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KNOWLEDGE AND PRACTICE OF NEW ADVANCES IN OCCLUSAL CARIES DIAGNOSIS AND EARLY CARIES MANAGEMENT AMONG DENTISTS IN NAIROBI
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ABSTRACT

***Objective*: To determine the knowledge and practice of new advances in occlusal caries diagnosis and management of early carious lesions among dentists in Nairobi.**
***Design*: Cross-sectional descriptive study.**
***Setting*: Nairobi City County**
***Subjects*: Registered dentists in clinical practice within Nairobi City County.**
***Results*: Ninety one filled questionnaires were returned. Knowledge on advanced caries diagnostic methods was low with 25.8% of the participants reporting lack of knowledge on the same. A statistically significant association was established between years of practice and knowledge of advanced methods of caries diagnosis (p=0.048). High cost and unavailability of advanced diagnostic equipment were identified as the main limitations to the utilisation of advanced methods of occlusal caries diagnosis Most of the respondents (78%) indicated sticky fissures with evidence of demineralized enamel/discolouration of dentine as the main indicator for operative intervention with majority (67%) stating resin composite as the choice of material in management of these lesions.**
***Conclusion*: Overall knowledge and utilisation of advanced diagnostic methods for occlusal caries among dentists in Nairobi was low. Sticky fissures with evidence of demineralised enamel or discoloration of underlying dentine were identified as main indicators for operative treatment for early carious lesions while resin composite was the most commonly employed restorative material.**

INTRODUCTION

Accurate diagnosis of the presence, extent and activity of a disease process is a fundamental requirement in healthcare. Accordingly, early diagnosis of occlusal caries before operative treatment is essential as it allows preventive non-operative intervention. The deep nature of some healthy fissures combined with the manner of progression of occlusal caries makes diagnosis of occlusal caries a formidable task. The early carious lesion in a deep fissure becomes invisible (1).

Conventionally, the commonly employed diagnostic techniques for occlusal caries have been visual, tactile and radiological. Visual and tactile methods alone, in the absence of cavitation, generally have relatively poor diagnostic capability for occlusal surfaces. This is because discoloration of pits and grooves limited to depth of the fissure or pit is almost a universal finding in normal healthy teeth of adults and is not sufficient indication for diagnosis of caries (2). Mechanical binding of an explorer, which is the tactile element employed, may be due to non-carious causes such as the shape of the fissure, sharpness of the explorer or force of application (2). Moreover, application of pressure with a sharp explorer has been discouraged because of documented damage to surface integrity and possible implantation of organisms, both of which may increase lesion susceptibility (3, 4).

Bitewing radiographs are of great importance in the detection of occlusal caries in dentine, however they show only those lesions that are well advanced into dentine (3). These anatomical and disease factors have made early and accurate diagnosis of dentinal caries more challenging on occlusal surfaces than on other surfaces resulting in considerable variation among clinicians as to its appropriate diagnosis and treatment. Inadequate detection results in undeterred progression of the caries, whereas exploratory operative intervention could lead to substantial

overtreatment.

There is need for utilisation of preventive and non-invasive treatment solutions for early carious lesions tailored to the care needs of patients based on scientific evidence. This is because invasive treatment involving the placement of a restoration, even when a minimal invasive approach such as air-abrasion or micro-preparation is used, condemns the tooth irreversibly to a restoration cycle, since no restoration can be considered permanent and will ultimately need to be replaced (5). Such restorations increase healthcare costs for patients and healthcare systems and compromise the long term survival of these teeth. On the other hand, failure to accurately detect presence of dental caries precludes timely intervention resulting in undeterred progression of the disease with subsequent problems associated with deep carious lesions.

More precise methods for definitive diagnosis of dental caries could significantly improve its management decisions with respect to operative or non operative intervention. Efforts made towards this end have seen newer diagnostic methods being used. These include; Fluorescence systems, electrical conductance measurements, dyes, and fibre optic transillumination systems among others (6).

The extent to which Nairobi dentists use these new advanced diagnostic techniques in order to avoid the pitfalls of the older techniques is not known. Hence the objective of this study was to assess the knowledge and practice of new advances in occlusal caries diagnosis and early caries management among dentists in Nairobi.

MATERIALS AND METHODS

This was a cross sectional descriptive study. Out of approximately 400 dentists practicing within Nairobi City County, a sample size of 152 was determined. Using purposive sampling, self-administered questionnaires were distributed to 200 dentists engaged in clinical practice within Nairobi City County. These were drawn from both public and private sectors.

A total of 91 filled questionnaires were returned. Questions were asked about age, gender, year of qualification, country of training, nature of practice, methods employed to diagnose caries, knowledge and practice of advanced diagnostic methods for occlusal caries, indicators for operative intervention, materials used for restoration of early occlusal caries and modes of non-operative intervention employed in management of early occlusal caries.

