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WEST AFRICAN JOURNAL OF MEDICINE

ORIGINAL ARTICLE

The Nigerian Dentist: Emerging Trends in Caries Management

Le Dentiste Nigérian: Tendances Émergentes Dans la Gestion des Caries

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ABSTRACT

BACKGROUND: Fundamental to effective caries management, are measures that eliminate caries risk factors and increase caries protective factors. These include the use of appropriate and effective caries assessment, diagnostic and teaching methods.

OBJECTIVES: To assess the use of current caries management protocols and teaching methods/techniques among Nigerian Dentists.

METHODS: A pre-tested self-administered questionnaire was used. Only dentists of Nigerian descent and practicing in Nigeria were assessed. The questionnaire inquired about diagnostic tools, assessment and teaching methods used by the Dentists in caries management.

RESULTS: More than half of the participants reported use of visual (86.3%), tactile method (76.2%) and periapical radiographs (66.2%) at all times for caries diagnosis. More than three quarters had never used electrical conductance, fibre-optic, CAMBRA, ICDAS, laser fluorescence or bacteria count in caries assessment and diagnosis. Among the 38.4% of the respondents who taught courses on cariology, didactic method and demonstration were the commonest methods used, while use of games was the least used. Didactic method was used more by those that had practiced for 10 years and more. This relationship was statistically significant (p= 0.05).

CONCLUSION: Majority of Nigerian Dentists still depend solely on traditional methods of teaching, assessment and diagnosis of dental caries. Modern caries assessment, diagnostic techniques and teaching methods are needed to improve caries management in order to promote early treatment, which is often preventive. **WAJM 2022; 39(12): 1285–1293.**

Keywords: Caries management, Cariology, Nigerian Dentists.

RÉSUMÉ

CONTEXTE: Les mesures visant à éliminer les facteurs de risque de carie et à augmenter les facteurs de protection de la carie sont fondamentales pour une gestion efficace de la carie. Ces mesures comprennent l'utilisation de méthodes appropriées et efficaces d'évaluation, de diagnostic et d'enseignement des caries.

OBJECTIFS: Évaluer l'utilisation des protocoles actuels de gestion des caries et des méthodes/techniques d'enseignement chez les dentistes nigérians.

MÉTHODES: Un questionnaire autoadministré pré-testé a été utilisé. Seuls les dentistes d'origine nigériane et exerçant au Nigeria ont été évalués. Le questionnaire portait sur les outils de diagnostic, l'évaluation et les méthodes d'enseignement utilisés par les dentistes pour la gestion des caries.

RÉSULTATS : Plus de la moitié des participants ont déclaré utiliser la méthode visuelle (86,3 %), la méthode tactile (76,2 %) et les radiographies périapicales (66,2 %) à tout moment pour le diagnostic des caries. Plus des trois quarts n'avaient jamais utilisé la conductivité électrique, la fibre optique, la CAMBRA, l'ICDAS, la fluorescence laser ou la numération bactérienne pour évaluer et diagnostiquer les caries. Parmi les 38,4 % des personnes interrogées ayant donné des cours de cariologie, la méthode didactique et la démonstration étaient les méthodes les plus utilisées, tandis que l'utilisation de jeux était la moins utilisée. La méthode didactique était plus utilisée par ceux qui avaient pratiqué pendant 10 ans et plus. Cette relation était statistiquement significative (p= 0,05).

CONCLUSION : La majorité des dentistes nigérians dépendent encore uniquement des méthodes traditionnelles d'enseignement, d'évaluation et de diagnostic des caries dentaires. Des techniques modernes d'évaluation et de diagnostic des caries ainsi que des méthodes d'enseignement sont nécessaires pour améliorer la gestion des caries afin de promouvoir un traitement précoce, qui est souvent préventif. **WAJM 2022; 39(12): 1285–1293.**

Mots clés : Gestion des caries, cariologie, dentistes nigérians.

