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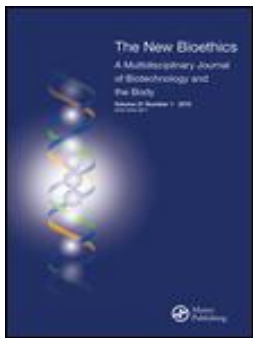
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# Screening Children for Caries: An Ethical Dilemma in Nigeria

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Dental caries is the main oral health challenge for children in Nigeria. Concern about its negative impact makes screening for caries in children an attractive public health strategy. The ability to detect the preclinical phase of caries, the availability of screening tools with high accuracy, and the possibility of treatment before onset of clinical symptoms with significant cost and health benefits, makes it appropriate for screening. However in Nigeria, the poor availability of highly specific and sensitive screening tools, poor access to oral health care and concerns with pre-screening consent, raise the question of the appropriateness of conducting screening programmes for children. We argue that a number of structural challenges associated with poor uptake of oral health care services need to be addressed before screening for caries can be considered ethically appropriate. These include facilitating access of children to quality oral health care and a systematic national approach to oral health implementation. Failure to address challenges associated with dental service utilization by children in Nigeria increases the risk of screening programmes promoting inequitable access to oral health care services.

**KEYWORDS** caries, screening, Nigeria, ethics

## Background

The main oral health challenge for children in Nigeria is dental caries (Folayan *et al.* 2014a). It is also a disease of significant global implications with caries in the permanent and primary teeth being the first and tenth most predominant global health problem, respectively (Kassebaum *et al.* 2013). Yet caries is highly preventable. The prevalence of caries in Nigeria ranges between 10.9 and 22.5% in the primary dentition, and between 5.7 and 35.5% in the permanent dentition (Folayan *et al.* 2014a). Compared to other parts of the world, this prevalence is low (Petersen 2004). However, the level of untreated caries in Nigeria is significantly high, ranging between 77.2 and 98.6% in the permanent dentition and 92 and 95.6% in the primary dentition. The Restorative Index (Umesi-Koleosho *et al.* 2007), Treatment Index and Met Need Index (Denloye *et al.* 2005) are all very low, indicating delayed management of dental caries in many communities in Nigeria.

Unfortunately, untreated dental caries is associated with multiple social, psychological, health and economic consequences. For children, the persistent pain from untreated caries may decrease the quality of life by interrupting the ability to learn, play, eat and sleep (Chukwumah *et al.* 2016). Children with severe caries often fail to thrive (Elice and Fields 1990), weigh less than their peers (Acs *et al.* 1992), and have less fulfilling and productive lives (Palermo 2000). Painful carious lesions may cause children to miss school; and when in school, make the time spent markedly less productive (Clarke *et al.* 2006). Caries may also disrupt psychological development of the child as the associated pain makes it difficult to play, and this distracts from ability to garner intellectual development and other social skills provided by the activity (Ginsburg 2007). Worse still, untreated caries increases the risk of developing new lesions by more than fivefold (Sofola *et al.* 2014). Cases of death have been reported when caries is left untreated (Casamassimo *et al.* 2009) as have other health challenges (Oziegbe and Esan 2013). For these reasons, researchers have recommended screening for caries in children to facilitate the prompt diagnosis and early treatment of lesions in line with the national oral health policy (Federal Ministry of Health 2012).

There is, however, very little known about the effectiveness of screening for caries and the associated ethical dilemmas in the Nigerian context. Specific ethical dilemmas could arise in a country like Nigeria where oral health care services are concentrated in urban areas, care is paid for mainly by out-of-pocket method, the quality of care is not always optimal, and there is no legislation to facilitate access of children with oral health problems to care (Adeniyi *et al.* 2012). This review will examine evidence on the effectiveness of caries screening programmes, and highlight possible ethical dilemmas associated with the screening children for dental caries in Nigeria.

