Fixed-prosthodontics in Nigerian private practice settings

Ikusika OF[1], Idon PI[2], Alalade O[3], Sotunde AO[4], Akinpelu MA[5], Igweagu CE[6]

[1]Department of Restorative Dentistry, Bayero University Kano/Aminu Kano Teaching Hospital Kano, Nigeria
[2]Department of Restorative Dentistry, University of Maiduguri/University of Maiduguri Teaching Hospital, Borno State, Nigeria
[3]Department of Restorative Dentistry, Bayero University Kano/Aminu Kano Teaching Hospital Kano, Nigeria
[4]Department of Restorative Dentistry, Bayero University Kano/Aminu Kano Teaching Hospital Kano, Nigeria
[5]Department of Restorative Dentistry, Obafemi Awolowo Teaching Hospital Ile-Ife, Osun State, Nigeria
[6]Department of Restorative Dentistry, Bayero University Kano/Aminu Kano Teaching Hospital Kano, Nigeria

Abstract

Context: Private practice dentistry is predominant in Nigeria. Audits of fixed-prosthodontic practice in these settings are rare and will highlight capacity and guide training. This study aimed to assess the scope and quality of fixed-prosthodontic practice in such settings in Nigeria.
Objectives: The study sought to assess:
- Participants' sociodemographic and their diagnostic and preoperative practices.
- The quality of impression making and operative technique, reviews and maintenance, temporization practices and communication with the laboratory.
- The range of treatments given and provision of advanced treatments.

Materials and Methods: An adapted questionnaire was administered electronically on Nigerian dentists practicing fixed-prosthodontics in private practice settings. Retrieved data underwent descriptive statistics and associations were tested with the Fischer's Exact and Chi-Square tests using IBM SPSS Statistics version 21. Statistical significance was set at p≤0.05.
Results: A total of 100 valid responses with a male:female ratio of 2.1:1 from 16 states were retrieved. Fifty-nine participants had only first degrees and mean experience was 14.3±9.5 years. There were 27 adequate responses with regards to range of treatments offered. Sixty-three participants practiced direct temporization. Twenty-one and 14 participants regularly practiced implantology and CAD/CAM dentistry respectively. Direct temporization was significantly associated with increasing education (X^2=6.03, p=0,05) and experience (X^2=13.2, p=0.03).
Conclusion: Only a few Nigerian dentists in private practice gave an adequate range of treatment. Most of them prefer direct temporization. Implantology and CAD/CAM dentistry practice are improving, but are still not very common.

Keywords: Dentistry, Fixed-prosthodontics, Private practice, Nigeria.

Corresponding Author: Dr Oluwafeyisayo Francis IKUSIKA

Senior Lecturer and Honorary Consultant Prosthodontist,
Department of Restorative Dentistry,
Bayero University Kano/Aminu Kano Teaching Hospital Kano,
Kano State, Nigeria
ORCID ID: 0000-0001-6494-1211
Email: feyiikusika@yahoo.com,
feyifrancisxavier@gmail.com, Phone: +2347039294927

Introduction

There are more private dental health facilities than public health facilities in Nigeria.[1,2,3] These private facilities also have a greater spread than the public facilities.[2,3] Access to private dental facilities is more convenient for many in the Nigerian State.[3] The proliferation of private practices may be related in

part to the permission granted public sector remunerated dentists to provide dental services in their private capacity by the regulatory authorities.[4] There is greater access to these private facilities by a greater proportion of the population. Investigations related to capacity in these private facilities will illuminate the spectrum and quality of service they provide to the society.

The area of fixed-prosthodontics has been described as a secondary level of dental service provision readily carried out by generalists.[5] The desire by dentists to engage in fixed prosthodontic practice is also encouraged by the lucrative nature of the practice.[6] The predilection of dentists towards performing fixed-prosthodontics in private practice is also encouraged by the more fluid nature of these private practices. Public dental facilities are usually regimented along departmental lines and tend towards a specialist service provision model.[7]

The scope of fixed prosthodontic practice is wide, but it essentially concerns itself with provision of dental prostheses which cannot be easily removed by the wearer.[8] It ranges from preoperative assessments and diagnoses to intraoperative techniques and impression making.[9] It also encompasses the range of restorations that can be made available to patients and the methods for temporization.[10] An assessment of fixed prosthodontic practice will also be incomplete without an assessment of currently available best practices like implantology and Computer Aided Design and Manufacturing (CAD/CAM). Temporization in fixed prosthodontics is a seemingly controversial topic.[11] The two methods of temporization have their own advantages and setbacks. There are as yet arguments for and against both methods. The predominant method chosen by most dentists in any studied community may however give insights into the level of their translation of academic training, and their dependence on laboratories for fixed-prosthodontic work.