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INTRODUCTION

Many African countries, including Nigeria have reported low caries prevalence.[1–4] However, a study from Nigeria reported a decline in caries prevalence in the permanent teeth of children over a 3-year period, but an increase in the prevalence and severity of caries in the primary dentition of school children.[5] In addition to this, there are also reports of increase in untreated dental caries among Nigerian children.[4–8] According to the World Health Organisation (WHO), severe caries affects children's quality of life as they experience pain, discomfort, disfigurement, acute and chronic infections, eating and sleep disruption as well as higher risk of hospitalization, high treatment costs and loss of school days with the consequent diminished ability to learn.[9] Nevertheless, evidence based reports have shown that dental treatment of young children is associated with considerable improvement in their parent-reported oral health related quality of life (OHRQoL).[10–12] Dental caries, being one of the most important contributors to the global oral health burden,[13] affects almost 100% of adults worldwide.[14] In Nigeria, studies have shown that the prevalence of dental caries in adults ranges from about 4 to 40%[15,16] and the prevalence of untreated dental caries is 90%.[17] It is however expected that proper and adequate prevention and treatment of oral health conditions especially dental caries is necessary to ensure improved quality of life. This would be achieved by proper oral health education, effective and proper caries detection, assessment, diagnosis and treatment of dental caries.

Caries detection, assessment and diagnosis are important steps in caries management. Hence, dentists should utilise both traditional and current diagnostic techniques and tools to enhance successful outcome. Over the years, dentists had focused more on restoring teeth destroyed by caries activities. However, in the last few decades, scientific evidence shows that risk-adjusted preventive strategies can manage dental caries by preventing the initiation, reversing early signs of caries and preserving tooth structure.[18,19] Thus, caries management by risk assessment has emerged as the new paradigm in patient care and represents an evidence-based, best practices approach with the potential for significant advantages over traditional methods.[20]

Nonetheless, it is estimated that 71% of all restorative treatments are performed on previously restored teeth, with recurrent carious lesion as a predominant cause.[21] This shows that the management was not effective because the specific cause and risk factors were not adequately documented, considered and investigated.

The maintenance of health and preservation of tooth structure through risk-based prevention and patient-centered, evidence-based disease management, reassessed at regular intervals over time, have been recognized as cornerstones of modern caries management.[22-26]

Therefore, decreasing caries risk factors, increasing caries protective factors, proper caries detection, assessment and diagnosis are important steps in proper caries management.

In order to achieve this, the dental team should provide improved care for patients by bringing together information, tools and methods in a structured manner to enable them to provide adequate and proper care for individuals with dental caries using a minimum intervention approach focused on prevention as well as evidence.

Unfortunately, there is paucity of studies on the use of current concept of caries management in Nigeria, hence the need for this study. It is expected that this study will provide information relevant for cariology curriculum for undergraduate and post graduate training protocols on caries management among dentists, especially in the early years of practice. This would be very relevant towards evaluating the knowledge and skills of young dental graduates regarding caries management and their preparedness for the labour market.

METHODOLOGY

Study Area

The study area was Nigeria, located in West Africa. It has about 200 million people and various ethnic groups. The country is divided into 6 geopolitical zones: North West, North East, North Central, South West, South East and South South zones. At the time of the study , there were 10 accredited dental schools in the country: 4 in South west zone (University of Lagos, Lagos State; Lagos State University , Lagos State; University of Ibadan, Ibadan, Oyo State; Obafemi Awolowo University, Ile Ife Osun State), 1 in South East zone (University of Nigeria, Nsukka, Enugu State) 3 in South South zone(University of Benin, Edo State, University of Port Harcourt, Rivers State; University of Calabar, Cross River State), 1 in North West zone (Bayero University, Kano, Kano State) and 1 in North East zone (University of Maiduguri, Maiduguri, Borno State).