Data were transferred to a computer and analysed by use of Statistical Packages for Social Sciences (SPSS version 21). Basic descriptive statistics were performed. Chi-square test, Fisher's Exact test and Spearman Rank Order test were performed to identify associations between different variables. The level of significance was set at 0.05.

RESULTS

A total of 91 dentists returned completed questionnaires, 46 (50.5%) male and 45 (49.5%) female. The age of the participants ranged between 23-61 years with a mean of 32.60±8.70 SD. Majority of the respondents received their undergraduate training in Kenya (87.9%). Most of the respondents were General practitioners (75.8%) with specialists accounting for 24.2%.

Many of the respondents were engaged in part time private/ part time public service (46.2%) whereas 34% were engaged in full time public service and 19.8% in full time private practice.

Knowledge and practice of advanced methods in occlusal caries diagnosis: Use of visual-tactile methods in combination with conventional radiography was the most commonly utilised method of occlusal caries diagnosis (67%), closely followed by use of visual tactile methods in combination with digital radiography 40.7% (Figure 1).

In regard to familiarity with advanced diagnostic methods for caries, 34.4% of the respondents mentioned flourescence systems, 29% mentioned caries detection solutions/dyes, 20.4% mentioned transillumination techniques while 17.2% mentioned imaging. Other participants mentioned laser technology (8.6%) and electrical conductance machines (1.1%). 25.8% of the participants reported lack of knowledge on advanced caries diagnostic techniques (Figure 2).

Slightly more than half of the participants (53.8%) reported familiarity with flourescence systems used in caries diagnosis while 46.2% were not familiar with the same (Figure 3). Only one participant reported utilisation of such systems in their practice. A good number of participants (68.1%) were not familiar with the ICDAS system of caries diagnosis (Figure 4).

Majority of the members highlighted cost of advanced diagnostic equipment (82.5%) and their unavailability (84.7%) as the main limitation to the utilisation of advanced methods of occlusal caries diagnosis. Some of the respondents (67.1%) felt that insufficient knowledge on the methods was also a contributing factor. However a number of the respondents (25.3%) felt that there were few or no perceived benefits in utilisation of advanced methods in occlusal caries diagnosis (Figure 5).

There was a significant relationship between knowledge and practice of advanced diagnostic methods for caries ($p = 0.001$). A Spearman Rank-Order correlation between years of practice and knowledge of advanced methods of caries diagnosis elicited a statistically significant association ($r = 0.470$,

p = 0.048)

However, there was no significant relationship between the nature of practice, country of training, level of training and the knowledge and practice of new advances in occlusal caries diagnosis.

Management of early carious lesions: All sticky fissures with evidence of demineralised enamel/discoloration of underlying dentine were identified as main indicators for operative treatment by majority of the respondents (78%). 30.8% reported radiographic evidence of dentine involvement whereas 14.3% regarded all sticky fissures as the main indicators for operative treatment for occlusal caries.

Majority of the participants (73.6%) employed resin composite as the material of choice for management of early occlusal caries whereas 46.2% employed fissure sealants and 3.3% amalgam in management of those lesions (Figure 6). Extent of the lesion was indicated as the main determinant in the choice of material by 86.8% of the respondents. Other determinants that influenced choice of material included caries risk (30.8%), patient preference (19.8%) and cost (15.3%).

Administration of oral hygiene instructions was the mode of non-operative intervention for early occlusal caries employed by majority of the dentists (97.8%). Diet counseling (61%), frequent recall (50.5%), fluoride application (47.3%) and use of antibacterial agents (30.8%) were the other strategies employed (Figure 7).

It was established that only slightly more than half of the participants (52.7%) did a routine caries risk assessment for their patients. Most of the participants recalled their patients semi-annually (57.1%), while the rest did it every three months (35.2%) and annually (7.7%).

A Fisher's Exact Test revealed a non-statistically significant association between nature of practice and methods of treating early occlusal caries (p= 0.568) and between country of training and methods of treating early occlusal caries (p = 0.271).