## Method

This article is based on information retrieved from a review of published peer-reviewed journal articles, internet resources and Nigeria government documents which provide insight into the oral health care system in Nigeria with particular focus on caries in children. First, we conducted a search on some electronic databases namely PubMed, Global Health, Google scholar and African Journal Online (AJOL) for relevant articles using search terms such as ‘oral health screening’, ‘oral health’, ‘screening’, ‘dental caries’, ‘Nigeria’ and ‘ethics’. Using the ‘and’/‘or’ option reduced the initial search to 2795 titles. Review of the retrieved titles and abstracts showed some articles were not relevant while several articles were duplicated. A total of 61 abstracts were downloaded of which 29 full articles were considered relevant for the present study.

Where appropriate, the ‘related articles’ search tool was used to retrieve more relevant materials. In addition, we checked the reference lists of all documents and articles retrieved in the previous search stages to identify relevant materials. This retrieved a further 25 papers not earlier included. [Figure 1](#) shows the literature search flowchart.

The inclusion criteria for articles in this appraisal were the objective(s) of the paper and the quality of the material. Materials were included only if they clearly addressed issues related to dental caries in children, oral health screening, screening for caries especially in children and ethical considerations for screening. In order to ensure validity and reliability of the information obtained, we examined the information for consistency. In addition, we verified the information by triangulating with other documents. Information that could not be fully substantiated was excluded.

In considering the research question, we adopted the definition of screening provided by UK National Screening Committee (Health Knowledge, Unknown), which is

a public health service in which members of a defined population, who do not necessarily perceive they are at risk of, or are already affected by a disease or its complications, are asked a question or offered a test, to identify those individuals who are more likely to be helped than harmed by further tests or treatment to reduce the risk of a disease or its complications.

We adapted this definition for caries screening noting that caries screening requires the use of simple tests across an apparently healthy population in order to identify individuals who have risk factors or early stages of caries disease, but do not yet have symptoms (Health Knowledge, Unknown).

We then conducted a review of literature to identify the ethical requirements for caries screening, the contextual situation in Nigeria and how this may pose a challenge to the ethical conduct of caries screening for children in Nigeria. In addition, we examined the possible policy and programmatic changes that could be made to improve the ethical conduct of caries screening for children in Nigeria.