Study Population

The study population was all Dentists involved in the management of dental caries in the different dental schools.

Study Design

This was a cross-sectional descriptive study that evaluated caries assessment, diagnostic and treatment methods among dentists. The independent variables were age, sex, academic degree, years of practice and institute of practice while the dependent variables included assessment and diagnostic methods as well as methods of teaching cariology.

Minimum Sample Size

The minimum sample size was obtained using the formula for cross-sectional studies below:

$$N = \frac{z^2pq}{d^2}$$

Where, N= minimum sample size for the study, Z= 1.96 at 95% confidence level; p= proportion of Nigerian dentist with accepted line of management about dentine hypersensitivity (80%) from reference study (27); q= 1–p; d= acceptable margin of error of 5% precision Substituting

$$n = \frac{(1.96)^2 \times 0.86 \times 0.14}{(0.05)^2}$$

$$= \frac{3.841 \times 0.86 \times 0.14}{0.0025}$$

The calculated minimum sample size was therefore 185 subjects.

Data Collection Tool

Information was obtained using self-administered questionnaires. The questionnaire was pre-tested among 10 dentists from the institution of the principal investigator, who were not part of the final sample to determine the clarity of wordings, comprehension and ease of reading of the questions while modifications were made based on the responses.

The questionnaire was sent by courier to contact persons in the ten accredited dental schools, at the time of data collection, other than that of the principal investigator. The contact persons returned the questionnaires to the principal investigator through courier after data collection and collation.

The questionnaire sought to find information regarding the management of dental caries among Nigerian dentists. It also inquired about the diagnostic tools and assessment methods used in caries management as well as teaching methods used for cariology in the various dental schools. Additional survey items included questions regarding socio-demographic characteristics of the dentists (age, sex, area of specialization and years of practice and whether they are private or public practitioners). The inclusion criterion was dentists practicing in Nigeria, involved in the management of dental caries who consented to participate in the survey.

Data Analysis

This was done using the SPSS version 20. A descriptive statistic was used to determine the mean age and sex distribution. The association of categorical variables was by chi-square. A binary logistic regression was done to determine the demographic factors associated with respondent's use of adequate caries risk assessment. The level of significance for all statistical tests was set at $p < 0.05$.

Ethical Consideration

Ethical approval was obtained from the Health Research and Ethics Committee of the Lagos University Teaching Hospital (ADM/DCST/HREC/APP/534). Written informed consent was obtained from all the study participants with confidentiality guaranteed.

RESULTS

Two hundred and fifty questionnaires were sent out to different dental institutions in Nigeria and 237 were duly completed and returned, giving a response rate of 94.8%. Majority were males 128 (54%). Almost half, 114 (48.1%) were in the 31–40 years age group. A total of 23(9.7%) of the participants had additional qualifications other than their first degree in Dentistry while less than one-fifth, 34(14.4%) had some form of training in Dentistry outside Nigeria. More than half, 154 (64.7%) had practiced for 10 years and below with a median practice year of 5.5years (Table1). The institution of practice for majority, 199 (84%), of the respondents was public institutions (Table 1). Majority of them were General Dental Practitioners (38.4%) and the least, Oral diagnostic specialists (0.42%) (Figure1).

More than half of the participants

Table 1 : Socio-demographic Characteristics of the Participants (n-237)

Variables	Frequency	Percentage (%)
Age Range (Years)		
21–30	52	21.9
31–40	114	48.1
41–50	57	24.1
51–60	14	5.9
Sex		
Male	128	54.0
Female	109	46.0
Last Academic Degree		
BDS/DDS/DMD	214	90.3
Masters	22	9.3
Ph.D	1	0.4
Years of Dental Practice		
<10	154	64.7
>10	83	34.9
Institution of Practice		
Private	38	16.0
Public	199	84.0
Had Training in Dentistry Outside Nigeria		
Yes	34	14.4
No	203	85.6

