

Prevention of Dental Caries in Nigeria: A Narrative Review of Strategies and Recommendations from 1999 to 2019

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ABSTRACT **Objectives:** This narrative review aimed to show the approaches recommended for the prevention of dental caries in Nigeria by epidemiological surveys (P), primary preventive methods and strategies, (I) comparison preferred by experts (C) in the prevention of dental caries (O). **Methods:** An electronic literature search of some databases such as Pubmed, Pubmed Central, Google Scholar, African Journal Online (AJOL) and Medline was conducted using these keywords delimited by Boolean operators AND, OR and NOT: “dental caries” “prevention” “Nigeria. Epidemiological studies using WHO criteria published in English between 1999 and 2019 were included in this study. **Results:** All studies that met the inclusion criteria were epidemiological cross-sectional studies, non-clinic –based. The approaches recommended include need for continuous caries surveillance, preventive and restorative programmes, primary prevention, use fluorides, oral health education and atraumatic restorative treatment. **Conclusions:** The recommended approaches should include continuous caries monitoring, comprehensive preventive and restorative programmes, primary prevention, use fluorides, oral health education and atraumatic restorative treatments in public schools and primary health care (PHC) centres. It is necessary to augment these approaches with undergraduate cariology curriculum review of dental schools, public-private partnership and oral health policy implementation with emphasis on prevention.

KEYWORDS: Dental caries, epidemiological, Nigeria, prevention approaches

INTRODUCTION

Dental caries continues to be one of the most prevalent infectious, multifactorial diseases worldwide and has been described as a localized destruction of susceptible dental hard tissues by acidic by-products from bacterial fermentation of dietary carbohydrates.^[1-3]

Dental caries affects around 60%–90% of school-age children and the majority of adults in most industrialized countries but less in common developing countries. According to the Global Burden of Disease, the combined prevalence of caries for adults and children is 34.1%, affecting 2.5 billion people worldwide, making untreated caries in permanent teeth to be the most prevalent

condition seen in mankind.^[3,4] Previously Akpata^[5] reported a caries prevalence range of 3%–30% in Nigeria.

Global studies suggest a decline in caries prevalence in high-income countries but less in the low-income countries due to disparity in prevention-oriented oral health systems, the intake of cariogenic foods, low exposure to fluorides, access to oral health services, and lifestyle factors.^[6-10]

The approaches to prevention in a highly diversified country as Nigeria need to be reviewed to ascertain what experts are inclined to practice and recommend.

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The high-risk approach to caries interventions aims to prevent the progression of caries by the clinical application of procedures.^[11] The option of primary prevention has been particularly suggested for resource-poor countries to prevent pain, tooth loss, dysfunctional speech, and to reduce cost of treatment. Dental caries prevention has a broad multifactorial perspective involving nutritional considerations, dietary analysis, counseling, oral health education, plaque control, recall visits, oral prophylaxis, use of fluorides, fissure sealants, and other approaches including atraumatic restorative treatment, use of xylitol, dental caries vaccine, and probiotics. According to some reviews, there is strong evidence for the use of topical fluorides and varnishes in caries prevention but not sufficient for all other professionally applied methods.^[12,13]

There is an apparent paucity of reviews on caries prevention strategies and methods in Nigeria. The purpose of this article was to review the prevention of dental caries in Nigeria arising from caries epidemiological studies and to establish a baseline

toward developing guidelines for the use of caries preventive methods in Nigeria.

The objectives were based on PICO statement formulated to study subjects assessed by epidemiological surveys for dental caries in Nigeria (P), what primary preventive methods and strategies (I), comparison are preferred by experts (C) in the prevention of dental caries (O).

MATERIALS AND METHODS

An electronic literature search of PubMed, PubMed Central, Google Scholar, AJOL databases, or information sources was conducted using these keywords: “dental caries,” AND “prevention,” AND “Nigeria.” The eligibility criteria were narrowed to epidemiological studies using the World Health Organization (WHO) criteria published in English between 1999 and 2019 and they were included in this study.