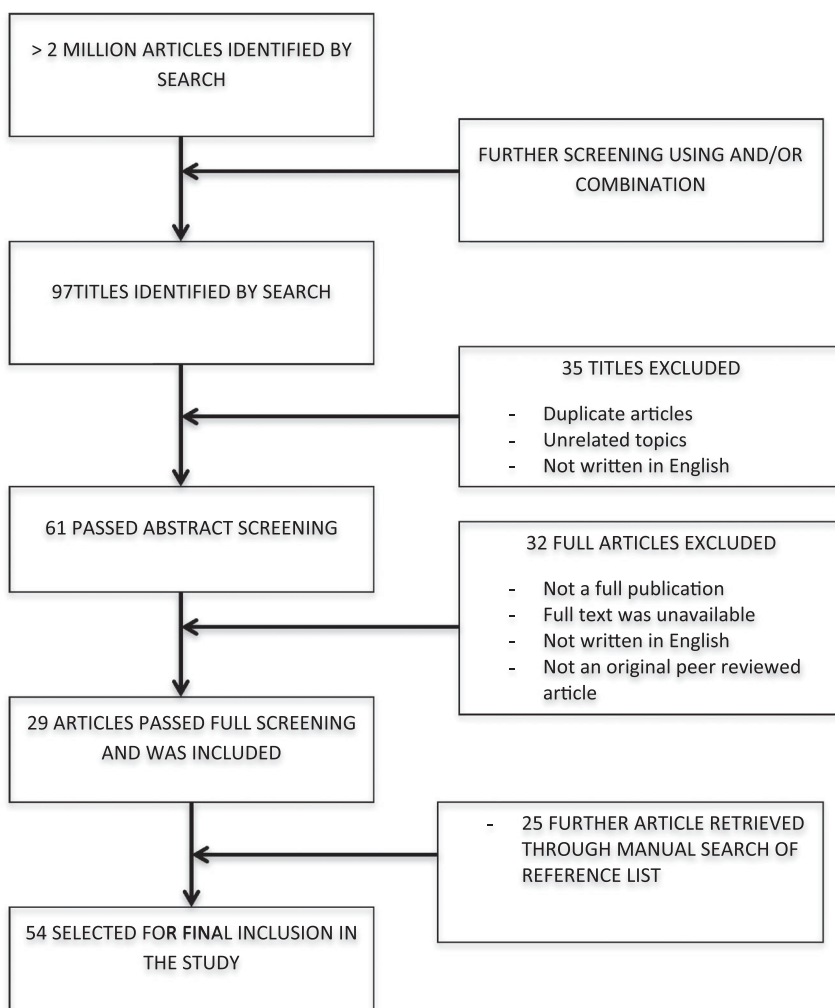


FIGURE 1. Literature search strategy.

### ***Screening for caries and its public health importance in Nigeria***

To be considered an appropriate public health approach, screening programmes should meet a range of criteria namely: the disease for which screening is conducted must be of public health significance; it should have a detectable preclinical phase; and treatment of disease before the onset of clinical symptoms should deliver more beneficial outcomes than treatment after onset of symptoms. The screening test itself should meet acceptable levels of accuracy and cost, and both the screening test and follow-up requirements should be acceptable to individuals at risk and to their healthcare providers (Holland *et al.* 2006). We examined how well screening programmes for caries in children in Nigeria meet these criteria.

*Is dental caries in children an important public health issue in Nigeria?* While the severity of caries in Nigeria, measured by the dmft/DMFT indices, is lower than the

World Health Organization threshold (Peterson 2004), the prevalence is high enough for it to be considered a silent unrecognized epidemic (Folayan *et al.* 2014a). The low treatment index and the significant impact caries has on the quality of life of children are reasons to promote early detection of caries and institute its prompt management. Treatment of caries also improves the quality of lives of children (Chukwumah *et al.* 2016).

*Is there a detectable preclinical phase of the caries lesion:* Caries starts as an insidious lesion resulting from decalcification of the enamel from acid generated from fermentation of refined carbohydrate by normal oral commensals (Simón-Soro and Mira 2015). The decalcification of the enamel results in a painless white chalky opacity of the enamel detectable by visual inspection (Cury and Tenuta 2009). The diagnosis of early lesions and lesions in sound occlusal fissures and interproximal spaces can be challenging (Bad Bader *et al.* 2002).

Recently, the use of the International Caries Detection and Assessment System (ICDAS-II) for visual caries screening has been promoted. Its sensitivity and reliability for caries detection is enhanced because it is a validated visual scoring system (Braga *et al.* 2010). It has high specificity though less sensitivity when clinical and histological diagnoses are compared (Diniz *et al.* 2009). It was also more specific for caries detection when compared to bitewing radiographs during in-vitro studies (Jan *et al.* 2015). However, ICDAS-II is not a rapid test. Its accuracy as a caries diagnostic tool is dependent on the competence of the individual conducting the visual inspection. Bader (2001) notes that the correlational validity of visual inspection in detecting enamel caries on occlusal surfaces is lower than the desired 80% though the results of Gimenez *et al.*'s. (2015) meta-analysis and some other studies (Baelum *et al.* 2012, Mendes *et al.* 2012) showed that the level of accuracy achieved through visual inspection was good enough.

Cleaning and drying the tooth could precede visual inspection of teeth for caries. Ismail (2004) noted that the detection of early signs of caries cannot be achieved unless the teeth are clean and dry. Gimenez *et al.* (2015) substantiated this by noting that the presence of bacterial plaque, acquired pellicle, saliva and soft tissues could reduce the detection of carious lesions, leading to lower sensitivity values. Yet a number of caries screening programmes conducted in Nigeria examined for caries while the teeth were wet (Folayan *et al.* 2015, Oyedele *et al.* 2015). There is, however, no data available to compare the accuracy and reliability of examining the teeth dry or wet or examining then clean or unclean (Ismail 2004). Additionally, the diagnosis of inter-proximal caries during visual inspection is hampered by natural variations in tooth shape and alignment (Gakenheimer 2002). Efforts at increasing effectiveness of visual inspection for fissure and interproximal caries through the use of dyes have however, proved unreliable (McComb 2000).