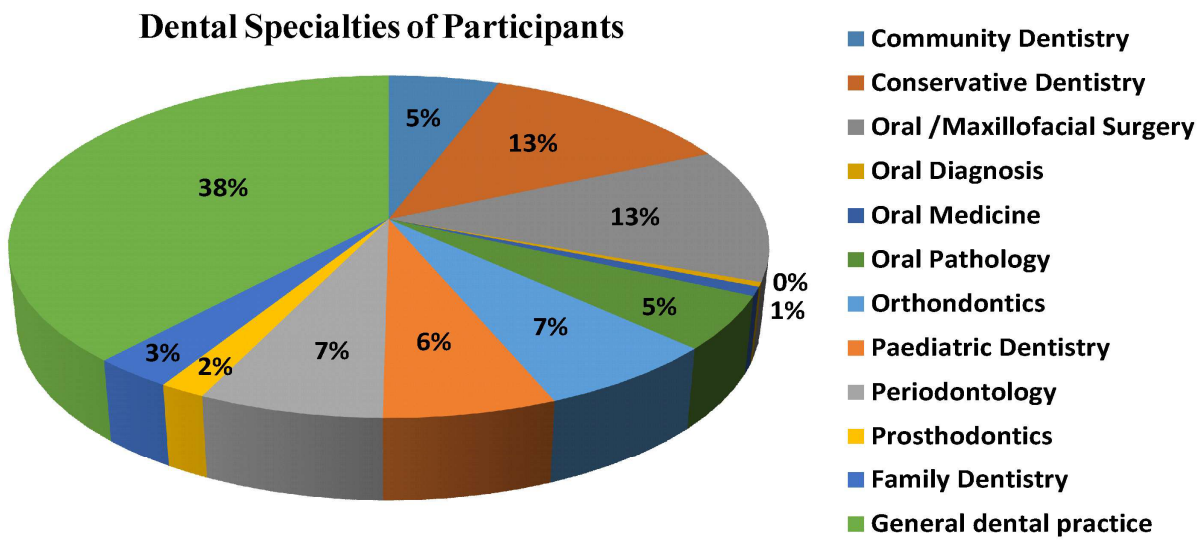

Fig. 1: Distribution of Dental Specialties of Participants.

reported use of visual inspection (82.3%), tactile method (72.6%) and periapical radiographs (66.2%) for caries diagnosis at all times (Table 2). Majority had never used electrical conductance (86.76%), fibre-optic (88.6%), dyes (77.2%), CAMBRA (80.8%), ICDAS (80.4%), laser fluorescence (91.78%), saliva flow rate (68%), saliva/plaque buffering capacity (85.8%) or bacteria count (93.2%) in caries assessment and diagnosis (Table 2).

In response to the risk factor that they would consider while managing dental caries, majority of the participants chose oral hygiene status 232 (97.8%) and tooth brushing frequency of their patients 218(92%).

After accounting for demographic factors, sex, institution of practice and specialty were positively associated with adequate caries risk assessment by the participants. Females were two and half times more likely to adequately conduct caries risk assessment compared to males (Table 3). Participants who practiced in public institutions were two times more likely to adequately conduct caries risk assessment compared to those practicing in private institutions. Participants specialized in areas closely linked with caries treatment such as Paediatric dentistry, Family dentistry and Conservative dentistry were three times as likely to adequately assess caries risk compared to dentists in other specialties (Table 3).

Among the 90 (38%) of the participants who taught courses on cariology, didactic teaching was the commonest method used, while the use of games was the least used method (Table 4). Participants who had practiced for 10 years or more engaged more in didactic teaching. These relationships and differences were statistically significant (p=0.05). In contrast, those participants with less than 10 years practice experience engaged more in free online learning tool methods. However, this relationship was not statistically significant (p=0.95) (Table 5).