This review focused on suggested caries preventive strategies drawn from the selected epidemiological

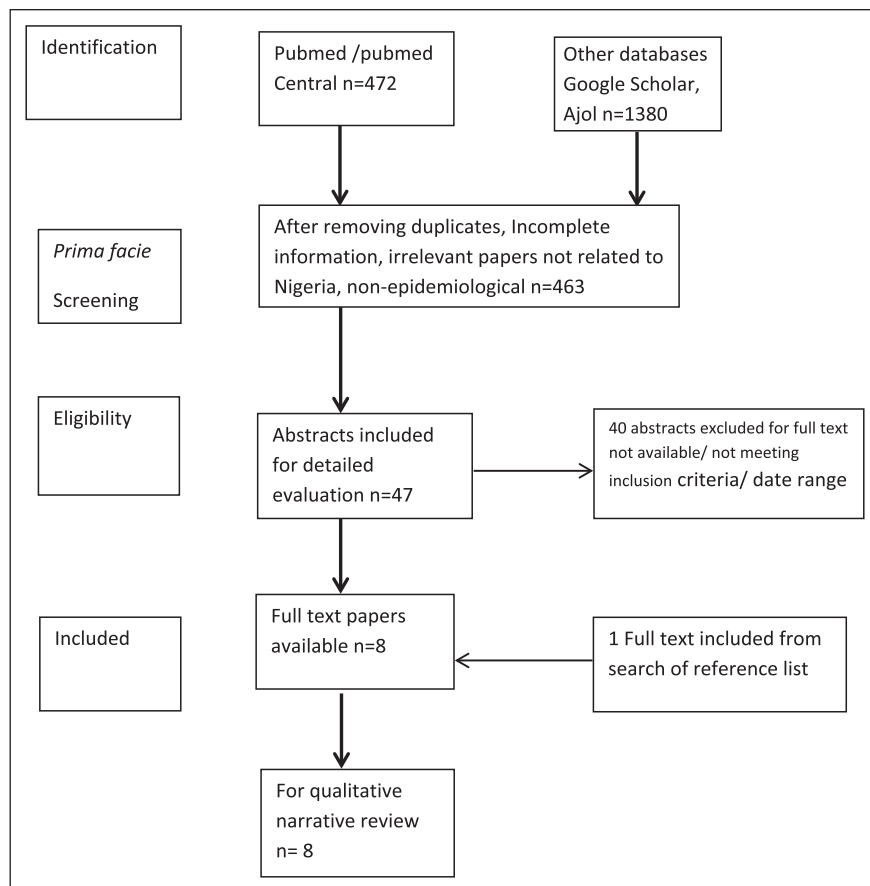


Figure 1: Flowchart indicating the processes leading to the inclusion of the reviewed literature

studies in Nigeria. Initially, a search in PubMed Central and databases after removing duplicates, incomplete information, irrelevant papers not related to Nigeria, and non-epidemiological studies yielded 463 citations with or without abstracts; and after screening the abstracts, 47 of them, which were related to Nigeria, got selected for the review at first stage.

A further review resulted in 16 abstracts, which were peer-reviewed independently. A further screening and manual search resulted in eight publications that met the final full-text criteria that were selected, thoroughly read, and the relevant data were extracted for this study [Figure 1]. Extracted data related to year of publication, the type of research, the authors, geographical location, title, research methodology, participants, recommended preventive intervention from discussion and conclusion and documented to ensure correct information. No quantitative analysis of data was carried out.

DISCUSSION

All studies that met the inclusion criteria were epidemiological cross-sectional studies, nonclinic-based and were conducted between 1999 and 2019 [Table 1]. The selected studies provided useful information on the prevalence and severity of dental caries and recommendations for its prevention. Table 1 also shows the prevalence of dental caries ranging from 4% to 40%, whereas the severity of dental caries was 0.46–0.7. The approaches include in summary caries monitoring (surveillance), oral health education, use of fluorides, and restorative programs such as atraumatic restorative treatments in schools.

This review shows that dental caries is a dental public health concern in Nigeria with a prevalence as high as 33% and mean decayed missing filled teeth (DMFT) range of 0.14–2.5 scores.^[14-21]

The reviewed epidemiological cross-sectional studies, however, provide insights on the need for preventive interventions to control dental caries.