In order to increase the objectivity and accuracy of caries detection, including the detection of interproximal caries, full mouth digital radiographs are recommended Gakenheimer, (2002). Digital radiographs increase diagnostic accuracy (Hintze 2006) and help overcome the limitations associated with traditional films such as less-than-perfect exposure levels, poor angulations and processing failures which

results in healthy teeth being misdiagnosed as having caries up to 20% of the time (White *et al.* 1984).

Unfortunately, there is low competency with the use of ICDAS for the diagnosis of caries in children in Nigeria. We found no study where ICDAS-II was used for caries diagnosis. Diagnosis of caries is majorly through the use of the World Health Organisation's criteria, which typically misses out enamel caries detection. Also, traditional radiographs are still in use in public oral health clinics, and there are no reports on the use of radiographs for screening children during field visits. Inability to use radiographs for screening during field visits further limits the competency of oral health personnel to diagnose preclinical carious lesions effectively during screening programmes, a major goal of screening programmes.

The treatment of preclinical caries offers substantial benefits compared with treatment after the onset of symptoms. Apart from the distress suffered by the child from the symptoms experienced and the associated parental stress, the cost of treating early lesions is significantly less than treating advanced lesions (Schwendicke *et al.* 2014). This should be an important screening goal for a resource-poor setting like Nigeria. Unfortunately, the ability to achieve this goal through the current screening effort is limited.

*Cost-benefit of caries screening:* Caries screening is relatively expensive due to the intensive use of skilled human resources and appropriate technology. Ideally, the screening exercise should lead to utilization of oral health services thus a screening exercise could save costs. A screening programme linked to comprehensive oral health care access would make it cost-effective. However, a screening programme that simply provides referrals for care would have very little benefits in terms of saving costs and thus would not be acceptable. Unfortunately, most screening programmes conducted in Nigeria simply refer children with oral health diseases for further treatment making them cost ineffective.

*Caries screening and follow-up treatment:* A major challenge for many children who need care following caries screening exercises in Nigeria, is the need to pay for services. Payment for oral health care is mainly through out-of-pocket expenses as preventive caries care and treatment of caries and its sequelae (except for amalgam restoration and extraction) is not covered by the National Health Insurance Scheme or any other financial scheme (Adekola 2015). The perception of ill health, culturally associated limitations with the use of health facilities, and structural challenges with access to oral health care services limits the uptake of treatment following caries screening.

Also, dental researchers often organize caries screening programmes for children through school programmes (Oyedele *et al.* 2015, Chukwumah *et al.* 2016) during oral health campaigns (Olusile *et al.* 2014), and through household surveys (Temilola *et al.* 2014, Kolawole *et al.* 2016) mainly for research purposes. State agencies rarely conduct oral health screening programmes. The screening programmes therefore remain largely uncoordinated and haphazard with the potential to create concerns and resistance to seeking treatment by programme recipients who may view the research project as of little or no benefit for study participants, with poor enthusiasm to take action when referrals are made.



### ***Effectiveness of caries screening programmes for children in Nigeria***

For dental screening programmes to be effective, demand must be generated through the screening programmes, and the supply of adequate and affordable dental care must exist to meet the demand created. Unfortunately, in Nigeria, both the demand for and supply of oral health care services are limited (Adeniyi *et al.* 2012). The outcome of many screening programmes in Nigeria to date has been referral for treatment, rather than the treatment itself. While referral increases access of some individuals to oral health care, the proportion of children with treatment needs who access treatment following screening programmes is minimal and of little public health significance. Folayan *et al.* (2013) reported only 15.8% of the cases referred for treatment following oral health screening among secondary school children in Ile-Ife accessed oral health care within 12 months. Similarly, Onyejaka (2014) reported only 9% of the children referred for oral health care in Enugu State accessed care within 12 months of referral. Esan *et al.* (2015) also reported low uptake of oral health care services following a 4-year intense school-based oral education programme: only 7.3% of the population had utilized oral health care services in the last 12 months of the 4-year programme. Efforts to create demand for both preventive and curative oral health care services through school-based screening programmes have been limited and the results had been unimpressive. The only reports we found where efforts were made to increase access of children to preventive oral health care in Nigeria was by Onyejaka (2014).