In terms of relevance to the teaching of cariology, majority of the participants reported that courses on development, growth and structure of dental hard tissues, aetiology, pathogenesis and erosion, detection, assessment and diagnosis of dental caries, epidemiology and prevention and management are considered very important while behavioural sciences and epidemiology/ research methodology were considered less important (Table 6).

About half of the participants, 125 (52.3%) strongly disagreed to carry out a root canal treatment on a tooth with transient pain. (Table 5) The difference observed between dentists with reference

Table 2: Assessment and Diagnostic Methods used by the Participants (n=237)

Variable	Never N (%)	Occasionally N (%)	Often N (%)	Always N (%)
Visual inspection	0	12(5.1)	30(12.7)	195(82.3)
Tactile	0	20(8.4)	52(21.9)	165(69.6)
Periapical radiograph	0	22(9.3)	64(27)	151(63.7)
Bitewing	50 (21.1)	118(49.8)	37(15.6)	32(13.5)
Fibreoptic	200(84.4)	21(8.9)	16(6.8)	0(0.00)
Electrical conductance	190(80.2)	28(11.8)	11(4.6)	8(3.4)
Laser fluorescence	207(87.3)	19(8.0)	10(4.2)	1(0.42)
Dyes	175(73.8)	43(18.1)	10(4.2)	9(3.8)
Cambra	167(70.5)	44(18.6)	19(8.0)	7(3.0)
Icdas	182(76.8)	38(16.0)	15(6.3)	2(0.84)
Lactobacili count	220(92.8)	16(6.8)	1(0.42)	0(0.00)
Strepmutanscount	224(94.5)	11(4.6)	2(0.84)	0(0.00)
Saliva flow rate	169(71.3)	57(24.1)	11(4.6)	2(0.84)
Saliva buffering capacity	203(85.7)	24(10.1)	9(3.8)	1(0.42)
Plaque buffering capacity	206 (86.9)	22(9.3)	8(3.4)	1(0.42)

Table 3: Logistic Regression of Predominance of Caries Risk Assessment among Participants.

Variable	Use of Adequate Caries Risk Assessment				
	Reference Category	Odds Ratio	Confidence Limit		p-value
Age (Years)					
18–54	55–64 years	.9852413	.8865573	1.09491	0.782
Sex					
Male	Female	2.463894	1.333708	4.5518	0.004*
Female					
Years as Practicing Dentist					
0–10	10 years	1.003041	.8973315	1.121203	0.957
>10					
Place of Training					
Local	Local	.6566105	.2830509	1.523179	0.327
Foreign					
Institution of Practice					
Public	Public	2.092679	.9906575	4.420605	0.053
Private					
Specialty					
CONS	CONS	2.894563	1.245327	6.727946	0.014 *
OMFS					
OMFP					
CDH					

** Statistically significant p<0.05; CONS, Conservative Dentistry; OMFS, Oral and Maxillofacial Surgery; OMFP, Oral and Maxillofacial Pathology; CDH, Child Dental Health.*

Table 4: Participants Responses on Methods used in Teaching Cariology (n= 90)

Teaching Methods	Never N (%)	Occasionally N(%)	Often N(%)	Always N(%)
Didactic	1(1.11)	6(6.67)	16 (17.8)	67(74.4)
Demonstrating	1(1.11)	11(12.2)	30 (33.3)	48(53.3)
Brain storming	23(25.6)	40(44.4)	17(18.9)	10(11.1)
Case studies	17(18.9)	27(30.0)	28(31.1)	18(20.0)
Self-learning	22(24.4)	29(32.2)	26(28.9)	13(14.4)
Social media	41(45.6)	35(38.9)	10(11.1)	4(4.44)
Use of videos	45(50.0)	29(32.2)	9(10.0)	7(7.78)
Use of games	74(82.2)	10(11.1)	6(6.67)	0(0.00)
Free online learning tool	32(35.6)	33(36.7)	15(16.7)	10(11.1)