Figure 1

Methods of occlusal caries diagnosis

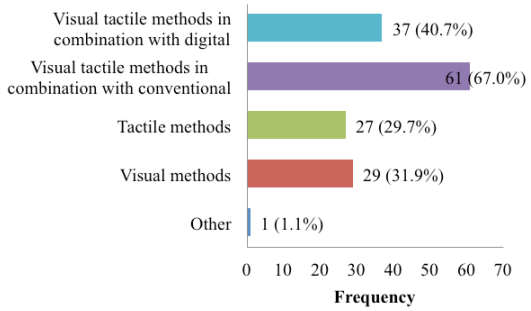


Figure 2

Knowledge of advanced diagnostic methods for caries

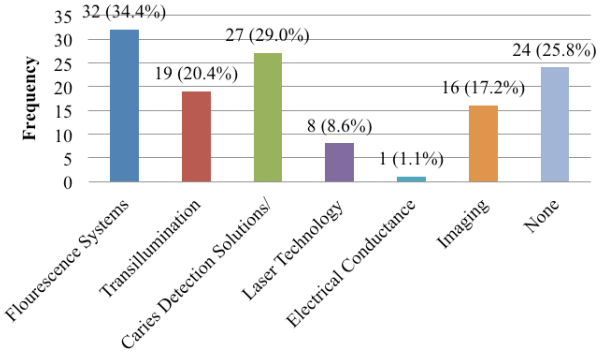


Figure 3

Familiarity with advanced flourescence systems

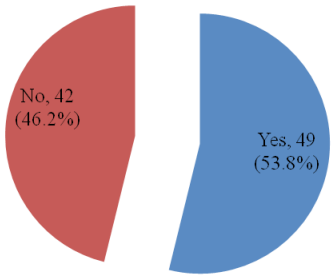


Figure 4

Familiarity with ICDAS

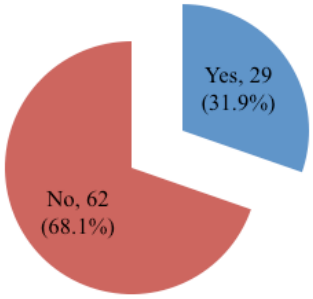


Figure 5
Limitations to use of advanced diagnostic methods

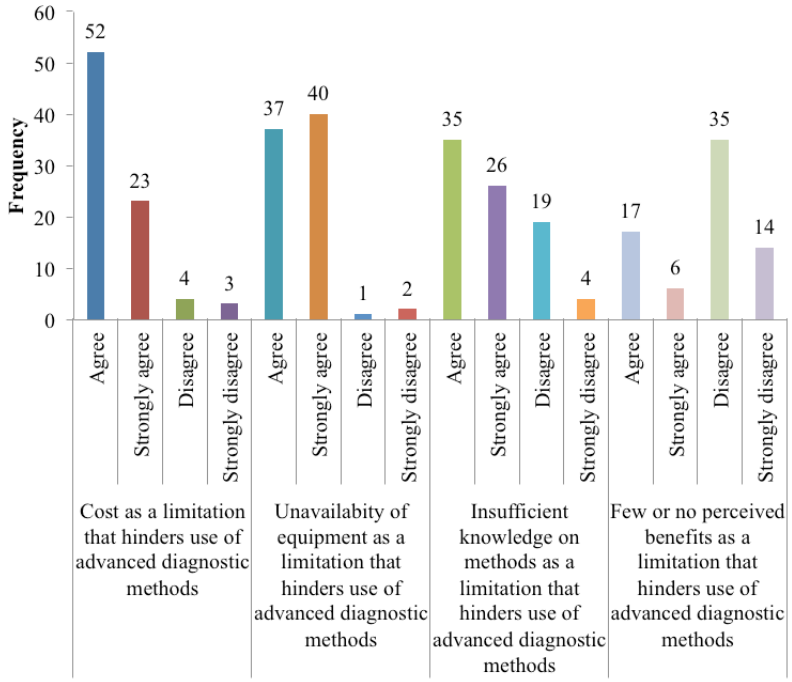


Figure 6
Choice of materials for early carious lesions

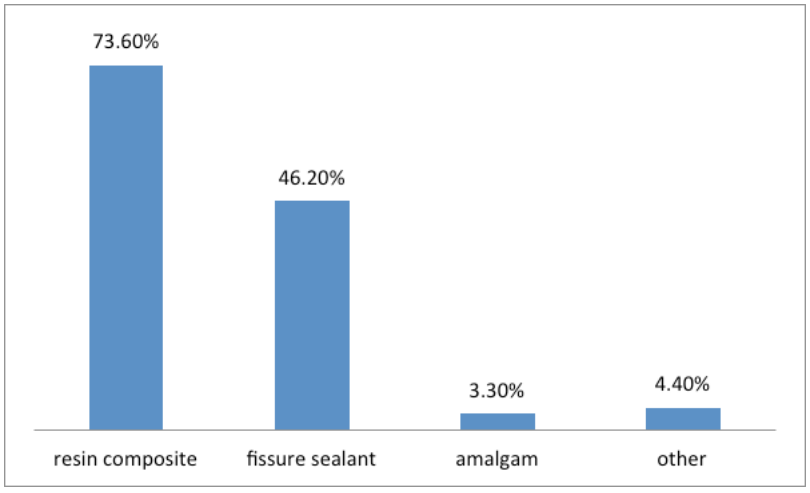
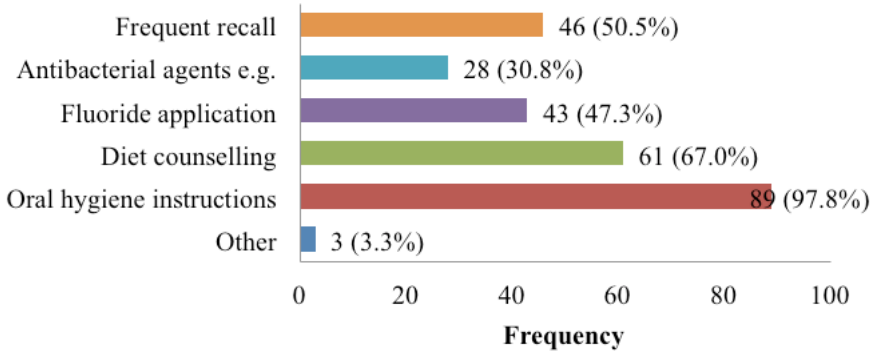