*Barriers to utilization of oral health services:* Low demand for oral health services in Nigeria may result from disparity of views about felt and expressed dental health care needs (Wright and Walley 1998). Cultural beliefs about sickness and wellness appear to have significant impact on the use of health care services (Ajayi and Arigbede 2012). In Nigeria, hospital attendance is associated with severe ill health and weakness (Jegede 2002). Also, the belief that illness is the result of supernatural phenomena means many people often resort to prayer or other spiritual interventions that counter the presumed dis-favour of powerful forces (Mc Laughlin and Braun 1998). Hospital visits are, therefore, often delayed and a last resort for health care (Jegede 2002). Folayan *et al.* (2013) also identified low perception of need for oral health services among adolescents as the main reason for low use of oral health services.

Some socio-economic variables also influence the pattern of use of oral health care services. Social class differences in the uptake of dental services have been reported in numerous diverse settings (Tickle *et al.* 1999). The use of preventive oral health care services is higher among children from high-income households (Watson *et al.* 2001); and the use of oral health care services is higher for children with highly educated mothers (Lopez and Baelum 2007) even in Nigeria (Onyejaka 2014). While uptake of dental services following referrals is moderate in developed countries where the barriers to access of dental services are few (Milsom *et al.* 2006a) for a developing country like Nigeria where there are multiple challenges to oral care service access, referral is unlikely to increase oral health care service utilization significantly.

Challenges to service access arise from a range of individual, family and structural issues. Individual challenges include dental anxiety and fear (Bamise *et al.* 2008), while family challenges include caregivers' attitude to oral health (Folayan *et al.* 2015) and cost of treatment (Onyejaka 2014). Children who live with persons who are not their parents (Simón-Soro and Mira 2015), and those who live with single mothers (Ola *et al.* 2013) are less likely to receive oral health care when referred. Structural challenges include distance to oral health care facilities (Onyejaka 2014) resulting from limited number of oral health facilities (Denloye *et al.* 2004) and poor geographical distribution of available facilities, poor quality of health care services, the timing of service provision (public oral health service are provided during school hours and working hours) and inadequacy of oral health personnel (Adeniyi *et al.* 2012).

Frequently, clients who are lost to health care services following referrals are from the low socio-economic strata (Milsom *et al.* 2006b). Screening and referral of children with dental caries for treatment may therefore create new problems wherein an oral health intervention further entrenches inequality due to differential ability of children's caregivers to overcome barriers to accessing oral health care treatment. Onyejaka's (2014) study pointed to this possibility: her study reported that children from low and middle socio-economic status were less likely to utilize dental services post referral. They however did not explore the reasons for the observations.

In countries where screening programmes are conducted as part of a defined national oral health programme like in the United States, the uptake of preventive services is still low (Shenson and Alderman 2004). Without a structured national programme on caries management wherein screening programmes are complementary to achieving national set objectives, caries screening programmes may actually be a non-beneficial public oral health practice for children as is the case with Nigeria.

### ***Ethical challenges with screening for dental caries in children in Nigeria***

Ideally, screening programmes should identify children with dental caries and facilitate their uptake of preventive and curative treatment services. The public health justification for population screening programmes is an early diagnosis, which leads to a cost-effective and measurable reduction in disease burden and improved quality of life for the population (Herman *et al.* 2002). However, screening comes with associated risks such as misunderstanding of results, misdiagnosis, labelling, stigmatization and decreased psychological well-being (Herman *et al.* 2002). Results from screening programmes may be misused by insurance companies to exclude individuals from benefits (National Health Committee 2003).