Table 5: Comparison of Years of Practice with Clinical Scenario and Method of Teaching

Variable	Fill Teeth 15, 16 and RCT for 34		
Years as Practicing Dentist			
	Disagree (%)	**Agree (%)**	**Total (%)**
<10	75 (53.57)	65(46.43)	140(100.00)
>10	50(52.08)	46(47.92)	96(100.00)
Total	**125(52.97)**	**111(47.03)**	**236(100.00)**
χ^2 = 0.0506, p= 0.82, odds ratio = 1.0615, CI = 0.6309 : 1.7860:			
	Filling Teeth 35		
Years as Practicing Dentist			
	Disagree (%)	**Agree (%)**	**Total (%)**
<10	60 (42.86)	80 (57.14)	140(100.00)
>10	47 (48.96)	49(51.04)	96(100.00)
Total	**107(45.34)**	**129(54.66)**	**236(100.00)**
χ^2 = 0.8554, p= 0.355, odds ratio = 0.7819, CI = 0.4641 : 1.3175			
	Didactic Learning		
Years as Practicing Dentist	**Never (%)**	**Always (%)**	**Total (%)**
<10	6 (13.0)	40 (87.0)	46 (100.00)
>10	1 (2.3)	43 (97.7)	44 (100.00)
Total	**7 (7.8)**	**83 (92.2)**	**236 (100.00)**
χ^2 = 3.6372, p= 0.05, odds ratio = 6.4500, CI = 0.7436 : 55.9502			
	Use of Online Tools		
Years as Practicing Dentist	**Never (%)**	**Always (%)**	**Total (%)**
<10	33 (71.74)	13 (28.26)	46(100.00)
>10	32(72.73)	12(27.27)	44(100.00)
Total	**65(72.22)**	**25(27.78)**	**90(100.00)**
χ^2 = 0.0109, p= 0.92, odds ratio = 0.9519, CI = 0.3782 : 2.3961			

to number of years of practice was not statistically significant (P=0.82). Furthermore, more than half of the participants, 129 (54.7%) strongly agreed that a tooth with no radiographic evidence of caries but with a complaint of decayed tooth from a patient should be restored with dental restorative material. Though majority of them were participants with less than 10 years of practice, the observation was not statistically significant (p=0.355) (Table 5).

DISCUSSION

The present study which assessed the practice of Nigerian Dentists regarding the management and teaching of dental caries, observed that most of the dentists still made use of only traditional methods for caries diagnosis and detection; mostly used were visual inspection, tactile method and periapical radiographs. This may be because majority of the respondents are general dental practitioners and specialists whose practices are in the government owned teaching hospitals. Most of the dental schools in the country are government owned and have only basic equipment. Unfortunately, research has demonstrated that the traditional methods for dental caries detection are not effective in detecting early carious lesions, particularly on occlusal surfaces[28–30] and therefore may not offer a complete representation of a possibly carious tooth. Gomez[31] however, suggested that combining traditional methods with more sensitive methods may improve caries diagnosis and also help the clinician in monitoring non-operative treatments.

Assaf *et al,*[32] also noted that the visual/tactile method, with or without diagnostic adjuncts such as FOTI, DIAGNOdent, Laser, Fluorescence can diagnose cavitated lesions efficiently, but not non-cavitated lesions. Strassler[33] in his study maintained that these non-invasive, non-radiation, light-emitting technologies are adjuncts and therefore should not be solely relied on but combined with clinical experience and judgment while making diagnosis.

Despite the fact that majority of the respondents have practiced for more than ten years, yet more than three-quarters of them reported that they have never used most of the modern methods of assessing, detecting and diagnosing caries such as electrical conductance, fibre optic, dyes, CAMBRA, ICDAS, FOTI, DIAGNO dent, Laser and Fluorescence. Some studies[34–37] in the scientific literature have also reported a low use of these methods and devices in dental practices. This observation may be explained by limited knowledge of these methods, ease of use and availability of the materials required for some of their use.