Figure 7
Non operative intervention for early carious lesions



DISCUSSION

This study found that visual-tactile methods coupled with either digital or conventional radiography was the most commonly employed method for occlusal caries diagnosis. This finding is similar to that captured in a study that reported visual and tactile methods as the clinical methods most commonly employed for diagnosis of occlusal caries (7). The tactile method entails use of a probe to determine sticky fissures as evidence of decay, though in recent times applying pressure with a sharp explorer has been discouraged because of documented damage to surface integrity and possible implantation of organisms, both of which may increase lesion susceptibility (3,4). This tactile method may also be deemed inaccurate as a sticking probe is not necessarily indicative of decay and may entirely be due to local anatomic features. Discolouration and cavitation are some of the visual parameters used in diagnosis of occlusal caries. This is in spite of the finding by several authors that discoloration of fissures is not necessarily indicative of caries (8-10).

The use of more precise, specific visual diagnostic criteria has been shown to lead to more accurate detection of "hidden caries" and provide substantially better diagnostic sensitivities (11). The International Caries Detection and Assessment System (ICDAS), is one such system which serves to improve the visual diagnosis. This system incorporates clinical descriptions which reflect the underlying histopathology of carious lesion progression (6). It is therefore worth noting that a good number of participants (68.1%) were not familiar with the ICDAS system of caries diagnosis with a mere 5.5% reporting routine use of this system in their practice.

Due to the drawbacks associated with the visual-tactile methods, newer methods of diagnosis are continually being described. Studies on certain fluorescent diagnostic systems have shown improved diagnostic accuracy of carious lesions as compared to traditional diagnostic methods (12). These systems have also demonstrated excellent repeatability and reproducibility indicating they may be of value for longitudinal observation of carious sites (12,13). However despite these documented advantages, only slightly more than half of the participants (53.8%) reported familiarity with flourescence systems used in caries diagnosis with only one participant reporting utilisation of such systems in their practice.

In the management of early carious lesions, significant clinical evidence is accumulating that optimum sealing can prevent the progress of dentinal decay (14,15). Hence it is not surprising that 46.2% of the participants use fissure sealants in the management of early carious lesions.

Certain studies have shown that the threshold for intervention with restorative treatment is low with many practitioners providing restorations for enamel lesions that could have been managed with non-invasive treatment (16, 17). Similarly, in our study 14.3% regarded all sticky fissures as the main indicator for operative treatment for occlusal caries yet as earlier mentioned sticky fissures in some instances may arise due to anatomical features and are not always indicative of caries. Majority of the participants (73.6%) employ resin composite as the material of choice for management of early occlusal caries. This augers well with the principles of minimum intervention dentistry as through the use of adhesive materials, these cavities can remain minimally invasive (18).

Most of the participants agreed that high cost and unavailability of advanced diagnostic equipment locally was the main hindrance to utilisation of advanced techniques in occlusal caries diagnosis. A good number also admitted that insufficient knowledge on the same was also a hindrance.

Caries risk assessment is currently recommended for all dental patients (6). However 47.3% of the participants reported that they did not carry out routine caries risk assessment for patients under their care. Most of the participants highlighted oral hygiene status, past caries experience and diet as the main determinants of caries risk; this was in agreement with documented literature which indicates past caries experience as the most reliable and most practical method for assessment of caries risk (6).

In conclusion, the knowledge and practice of advanced techniques that would improve diagnostic sensitivity of dental caries was low among the dentists in Nairobi who participated in the study. Sticky fissures with evidence of demineralised enamel or discoloration of underlying dentine were identified as main indicators for operative treatment for early carious lesions while resin composite was the most commonly employed restorative material for these lesions.

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