Screening programmes should therefore be implemented only after instituting safeguards for these possible harms. Such safeguards include ensuring screening tests are linked to evidence-based treatments that are affordable for all screened individuals regardless of their socio-economic status (National Health Committee 2003); informed consent should be obtained from parents of children before screening is conducted; and procedures to protect the right to privacy of children and their families should be implemented well in advance of the actual screening (National Health Insurance 2016).

*Pre-screening consent:* It is a professional obligation for health professionals conducting caries screening exercises to ensure that individuals being screened receive unbiased, balanced timely information that enables them to understand the procedure. Verbal or written consent needs to be explicit and recorded (National Health Insurance 2016). The information should be given in a culturally appropriate and sensitive way, which is right for the users and their circumstances. This is important as screening can involve difficult choices with individuals at liberty to make independent informed choices about whether or not they want to be screened and – if they are found to have a condition – what treatment and advice they would like (National Health Insurance 2016).

Children and young adolescents need a legally authorized surrogate decision maker—usually a family member – to make decisions on their behalf. In Nigeria, the need for children to visit oral health clinics and pay for services received makes it more imperative to actively engage parents in the decision-making process. Also, the cultural and social sensitivity around parenting promotes and supports obtaining parental consent prior to screening children and adolescents (Folayan *et al.* 2014b).

School-based research related caries screening programmes in Nigeria have depended on verbal or written consents using an ‘opt-out’ approach or proxy consent. For opt-out approach to be valid, informed consent document must be sent to parents or legal guardians at least two weeks before research activities begin and should not be sent home with the young person (Folayan *et al.* 2014b). Proxy consent holds no legal validity and has been challenged in past situations (Folayan *et al.* 2014b). The pre-screening consent process in children in Nigeria can therefore, be improved.

*Protection of privacy of children, adolescents and families:* Concerns about privacy and confidentiality can prevent children and their families from seeking care, and can deter them from communicating openly with providers (Klein *et al.* 1998). Over the years, adolescents have gained many opportunities to receive confidential health care services, especially those related to sexual health and prevention of pregnancy, HIV management and other sexually transmitted infections, substance abuse and mental health (English and Ford 2004). This has mainly resulted from the sensitive nature of sexual and reproductive health and the possible limitations parental consent can bring to adolescents’ access to health care.

Caries screening does not have the level of sensitivity associated with screening for sexual, reproductive diseases and mental illnesses. However, concerns about privacy and confidentiality and a medical practice ethos still need to be upheld to show respect for clients. This implies that during caries screening exercises, screening outcomes should be accessible only to the child and the legal guardian. Screening exercises should ensure that information is only used to promote care for the client (HHS.gov 2000). Unfortunately, the breaching of clients’ privacy and confidentiality is rife in medical and dental practice in Nigeria (Adeleke *et al.* 2011). This is one major reason clients adjudge medical care services in the public health sector poor and a reason for not accessing care (Adesanya *et al.* 2012).

Researchers also face challenges with screening of children for research purposes. Oftentimes when children are screened during school visits, children are screened

openly in classrooms (Chukwumah *et al.* 2016, Oyedele *et al.* 2015). Efforts to ensure privacy during the screening examination should be actively pursued by oral health care personnel. Information on outcomes of screening exercises is then given to children for onward relay to their parents with little or no evidence suggesting confidential handling of this information such as sealing the referral document in envelopes or other measures that limits access of unauthorized individuals to information.

## Discussion

Screening for caries in Nigeria could be an ethical and robust public health approach for addressing the current public health challenge with caries management. Its effectiveness is however limited by multiple implementations and ethical challenges identified above. While dental professionals consider caries a public health challenge, policymakers give it poor attention because of the low morbidity and mortality (Folayan *et al.* 2014a). Oral health is poorly funded in Nigeria with only 0.41% of the national health budget dedicated to oral health between 2006 and 2010 (Adeniyi *et al.* 2012). Low investment in national oral health compromises the ability to develop appropriate interventions for the early management of oral disorders like caries. For example, it could limit the building of oral health care practitioners' competency to reliably use the ICDAS for preclinical diagnosis of caries, and purchase of digital radiographic machines, which increases the specificity, and sensitivity for diagnosis of pre-carious lesions. While the treatment of pre-carious lesions may be beneficial, the poor financing of oral health combined with various individual, family and structural barriers reduces the prospect for uptake of preventive care by majority of the Nigerian population; the very objective for screening exercises. Additionally, the existing practices concerning obtaining pre-caries screening informed consent, maintaining patient's privacy and confidentiality further compromises the integrity of caries screening exercises in Nigeria.