This study aimed to perform an audit of Nigerian dentists who offer fixed-prosthodontic service in private practice settings with a view to assessing their level of service provision in the light of accepted norms within the dental profession. The study also sought to assess the level of exposure of our cohort to facilities for implantology and CAD/CAM dentistry.

Materials and methods

The study was a prospective electronic questionnaire-based survey of Nigerian dentists who perform fixed prosthodontic procedures in private practice settings. Ethical approval (NHREC/28/01/2020/AKTH/EC/3216) was obtained from the Ethics Review Board of the Aminu Kano Teaching Hospital. A two-section electronic questionnaire (Google Forms from https://www.google.com/forms/about) was adapted from a similar questionnaire validated in Saudi Arabia.[12] The questionnaire required consent before it could be filled. The questionnaire retrieved information on participants' sociodemographic with seven questions, while thirty-three five-point Likert scale questions retrieved information concerning fixed prosthodontic practice. The information retrieved about fixed prosthodontic practices was classified as follows: communication with laboratory, diagnoses and preoperative procedures, impression making and operative technique and range of available treatment. Other categories of practice assessed included techniques for temporization and capacity for advanced fixed prosthodontic treatment.

Fully registered dentists who perform fixed prosthodontic procedures in private clinic settings were eligible to participate in the study. The sampling for the study was a purposive sample of qualified potential participants. There was no attempt to determine a minimum sample size due to a paucity of local studies in this subject area. Questionnaires were administered electronically through personal contacts and on all available electronic portals for Nigerian dentists until a point of response saturation was attained. The questionnaires were administered for a period of six weeks until a whole week passed by without any response. This was taken to be the point of response saturation.

Data retrieved from the questionnaires was entered into an electronic spreadsheet and analyzed with IBM SPSS Statistics version 21. Sociodemographic data was subjected to descriptive statistics. The states in Nigeria from which participants were drawn were classified as Lagos, Abuja, North and South for ease of analysis. Data retrieved from the

Likert scale questions was categorized as adequate, fair and inadequate (or often, occasionally and rarely as appropriate). Associations were tested with the Fischer's Exact test or Chi-square test as appropriate. The level of statistical significance was set at p≤0.05.

Results

A total of 100 valid responses were retrieved from 102 responses. The 2 disqualified responses were from individuals who claimed not to practice fixed prosthodontics in private practice settings. There were 34 full-time private practitioners and 66 participants who only practiced privately occasionally (p=0.03). There were 68 (68%) males and 32(32%) females among the participants. Most (59%) of the participants attained only undergraduate qualification, while 41% had some form of postgraduate training or qualification. Ten participants were members of the postgraduate colleges, while 22 were fellows of these colleges. Nine participants had postgraduate specialist certification from institutions separate from the postgraduate colleges. The post-qualification experience of the participants ranged from 1 to 39 years with a mean duration of 14.3±9.5 years. Nineteen participants had 1 – 5 years' experience, 27 participants had 6 – 10 years and 12 participants had 11 – 15 years' experience. Many (42%) of the participants had greater than 15 years post-qualification experience. Fixed prosthodontic services was provided often, occasionally and rarely by 45%, 36% and 19% of the respondents respectively. (Table 1).

Participants from 16 states in the country participated in the study. Lagos State with 24 participants had the highest representation. Kano State with 23 participants and the Federal Capital Territory (FCT) with 14 participants were a close second and third respectively. The distribution of participants by States where they practiced is shown in Figure 1.

There were 73 adequate, 8 fair and 19 inadequate responses with regards to communication with the laboratory. There were 62 and 26 adequate and fair responses with regards to reviews and maintenance, while 12 responses were inadequate. There were 43 adequate responses regarding impression techniques and operative procedures, while 49 and 8

responses were fair and inadequate respectively. While 41 and 48 responses were adequate and fair regarding diagnoses and preoperative procedures, 11 responses were inadequate. Most (65) participants provided fair responses regarding the range of treatment they provided. However, 27 and 8 responses were adequate and inadequate respectively. Figure 2 summarizes the distribution of adequate, fair and inadequate responses to questions assessing fixed prosthodontic practices among participants.

Most (63%) respondents regularly temporize in their offices, and about half (49%) preferred to make their own temporaries. Few (30%) respondents preferred laboratory made temporaries, while even fewer (20%) relied on them. Majority of respondents had no access to CAD/CAM technology either locally (57%) or internationally (63%). Only 15% of participants had regular access to this technology. Many (42%) of respondents did not offer implant supported prostheses, while only 21% of respondents regularly offered such prostheses. The responses from participants regarding temporization and capacity for advanced fixed prosthetic work are shown in table 2.

