodontics rotation.

Pre-clinical and clinical training develops and fine-tunes psychomotor skills of students over the years. Pre-clinical training courses should therefore include skills that the students will perform in the clinical years before graduation. It is thus noteworthy that almost all (89.5%) dental schools in the current study had preclinical courses for CD fabrication in the second year of their course. This helps the students to be prepared before they carry out the procedures in clinical settings. Similar preclinical courses are also widely taught in American as well as British dental schools.[7,10]

Faculty of all 40 dental colleges in the study gave their students live clinical demonstrations for conventional CD construction before they construct them in the OPDs. Demonstration of skills by a facilitator, thereby providing the necessary learning guidance, is one of the key steps in any skill acquisition.[17] Students have also reported that if they receive demonstrations before carrying out a procedure, it helps when they perform it themselves.[18] Even in this era of digitalisation, a very small number of colleges in the current study reported the use of virtual aids like e-learning and videos to help augment student learning. Online teaching should thus be emphasised so that the students may benefit from modern and extensive online resources available, which may be more readily available than their facilitators. Clark et al. in 2010 reported that all dental schools in the United Kingdom had embraced e-learning and a large majority replaced live demonstrations with video programmes to teach clinical steps of CD fabrication.[10]

Students of all Turkish schools and a majority of schools in the United States (87%) and Spain (73.7%) use irreversible hydrocolloid for preliminary impressions.[7,8,14] In comparison, students of almost all dental schools (97.5%) in the current study used impression compound for preliminary impressions. Although alginate is the preferred material for initial impression in developed countries, impression compound is time-tested and has long been used as a primary impression material in undergraduate schools.[6]

Stability and dimensional accuracy of custom tray is important for final impressions. By their use, accuracy of final impression is ensured as their rigidity reduces any potential for distortion.[19] In the current study, custom tray was being used at all colleges for secondary impression-making, which is in agreement with practices in the US,

Turkey, the UK and Spain.[7,8,10,14] Border moulding in dental colleges in Pakistan was found to be done using green stick impression compound, which is a trend similar to British and Turkish schools.[8,10] For final impression-making, in all the dental schools of Pakistan, zinc oxide eugenol paste was being used, which is similar to the practice of Turkish and British undergraduate students.[8,10] In contrast, students in the US dental schools commonly use polyvinylsiloxane (PVS) for the final impressions.[7,20] The cost-effectiveness of the zinc oxide eugenol paste compared to PVS may be the reason that it is widely used in undergraduate dental settings.

About 70% of US pre-doctoral prosthodontic programmes use light-cured composite resin for fabrication of record bases, while only a very small number (14%) advocate use of acrylic resin for the same.[7] In Turkish dental schools, cold curing acrylic resin is the most popular material (70.5%), followed by light curing acrylic resin (29%).[8] In contrast, in the current study, the material of choice for fabrication of record bases was found to be heat cure acrylic resin (87.5%), followed by cold curing acrylic resin (15%). Use of heat cure acrylic base plate is advocated as it has a comparatively better accuracy of fit and determines the retention of denture base at an early stage.

Various techniques are cited in literature to record centric relation during CD construction. Positioning mandible in centric relation can be achieved by the clinician guiding the mandible, like bimanual and finger-thumb chin manipulation, or by patients' own actions, like placing tongue at the posterior aspect of palate.[21] Reproducibility is important when recording the centric relation and out of these two, clinician-guided jaw manipulation (bimanual and finger-thumb) are considered more reproducible.[22,23] In the current study, 60% of the colleges taught their students to use thumb and finger manipulation along with tongue placed at the posterior aspect of palate to record the centric relation. These findings are similar to teaching methods in American (68%) and Turkish (65%) schools.[7,8]

In the current study, students of only 3(7.5%) colleges practised eccentric interocclusal records when constructing CDs. Similar results were found in Turkish dental schools where only about 6% colleges taught both lateral and protrusive excursive records.[8] In stark contrast, majority (85%) of the students at US dental schools were taught protrusive and lateral excursive records when constructing CDs.[7] Due to great variations in precision of these records and lack of proof of their practicality in clinical results, eccentric occlusal records are seldom used nowadays in CD fabrication.[24]