While the national oral health policy (2012) advocates for caries screening in children, there are currently no national screening programmes, thus existing screening exercises tend to be unfocused with no measureable outcomes. A national caries screening programme can only be established if the implementation and ethical conditions discussed above are met. The merits of caries screening though laudable from a public health perspective, faces low potential benefits for majority of Nigerians because of the barrage of unaddressed problems that act as barriers to dental service access. The psychological distress for parent and child who are referred for caries management but are unable to access care due to existing barriers is an associated risk that may be damaging on the long run. Therefore we could argue that the current conduct of caries screening programmes in Nigeria though profitable for academic purposes, definitely have limited public health outcomes.

An approach for improving the public health benefits associated with caries screening programmes could be incorporating school-based treatment programmes for all school-based caries screening programmes in the country. A pilot programme conducted in Lagos State, which provided treatment services alongside the screening

exercises was scaled down due to the high cost of the project (personal communication – Adeniyi AA). The high cost of implementing school-based caries treatment programmes could be offset by children's access to health insurance schemes. The government could also provide free oral health care for children. While free treatment implies that the economic barriers limiting access to caries treatment is addressed, it does not address other factors beyond the economic factors that serve as barriers to dental treatment access (Butani *et al.* 2008).

Addressing structural barriers to oral health service access is critical. There are over 6000 tertiary, secondary and primary health care facilities in Nigeria (Federal Ministry of Health and Measures Evaluation 2011) all with the potential to provide oral health screening programmes for children. Currently, oral health care is largely provided by private clinics in Nigeria with public health institutions constituting a small fraction of all facilities providing the oral health care services in Nigeria (Otoh 2015). Focus on equipping public health facilities to provide quality caries treatment services for children is essential. A school-based caries treatment programme would not reach the 30% of pupils who drop out of primary school and another 54% of primary school children who will not transit to Junior Secondary Schools (UNICEF 2005). Using a community-based caries screening and treatment approach will likely be more effective.

For cost effectiveness purposes, caries screening programmes could be a component of other national health screening exercises. The national demographic health survey is conducted every five years in Nigeria and has been conducted since 2003. Incorporating oral health screening into the national demographic health survey will generate evidence for national action.

A systematic approach to caries screening that informs national oral health policy and programmes can improve oral health in children and can yield important health gains. Such systematic approach to primary caries prevention has been reported in Tanzania with similar health and financial indicators like Nigeria (Masumo *et al.* 2018). Developed countries such as Australia, Canada, New Zealand and the United States of America have systematized approaches to caries screening for children (Folayan 2018) with efforts also instituted to prevent inequitable access to oral health care in children. For these countries, dental services are delivered through instituted free school health programmes thereby eliminating the negative impact of costs and distance on oral health care access by children.

Extensive financial, manpower and capacity development are required in Nigeria to address the barriers to oral health care access. Much more than that, the political will to implement the oral health policy, and address the barriers there are to access of primary oral health care for children, is required. Only then can caries screening programmes be considered ethical.

## Conclusion

Caries screening programmes in Nigeria have the potential to be useful in addressing the current public health challenges of prompt caries detection and treatment for children. However, there exist limiting factors in the delivery of oral health care

that currently makes screening programmes ineffective in addressing its objective, which is early detection and prompt treatment of carious lesions. Failure to address such structural challenges that limits access of some vulnerable children to oral health care services will result in caries screening programmes in Nigeria further promoting inequitable access of children to oral health care services.

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