There were statistically significant associations between participants' sociodemographic and their responses to queries on their fixed prosthodontic practices. A greater percentage of female participants gave responses considered adequate regarding reviews and maintenance compared to male respondents (X^2=6.99, p=0.03). The technique used for temporization was associated with the educational level attained by the respondents (X^2=6.03, p=0.05). The practice of in-office temporization was associated with attainment of higher educational qualification. This method of temporization was also associated with increasing years of post-qualification experience (X^2=13.2, p=0.03). The association between fixed prosthodontic practice and participants' sociodemographic is illustrated in Table 3.

There was less than 50% level of access to CAD/CAM technology both locally and internationally, while less than 20% used this technology regularly. There were no statistically significant associations between respondents' sociodemographic and their exposure to CAD/CAM technology. However, there were

Table 1. Sociodemographic characteristics of Nigerian dentists in private practice (n = 100)

Variables	N (n = 100)	Female, n (%) (n = 32)	Male, n (%) (n = 68)	P-value
Years of practice				0.45
1 to 5	19	8 (25)	11 (16.2)	
6 to 10	27	10 (31.3)	17 (25)	
11 to 15	12	2 (6.3)	10 (14.7)	
> 15	42	12 (37.5)	30 (44.1)	
Highest Qualification				0.41[a]
First degree	59	20 (62.5)	39 (57.4)	
Part 1 membership	10	1 (3.1)	9 (13.2)	
Fellowship	22	7 (21.9)	15 (22.1)	
PG specialist cert.	9	4 (12.5)	5 (7.4)	
Types of Practice				0.03*
Part time	66	26 (81.3)	40 (58.8)	
Full time	34	6 (18.8)	28 (41.2)	

*PG: Postgraduate, Cert.: Certification   *Significant at p= 0.05*
P-value obtained using Chi-square test and [a]Fisher's exact test
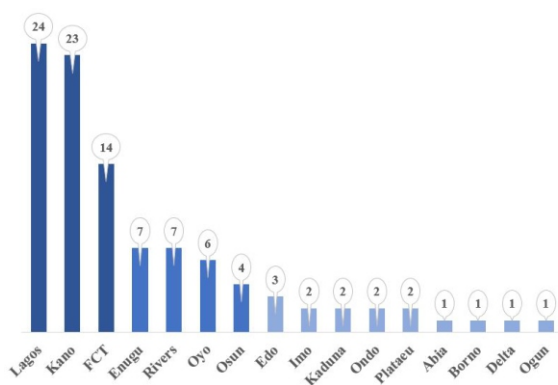
Figure 1. Distribution of Nigerian dentists who perform fixed-prosthodontics in private practice
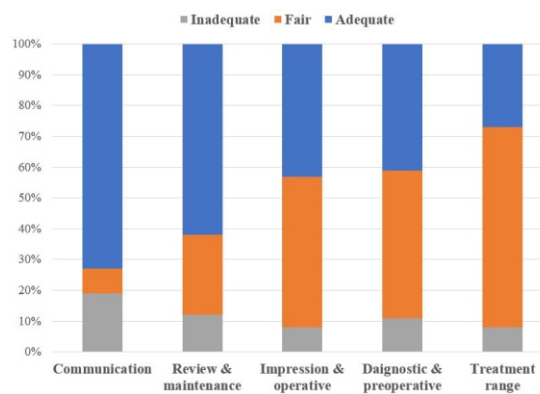
Figure 2. Frequency distribution of performance levels in relation to fixed prosthodontics among Nigerian dentists in private practice

Table 2. Temporization and capacity for advanced fixed prosthodontic treatments among Nigerian dentists in private practice

Items	n (%)				
	Never	Rarely	Occasionally	Often	Always
Do you temporize in your office?	8 (8)	13 (13)	16 (16)	34 (34)	29 (29)
Do you rely on lab-made temporization?	12 (12)	27 (27)	41 (41)	15 (15)	5 (5)
Do you prefer lab-made temporization?	10 (10)	26 (26)	34 (34)	21 (21)	9 (9)
Do you prefer to make your own temporaries?	6 (6)	16 (16)	29 (29)	29 (29)	20 (20)
Availability and Use of Advanced Technology					
Access to CAD/CAM technology locally?	57 (57)	17 (17)	11 (11)	9 (9)	6 (6)
Access to CAD/CAM technology internationally?	63 (63)	15 (15)	7 (7)	7 (7)	8 (8)
Do you offer implant supported restorations?	42 (42)	24 (24)	13 (13)	16 (16)	5 (5)

Table 3. Associations between respondent sociodemographic and practice of fixed-prosthodontics among Nigerian dentists in private practice