It was also observed that risk assessment practices were not appropriate wherein many considered oral hygiene rather than diet history as the most

Table 6: Participants Views on Courses Relevant to Teaching of Cariology (n=196)

Courses	Never N (%)	Occasionally N (%)	Often N (%)	Always N (%)
Development, growth and structures of dental hard tissues	126(64.3)	66(33.7)	3(1.53)	1(0.51)
Aetiology, pathogenesis and modifying factors of dental caries	171(87.2)	25(12.7)	0(0.00)	0(0.00)
Detection, assessment and diagnosis	167(85.2)	27(13.8)	1(0.51)	1(0.51)
Epidemiology and research methodology	88(44.9)	98(50.0)	5(2.55)	5(2.55)
Behavioural sciences	77(39.3)	108(55.1)	8(4.08)	3(1.53)
Prevention and management	164(83.7)	30(15.31)	0(0.00)	2(1.02)

important risk factor in caries risk assessment. This is similar to the report of the study conducted among the Japanese and Irish populations.[38] In studies among the French[39] Croatian dentists[40] and dental practice-based research network member dentists in United States of America,[41] oral hygiene was found to be the most important risk factor. However, a review on caries management by risk assessment reported diet as an important risk factor for dental caries noting that the physical properties of food and the frequency of eating influenced the cariogenicity of the patient's diet.[42] Nonetheless, annual utilization of oral health facilities was considered a least important risk factor by the respondents. This may be because it is habitual for most Nigerians to visit the dental clinic only when there are symptoms as majority of the populace use the out-of-pocket payment method for their dental services. However, this finding is of great concern, as a number of studies[43–46] have reported low utilization of dental services among Nigerians and Indian nationals. It is important to note that regular dental visits have been reported to help identify early stages of dental caries and when commenced early, are known to facilitate optimal dental health.[47,48] There is therefore need for clinicians to assess the dental caries risk of their patients using as many factors as possible to enable them institute adequate preventive measures for the prevention of further or new diseases.

Participants in this study who worked in public institutions were more likely to use caries risk assessment compared to those who practiced in private institutions. This is similar to the findings of Tagliaferro *et al*[49] and Gordan *et al*[35] where dentists working exclusively in a private practice model were less likely to perform caries risk assessment. This may be because private practices are more profit oriented and would want to provide quick and prompt services for rapid patient turn over and therefore would focus more on providing solution/ treatment instead of spending time on risk assessment which is geared towards prevention of future diseases. On the other hand, public hospitals are owned and funded by the government and are mostly established for easier access and cheaper services as well as for teaching and research. In addition, majority of the dentists in public hospitals included in this study were staff of the teaching hospitals where teaching, research and evidence-based dentistry are practiced and would therefore be more likely to perform a caries risk assessment on their patients than a dentist in a private sector. Moreover, public hospitals have more workforce such as students, interns, resident dentists, specialists and other auxiliary staff who would make management of patients easier and faster. In the present study, it was also observed that female dentists were more likely to perform caries risk assessment on their patients. This could be because females have been reported to be more detailed and passionate. This is similar to the report in the study by Riley*et al,*[50] that female dentists differ from their male counterparts in some aspects of the prevention, assessment, and treatment of dental caries and concluded that practice patterns of female dentists suggest a greater caries preventive treatment philosophy.

In contrast, there was no significant association between practice years and performing caries risk assessment. Tagliaferro *et al*[49] in their study, reported that dentists who had practiced for longer years were more likely to perform caries risk assessment, which is different from the findings of Riley *et al,*[41,51] who found that dentists with less years since dental school graduation were more likely to practice caries risk assessment.