Acrylic resin was the material of choice for artificial teeth in all colleges for CD construction in the current study, which is similar to practices in Turkish[8] and US[7] schools. This choice may be explained as it is easy to adjust acrylic resin teeth, their adhesion to the acrylic base is not affected after adjustments, and they are easy to polish post-adjustment.[25]

Almost two-thirds (70%) of colleges in the current survey advocated the use of semi-adjustable articulators when fabricating CDs. This practice is similar to schools of UK,[10] but less than what has been reported from US.[7] Semi-adjustable articulators have the provision of accepting a face bow record as well as centric and eccentric records. High cost of semi-adjustable articulators prevents students in developing countries, such as Pakistan, from affording these articulators. Nevertheless, students should be encouraged to use semi-adjustable articulators on a routine basis to fabricate quality dentures, thereby providing better treatment to their patients.

The check records and remount procedures help to correct processing changes and occlusal errors that occur during the CD fabrication process, thereby improving patient comfort and reducing the number of recall appointments.[26] In the current study, students of only 10(25%) colleges practiced check records, remount and occlusal adjustments by an articulator at the fit stage. This result contrasts from practice in the US where majority of students were required to perform remount procedures and occlusal equilibration at the time of denture delivery.[7] These procedures should thus be reiterated in the practice of dental students in local settings so that they may fabricate quality dentures.

All colleges (100%) used conventional compression moulding method and heat-curing technique for processing CDs in the current study. Although all Turkish schools and a large number of US schools (82%) also used similar denture processing techniques, 16% of the US schools also reported processing of CDs using contemporary techniques, like microwave processing and injection moulding technique.[7,8] In the modern era of machinery and digitalisation, these newer techniques should be sought to overcome the inherent issues with the age old conventional compression moulding method and heat-curing techniques.

Denture construction is a skill and to be competent in it, students must practise clinically after gaining basic theoretical knowledge. Even though didactic teaching of conventional and unconventional CDs was being carried out at almost 90% of the dental colleges in the current study, a very small number fabricated unconventional dentures, such as overdentures 8(20%), copy dentures 3(7.5%) and immediate dentures 8(20%) in the

Prosthodontics clinics. Lack of resources and time constraints were the commonly reported reasons for this practice. On the contrary, students of 88% dental schools in US and UK treated patients requiring tooth supported over dentures and copy dentures.[7,10] Undergraduate students must be given more clinical exposure to unconventional CDs, so they may broaden their skill set and treat a larger set of patients once they graduate.

In the current study, laboratory steps for conventional CD construction were performed by students of all dental schools. In contrast, majority of the studies in developed countries,[7,8,10] reported that their dental technicians had the responsibility to perform laboratory steps for the cases allocated to students. The current results are worth mentioning as conducting laboratory steps is essential for the students so they will be able to supervise the quality of laboratory stages of dentures in their future clinical practices. This will also help them better communicate with the dental laboratory staff after they graduate and start independent clinical practice.[8,13]

Implant-supported overdentures were taught theoretically at two-thirds of the dental colleges in the current study, but 90% of the colleges did not provide any clinical experience, including observation of surgical and restorative procedures, to students in the OPDs. Lack of resources, patient affordability and time constraints were the common reasons reported in this regard. These findings are analogous to results in Turkey, UK and Ireland where clinical experience of dental students related to restorative and surgical implant placement procedures was low.[8,27] A study in 2016 also reported that fabrication of implant-retained dentures is a competency that is still neglected at undergraduate level in colleges.[28] Dental schools should be encouraged to increase exposure of students to implant retained prosthesis to keep abreast with this contemporary treatment modality.

Conclusion

Majority of the dental schools were found to be using similar impression materials and techniques for fabricating conventional CDs. Didactic teaching of conventional and unconventional CDs was being carried out at almost 90% of the dental colleges. Faculty of all dental colleges gave their students live clinical demonstrations on steps of CD construction. Students on an average construct 3-4 complete dentures during their Prosthodontics rotation. However, students of only a few dental colleges fabricated unconventional dentures in their undergraduate years.

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