Practices aspects	Sociodemographic, n (%)							
	Gender		Education		Years of practice			
	Female	Male	First degree	PG	1 to 5	6 to 10	11 to 15	> 15
Formal communication								
Inadequate	7 (21.9)	12 (17.6)	12 (20.3)	7 (17.1)	2 (10.5)	9 (33.3)	0	8 (19.0)
Fair	0	8 (11.8)	5 (8.5)	3 (7.3)	1 (5.3)	2 (7.4)	1 (8.3)	4 (9.5)
Adequate	25 (78.1)	48 (70.6)	42 (71.2)	31 (75.6)	16 (84.2)	16 (59.3)	11 (91.7)	30 (71.4)
Fisher's test; *P*-value	4.28; 0.13		0.28; 0.94		7.45; 0.24			
Review & Maintenance								
Inadequate	4 (12.5)	8 (11.8)	9 (15.3)	3 (7.3)	3 (15.8)	4 (14.8)	0	5 (11.9)
Fair	3 (9.4)	23 (33.8)	15 (25.4)	11 (26.8)	3 (15.8)	9 (33.3)	3 (25.0)	11 (26.2)
Adequate	25 (78.1)	37 (54.4)	35 (59.3)	27 (65.9)	13 (68.4)	14 (51.9)	9 (75.0)	26 (61.9)
X^2; *P*-value	**6.99; 0.03***		1.46; 0.48		3.93; 0.70			
Diagnostic & preoperative								
Inadequate	3 (9.4)	8 (11.8)	7 (11.9)	4 (9.8)	4 (21.1)	3 (11.1)	0	4 (9.5)
Fair	16 (50)	32 (47.1)	28 (47.5)	20 (48.8)	7 (36.8)	15 (55.6)	3 (25)	23 (54.8)
Adequate	13 (40.6)	28 (41.2)	24 (40.7)	17 (41.5)	8 (42.1)	9 (33.3)	9 (75.0)	15 (35.7)
X^2; *P*-value	0.15; 0.93		0.11; 0.95		8.66; 0.17			
Impression & operative								
Inadequate	2 (6.3)	6 (8.8)	5 (8.5)	3 (7.3)	2 (10.5)	3 (11.1)	0	3 (7.1)
Fair	16 (50.0)	33 (48.5)	33 (55.9)	16 (39.0)	12 (63.2)	15 (55.6)	4 (33.3)	18 (42.9)
Adequate	14 (43.8)	29 (42.6)	21 (35.6)	22 (53.7)	5 (26.3)	9 (33.3)	8 (66.7)	21 (50.0)
X^2; *P*-value	0.19; 0.91		3.29; 0.19		6.89; 0.29			
Treatment range								
Inadequate	5 (15.6)	3 (4.4)	7 (11.9)	1 (2.4)	2 (10.5)	4 (14.8)	0	2 (4.8)
Fair	19 (59.4)	46 (67.6)	39 (66.1)	26 (63.4)	15 (78.9)	19 (70.4)	8 (66.7)	23 (54.8)
Adequate	8 (25.0)	19 (27.9)	13 (22.0)	14 (34.1)	2 (10.5)	4 (14.8)	4 (33.3)	17 (40.5)
Fisher's test; *P*-value	3.50; 0.18		3.88; 0.15		10.4; 0.08			
Do you temporize in your office?								
Never/Rarely	7 (21.9)	14 (20.6)	17 (28.8)	4 (9.8)	6 (31.6)	10 (37.0)	0	5 (11.9)
Occasionally	6 (18.8)	10 (14.7)	7 (11.9)	9 (22.0)	1 (5.3)	4 (14.8)	4 (33.3)	7 (16.7)
Often/Always	19 (59.4)	44 (64.7)	35 (59.3)	28 (68.3)	12 (63.2)	13 (48.1)	8 (66.7)	30 (71.4)
X^2; *P*-value	0.34; 0.85		**6.03; 0.05***		**13.2; 0.03***			
Rely on lab-made temporaries?								
Never/Rarely	11 (34.4)	28 (41.2)	24 (40.7)	15 (36.6)	7 (36.8)	11 (40.7)	2 (16.7)	19 (45.2)
Occasionally	13 (40.6)	28 (41.2)	21 (35.6)	20 (48.8)	6 (31.6)	10 (37.0)	9 (75.0)	16 (38.1)
Often/Always	8 (25.0)	12 (17.6)	14 (23.7)	6 (14.6)	6 (31.6)	6 (22.2)	1 (8.3)	7 (16.7)
X^2; *P*-value	0.85; 0.65		2.13; 0.35		7.55; 0.27			
Access to CAD/CAM tech. locally?								
Never/Rarely	22 (68.8)	52 (76.5)	47 (79.7)	27 (65.9)	17 (89.5)	22 (81.5)	8 (66.7)	27 (64.3)
Occasionally	4 (12.5)	7 (10.3)	3 (5.1)	8 (19.5)	0	1 (3.7)	3 (25)	7 (16.7)
Often/Always	6 (18.8)	9 (13.2)	9 (15.3)	6 (14.6)	2 (10.5)	4 (14.8)	1 (8.3)	8 (19.0)
Fisher's test; *P*-value	0.90; 0.72		5.03; 0.08		8.55; 0.16			
Access to CAD/CAM tech. abroad?								
Never/Rarely	26 (81.3)	52 (76.5)	44 (74.6)	34 (82.9)	15 (78.9)	22 (81.5)	8 (66.7)	33 (78.6)
Occasionally	1 (3.1)	6 (8.8)	5 (8.5)	2 (4.9)	0	1 (3.7)	2 (16.7)	4 (9.5)
Often/Always	5 (15.6)	10 (14.7)	10 (16.9)	5 (12.2)	4 (21.1)	4 (14.8)	2 (16.7)	5 (11.9)
Fisher's test; *P*-value	0.91; 0.68		0.95; 0.67		4.62; 0.58			
Offer implant supported restorations?								
Never/Rarely	16 (50)	50 (73.5)	39 (66.1)	27 (65.9)	14 (73.7)	18 (66.7)	9 (75)	25 (59.5)
Occasionally	7 (21.9)	6 (8.8)	9 (15.3)	4 (9.8)	0	6 (22.2)	1 (8.3)	6 (14.3)
Often/Always	9 (28.1)	12 (17.6)	11 (18.6)	10 (24.4)	5 (26.3)	3 (11.1)	2 (16.7)	11 (26.2)
X^2; *P*-value	5.81; 0.06		0.94; 0.62		7.19; 0.28			