According to our report, dentists in restorative specialties are almost three time more likely to properly perform a risk assessment compared to other specialties, in contrast to the study of Riley *et al,*[41] where dental specialty was not associated with performing adequate caries risk assessment on their patients. Similarly in this study, when specialties associated with treatment of caries (Paediatric dentist, Restorative dentists and General dentist) were compared with those not closely associated with treatment of caries (oral & maxillofacial surgery, oral pathology and medicine, prosthetic dentistry), those closely associated with caries treatment were more likely to adequately assess caries risk compared to people in other specialties. This may be explained by the emphasis on details of caries management in the core curriculum of the specialties.

The present study further assessed the different methods of teaching courses in cariology by the Dentists. The findings in this study show that the use of didactic /traditional teaching method was the most frequently used method while the use of games, video, self-learning, brain storming, case studies and free online learning tools were least used. Respondents that had practiced for more than ten years used the didactic method more often while those that had practiced for less years used more of the technologically driven methods and this relationship was statically significant. This shows that the younger generation dentists used what appeals to them to communicate with their students and were also more technically savvy and therefore would easily make use of the technology. Didactic teaching has been reported as the age long method of teaching in schools that tend to equip students with

only theory.[52–55] However, combining it with other methods will help them to internalize the subject and the procedures involved in solving patient's problem. In a recent study from Nigeria,[56] dental students reported that Problem Based Learning (PBL) provided a higher ability for intellectual stimulation and therefore preferred it to traditional teaching method. Another study from Malaysia[57] suggested the need to shift teaching strategies from didactic traditional teaching and recommended a combination of other methods such as Problem based learning, videos, quizes and discussions, making learning more interesting, interactive and effective. Gopinath in their study[58] also showed that the use of video based, computer-based methods have increased students' performance.

In terms of relevance to the teaching of cariology, majority of the respondents affirmed the importance of courses on development, growth and structure of dental hard tissues, aetiology, pathogenesis and modifying factors of dental caries and erosion, detection, assessment and diagnosis of dental caries, prevention and management are considered very important. However, some dentists felt courses on behavioural sciences and epidemiology and research methodology are not as important as others. On the contrary, human behaviour and psychology have been reported as more important factors in the development of dental caries.[59] Psychological skills, sociological aspects, communication skills and economic factors are all integrated in both the causes and prevention of caries.[59] Courses in epidemiology/research methodology will help students become familiar with common indices used to describe dental caries experience, study design, blind/double blind studies, age/sex matching of populations and control groups. It will also facilitate an understanding of the increasing number of evidence-based dentistry reports and population trends in dental caries.[54]

Dental caries continues to be one of the most common chronic diseases globally.

It is therefore important that dentists are trained to provide appropriate caries management protocols which is patient centred. The responses of participants in the present study to the clinical scenarios projected to assess the caries management practices, revealed deficiencies in the practise of minimally invasive dentistry and inadequate caries management protocol. This may be because of ill-defined curriculum in the dental schools, lack of exposure to diagnostic tools, modern techniques, and poor knowledge of international best practices.

International best practices for caries treatment planning is a serialized process that aims to eliminate or control pathogenic factors, restore existing lesion, and produce a functional and sustainable environment.

A successful caries management protocol is patient-centered and based on caries risk assessment, which takes comprehensive measures such as health promotion, prevention or treatment to affect various factors of caries occurrence and development. Cariology curriculum and teaching methods have undergone modifications in some countries.[52–55] There is also an urgent need for the development of a harmonized cariology curriculum in Nigerian dentist schools in order that 21st century dentists in Nigeria are competent proficient and have good practice skills.

CONCLUSION

Majority of Nigerian Dentists in the present study used solely traditional methods of detection, assessment, diagnosis and teaching of dental caries. The observation from the study participants on managing dental caries did not depict international best practices and evidence-based practice. There is need for the use of current caries management protocol to promote early intervention and encourage caries prevention as well as a combination of teaching methods for a better learning experience by the students.

Competing Interests

No competing interests in the conduct of the study and its findings.

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