differences in the response rates based on location. Participants in Abuja reported greater levels of exposure to CAD/CAM technology both locally and internationally. Lagos, the South and the North reported increasingly reduced levels of exposure in that order. Respondents from Lagos reported the highest levels of the practice of implantology. They were followed by respondents from Abuja, the South and the North in that order.

There were about 21.4% and 28.6% of respondents from Abuja who had access locally and internationally respectively to CAD/CAM technology. Lagos had 20.8% and 16.7% of respondents being exposed locally and internationally respectively. Southern states had 14.7% and 11.8% exposure respectively, while the Northern states had 7.1% and 10.7% exposure locally and internationally respectively.

The proportion of practitioners who regularly offered implant supported prostheses was similarly less than half of the respondents across all the regions surveyed. Lagos had 37.5% of respondents regularly offering this service. Abuja (28.6%), Southern States (17.6%) and Northern States (7.1%) followed in that order. There was no statistical significance in this proportion.

Discussion

The performance of regular audits has been advocated as a requirement for effective clinical practice.[13,14] Clinical audits may also be used as sources of information to refine dental educational programs.[15] Patel and co-workers found a diminished capacity of young dentists in some General Dental Council recommended competencies and attributed this to deficiencies in their undergraduate training.[15] Audits of fixed prosthodontic practices are available in the English Language literature.[12,16-18] We found that there was a paucity of African studies auditing fixed prosthodontic practice. However, we did find a retrospective audit of reasons why patients demanded fixed prosthodontic treatment from a Nigerian Teaching Hospital.[19]

We did not have any database readily available to obtain an estimate of the number and spread of qualified dentists engaged in fixed prosthodontics. A physical survey of available private dental clinics was discounted on account of the logistics of such,

and on account of the rather common occurrence of quackery in the country.[20,21] We decided to employ an online survey methodology where the professional validity of respondents could be ascertained by the distribution of questionnaires on professional social media platforms. We were however not unmindful of the strengths and weaknesses of this mode of data collection.[22] We were also guided to discontinue questionnaire administration at the point of data saturation by a consideration of documented factors that influence the effectiveness of online questionnaire administration.[23] We feel confident that our sample fairly represents the situation under consideration because our sample satisfied two principles propounded for purposive interview surveys.[24] The information redundancy principle (Lincoln and Guba)[24] and the information power principle (Malterud et al)[25] have been satisfied by the data we obtained. This is even in the face of receiving responses from less than 50% of the states in the Federation. The importance of obtaining baseline information on which future research can be based cannot also be discounted as another reason for making our findings public.

The gender difference observed within our cohort is in keeping with gender disparities already reported about dentists in Nigeria. Ogunbodede had reported a male preponderance among Nigerian dentists,[26] so our findings were not surprising. The greater numbers of participants with only a first degree is also in keeping with the historically reported perception of dentistry as mainly a primary care specialty.[5] Many of the specialists are likely to take up academic positions in teaching hospitals. These appointments may limit their involvement in private practice, and this may be partly responsible for the greater number of part time practitioners. The relatively experienced nature of the cohort of respondents may indicate that proficiency in fixed prosthodontics comes with increasing experience.[15] However, there may be a decline in the quality of fixed prosthodontic training in our dental schools. This may not be unrelated to reports of declining standards of dental education due to existential challenges in our dental schools.[27] This may be contributory to poorer expertise and confidence in fixed prosthodontic practice among recent dental graduates.

The greatest number of responses considered adequate was in communication with the laboratory and with patient review and maintenance. The least among the adequate responses were observed with the "hands-on" aspects of clinical management. These were in the areas of diagnoses and preoperative procedures, along with impression making and operative procedures. Generally, two out of every five respondents performed adequately in these areas. These results are similar to results obtained in a Saudi Arabian study.[12] These results suggest either an inadequate knowledge base or a general tendency for cutting corners among operators. When the limitations in treatment range offered by respondents are put into consideration, there arises the need to radically re-examine the nature of the undergraduate fixed prosthodontic course. There will always be many who will venture into private practice with only their undergraduate qualifications. The quality of training at this level may be a major determinant of their level of practice. The regulatory authorities should also pay greater attention to Continuing Dental Education when recertifying practitioners.

The area of temporization is an area where there are dissensions about the appropriate technique to employ.[28] Many clinicians advocate the use of direct temporization because of the greater control the dentist has over the process. However, this technique is said to create a thermal hazard for the pulp as the material for temporization sets.[29] The indirect technique avoids this potential hazard, but requires synergy between clinic and laboratory. The temporary must be fabricated before the patient can be discharged after preparation, and there may be delays in retrieving temporaries from laboratories. An ingenious method to discharge the patient before the provisional restoration is ready has been described. It involves the use of light cure periodontal surgical dressing material.[30] Most of our respondents preferred the direct technique for their temporization. This may be due to the logistics of getting temporaries from remote laboratories. This finding contrasts with the findings from an Indian study in 2019 where all participating dentists preferred an indirect method of temporization.[31] However, the indirect temporaries were mainly fabricated by the dentists in the clinic. Unfortunately, no reason was advanced for this

practice by the authors.

The field of fixed prosthodontics was revolutionized by two major developments. These are the introduction of Osseo-integrated implants and the development of CAD/CAM technology. The field of dental implantology was revolutionized by the work of Branemark,[32] while CAD/CAM technology became a viable treatment option in the mid-1980s.[33] Akeredolu et al drew attention to the low level of implantology practice among Nigerian dentists in 2007. They only found two dentists engaged in implantology in their survey.[34] This present study demonstrates an improvement in the number of dentists engaged in implantology nationally. This development validates the assertion by Ajayi et al, that there is an increasing level of awareness of implantology among Nigerian dentists.[35]

CAD/CAM technology was introduced to fixed-prosthodontics to shorten the time necessary for treatment. This is best exemplified by the Chairside Economical Restoration of Esthetics Ceramics (CEREC) system introduced in 1983.[36] The advantages of this system in improving efficiency and the quality of restorations have been reported in the literature.[33,36-39] However, the cost of this technology has limited the number of dentists who use these systems for their prosthodontic work.[37-39] It was estimated that only forty thousand dentists used these systems globally in 2014.[37] This is a small proportion of an estimated 703,947 dentists in a survey of 79 countries in 2000.[38] A study in Britain published in 2016 reported that majority of surveyed dentists did not use any part of the CAD/CAM workflow. There was a greater number of users in the private sector. However, most respondents in that survey believed that the technology will assume greater importance in future.[39] The figures obtained from our study are encouraging when viewed in the light of these studies. An almost three-fifth access to this technology locally is impressive for a developing economy. There should be concerted effort on the part of the dental profession to improve patient access to, and the popularity of this technology.

There was a tendency for both implantology and CAD/CAM services to be more available in the Cosmopolitan areas of Lagos and Abuja. This is not unexpected considering the fact that these cities are

a former and a present capital city respectively. There is a tendency for development to be concentrated in capital cities in many African countries.[40] These cities are likely to be at the forefront of material development in all facets of life including dentistry. The low level of implantology and CAD/CAM practice in Northern Nigeria should however cause concern. Dental education is relatively young in this region.[41] This provides an opportunity to structure training in such a way that contemporary treatment modalities are introduced as early as possible. The role of early exposure to training in implantology was highlighted by Ajayi and co-workers.[42]

The major limitation of this study is the inability to estimate the population of Nigerian dentists who engage in fixed prosthodontics in a private practice setting. This limitation brings to the fore the suboptimal levels of public data warehousing in our society. We recommend that all agencies concerned with the regulation of dental practice in the country synchronize their efforts and generate databases on all aspects of dental practice on a national level. These databases should also be updated regularly. We suggest annual updates when the registry of dental practitioners is being updated.

Conclusion:

Within the limitations of this study, most Nigerian fixed-prosthodontic services in private practice settings were rendered in cosmopolitan cities. Most dentists surveyed had acceptable levels of performance in the clinical aspects of fixed prosthodontics, however only a few practitioners provided an adequate range of treatments. The best performances were in the areas of maintaining restorations and communication with the laboratory. Most of the dentists preferred direct temporization and this was positively related to experience and obtaining some postgraduate qualification. There is an increasing level of the practice of implantology which is mainly available in cosmopolitan areas. There is an appreciable level of access to CAD/CAM technology, but the frequency of its use is still at a relatively low level. CAD/CAM technology is also mainly available in cosmopolitan areas. The levels of implantology practice and use of CAD/CAM technology is lowest in the Northern states compared to other areas in the country.

Conflict of Interests:

None to declare.

References

1. Uguru N, Uzochukwu B, Uguru C, Onwujekwe O. Determinants and inequalities in the utilization of routine oral health care services in Southeast Nigeria. J Med dent Sci. 2016; 15(4): 69 – 74

2. Uguru N, Onwujekwe O, Ogu UU, Uguru C. Access to oral health care: a focus on dental caries treatment provision in Enugu Nigeria. BMC Oral Health. 2020; 20(145): 1 – 13

3. Uguru N, Onwujekwe O, Uguru CC, Ogu UU. Achieving universal health coverage in Nigeria: the dilemma of accessing dental care in Enugu State, Nigeria. A mixed-methods study. Heliyon. 2021; 7(1): e05977

4. Medical and Dental Council of Nigeria. Code on Medical Ethics in Nigeria. 2008; Part E: 49

5. Morris AJ, Burke FJT. Primary and secondary dental care: The nature of the interface. Br Dent J. 2011, 191: 660 – 664

6. Brown MH. Definition of clinical prosthodontics- Undergraduate education. J Prosthet Dent. 1976; 34(1): 15 – 17

7. Makinde OA, Sule A, Ayankogbe O, Boone D. distribution of health facilities in Nigeria: Implications and options for universal health coverage. Int J Health Plan Manag. 2018; 33(4): e1179 – e1192

8. Enabulele EE, Omo J. Socio-demographic distribution of patients with fixed dental prosthesis in a developing economy. Periodont Prosthodont. 2018; 4(1): 06

9. Selby A. Fixed prosthodontic failure. A review and discussion of important aspects. Aus Dent J. 1994; 39(3): 150 – 156

10. Kaiser DA, Carazos E Jr. temporization techniques in fixed prosthodontics. Dent Clin North Am. 1985; 29(2): 403 – 412

11. Burns DR, Beck DA, Nelson SK. A review of selected dental literature on contemporary provisional fixed prosthodontic treatment: Report of the Committee on Research in fixed Prosthodontics of the Academy of Fixed prosthodontics. J Prosthet Dent. 2003; 90(5):

474 – 497

12. Alhoumaidan A, Mohan MP, Doumani M. The knowledge, attitude and practice of fixed prosthodontics: A survey among Qassim dental practitioners. J Family Med Prim Care 2019; 8:2882-7.

13. Ibbetson R, Hemmings K, Harris I. Guidelines for crowns, fixed bridges and implants. Dent Update. 2017; 44(5): 374 – 80, 382 – 4, 386

14. Sotunde OA, Alalade O, Igweagu C, Adeyemo YI, Ikusika OF. A five-year audit of root canal treatment at a tertiary centre in Northwest Nigeria. Niger J Restor Dent. 2018; 3(1): 11 – 14

15. Patel J, Fox K, Grieveson B, Youngson CC. Undergraduate training as preparation for vocational training in England: a survey of vocational dental practitioners' and their trainers' views. Br Dent J. 2016; 201: 9 – 15

16. Bartlett D, Preiskel A, Shah P, Ahmed A, Moazzez R. An audit of prosthodontics undertaken in general dental practice in the South East of England. Br Dent J. 2009; 207: E15

17. Dickie J, Shearer AC, Ricketts DNJ. Audit to assess the quality of communication between operators and technicians in a fixed prosthodontic laboratory: educational and training implications. Eur J Dent Educ. 2014; 18(1): 7 – 14

18. Shetty SH, Pawashe KG, Sanyal P, Sushma R. A study to assess communication hinderances by means of work authorization for fixed dental prosthesis: A survey. J Indian Prosthodont Soc. 2020; 20(2): 208 – 213

19. Funmilayo A-SIM, Mojirade AD, Omotayo SA. Audit of crown and fixed partial denture in a Nigerian Teaching Hospital. Braz J Oral Sci. 2017; 16: e17039

20. Arigbede AO, Adesuwa AA. A case of quackery and obsession for diastema resulting in avoidable endodontic therapy. Afr Health Sci.2012; 12(1): 77 – 80

21. Azodo CC, Erhabor P. Discrete gingival enlargement resulting from artificially created maxillary midline diastema. J Clin Sci. 2017; 14(1): 49 – 52

22. Nayak MSDP, Narayan KA. Strengths and weaknesses of online surveys. IOSR J Humanit Soc Sci. 2019; 24(5): 31 – 38

23. Nwakaego OF. Examining the factors affecting adoption of online survey tools among researchers in Nigeria. Eur J Comput Sci Inf Technol. 2021; 9(3): 19 – 28

24. Vasileiou K, Barnett J, Thorpe S, Young T. Characterizing and Justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. BMC Med Res Methodol. 2018; 18: 148

25. Malterud K, Siersma VD, Guassora AD. Sample size in qualitative interview studies: guided by information power. Qual Health Res. 2015; 26: 1753 – 60

26. Ogunbodede EO. Gender distribution of dentists in Nigeria, 1981 – 2000. J Dent Educ. 2004; 68(S7): 15 – 18

27. Isiekwe GI, Umeizudike KA, Abah AA, Fadeju AD. Undergraduate dental education in Nigeria: perception of dental students and recent dental graduates. Odontostomalol Trop. 2016; 39(154): 15 – 23

28. Keys WF, Keirby N, Ricketts DNJ. Provisional restorations-A permanent problem? Dent Update. 2016; 43(10): 908 – 12, 914

29. Chadda AS, Verma PR, Nagpal A, Archana RKS, Verma R, Katna V. Evaluation of temperature changes in pulp chamber during direct temporization using different combinations of provisional crown and impression materials – An in-vitro study. Indian J Dent Sci. 2012; 4(5): 23 – 27

30. Singh WBL, Singh S, Pandey WP, Solanki N. Use of a light cured periodontal surgical dressing material in temporization: A convenient approach. J Oral Biol Craniofac Res. 2015; 5(2): 117 – 119

31. Yalavarthi S, Ashok V, Jain AR. Knowledge, attitude, and practice survey on temporization following tooth preparation among Indian dental practitioners. Drug Invent Today. 2019; 11(9): 2131 – 35

32. Abraham CM. A brief historical perspective on dental implants, their surface coating and treatment. Open Dent J. 2014; 8: 50 – 55

33. Dickens N, Haider H, Lien W, Simecek J, Stahl J. longitudinal analysis of CAD/CAM restoration incorporation rates in Navy Dentistry. Military Med. 2019; 184: e365 – e372

34. Akeredolu PA, Adeyemo WL, Gbotolorun OM. Knowledge, attitude, and practice of dental implantology. Implant Dent. 2007; 16(1): 110 – 118

35. Ajayi DM, Abiodun-Solanke IMF, Gbadebo SO, Fasola AO, Dosumu OO, Arotiba JT. Dental implant treatment at a Nigerian Teaching Hospital. J West Afr Coll Surg. 2014; 4(3): 89 – 99

36. Nassani MZ, Ibraheem S, Shamsy E, Darwish M, Faden A, Kujan O. A survey of dentists' perception of chairside CAD/CAM technology. Healthcare. 2021; 9(1): 68

37. Sannino G, Germano F, Arcuri L, Bigelli E, Arcuri C, Barlatanni A. CEREC CAD/CAM chairside system. Oral Implantol (Rome). 2015; 7(3): 57 – 70

38. Zillen PA, Mindak M. World dental demographics. Int Dent J. 2000; 50(4):194 - 234

39. Tran D, Nesbit M, Petridis H. Survey of UK dentists regarding the use of CAD/CAM technology. Br Dent J. 2016; 221: 639 – 44

40. Kassouri Y, Okunlola OA. Analysis of spatio-temporal drivers and convergence characteristics of urban development in Africa. Land Use Policy. 2022; 112: 105868

41. Adebola RA, Bamgbose BO, Adeoye JB, Ladiende AL. A new dental school in Kano, Nigeria: the road map, challenges and prospects. Indo Afr J Educ Res. 2014; 2(4): 1 – 6

42. Ajayi YO, Oremosu OA, Umesi DC. Continuing professional development in implant dentistry among Nigerian dentists. Unilag J Med Sci Tech. 2019; 6(2): 33 – 44