Four broad recommendations that emerge from this narrative review are as follows:

1. Comprehensive preventive services^[14,17,20]: School-, community-, and hospital/clinic-based preventive services including minimal intervention dentistry.
2. Fluoride therapy, fluoridation, and primary prevention services^[18,19]: The level of fluoride in drinking water is an established factor in the control and prevention of caries. A previous study on fluoride in Nigeria found low concentration in water sources with 62% of locations having a

concentration of 0.3 ppm or less, which is a risk for caries.^[22] This is considered as high caries risk and is less than 0.6 ppm, and thus require preventive intervention according to Renson^[23] and Marthaler *et al.*^[24] who suggested that the decline in caries in developed countries is related to increased use of fluorides, improvements in oral hygiene and dietary changes, provision of preventive oral health services, increased dental awareness through organized oral health education programs, and the ready availability of dental resources. Professionally applied topical fluorides (PATF) are used for caries prevention in children and adults who are at high caries risk. The effectiveness of fluoride varnish and gel applications is well established and is safe and effective among high-risk populations.^[25,26] This recommendation together with other primary preventive services such as the use of sealants can form an integrated preventive program for schools and communities.

3. Dental caries surveillance and prevention^[15,21]: The need for oral disease surveillance systems as part of oral health information systems cannot be overemphasized. The World Health Organization Oral Health Country/Area Profile Programme (WHO/CAPP) recommends that country-based and regular clinical oral health surveys be conducted every 5–6 years for effective surveillance, which can progress to the development of community-oriented preventive programs.^[27]
4. Oral health education, particularly for children, to establish good oral health habits and knowledge:^[16] Furthermore, the U.S. Preventive Services Task Force (USPSTF), an independent, volunteer panel of national experts in disease prevention recommends oral fluoride supplementation for children whose water supply is deficient in fluoride and for high-risk populations. The appropriate use of fluoridated toothpastes, professional application of topical fluorides (APF), and fluoride varnish all need to be emphasized. In this study, the use of pits and fissure sealants and other primary preventive services was not revealed.^[28-31]

Folayan *et al.*^[32] emphasized on school preventive oral health program atraumatic restorative treatment (ART) and community-based oral health services through National Oral Health Policy and National Health Insurance Scheme (NHIS).

It has been postulated that both clinical prevention and dental health education approaches cannot solve the caries problem and that only common risk factor approach addresses it because it recognizes the need for

Table 1: Caries epidemiological studies and recommended preventive interventions

Serial number	Author, year	Location	Age	Prevalence/severity	Preventive service recommendation	Study site
1	Okeigbemen, 2004	Benin city	12–15 years	33%, Mean DMFT 0.65 DMFT scores at age 12, 13, 14, and 15 years were 0.51, 0.63, 0.78, and 0.66	Continuous monitoring, preventive, and restorative programs	General field and clinic activities
2	Denloye <i>et al.</i> , 2005	Ibadan	12–14 years	Female children had higher mean DMFT score of 2.031.13 compared with 1.781.0 for males ($P = 0.05$), prevalence 15%	Perform primary prevention programs, use fluorides in caries prevention	Specified field and clinic services
3	Adekoya-Sofowora <i>et al.</i> , 2006	Ile-Ife	12 years	The prevalence of caries was 13.9% and mean DMFT was 0.14	Dental health education and caries prevention program	General field and clinic activities
4	Umesi-Koleoso <i>et al.</i> , 2007	Lagos	11–16 years	23.8%, 0.72 Mean DMFT	Need for preventive and restorative oral health-care services	General field and clinic activities
5	Okoye <i>et al.</i> , 2010	Enugu	11–16 years	15.5% had dental caries. Mean DMFT score was 0.16 ± 1.25	Implementation of preventive oral care to maintain oral health	General field and clinic activities
6	Adeniyi <i>et al.</i> , 2012	Lagos	5–16 years	Overall caries prevalence in the study population was 13.1%. Mean DMFT score was 0.344 ± 0.937	Use of fluoride toothpaste and atraumatic restorative treatments in public schools	Specified field and clinic services
7	Braimah <i>et al.</i> , 2014	Port Harcourt	12–15 years	Prevalence of dental caries was 15.4%. The mean DMFT score was 0.25	Effective prevention program	General field and clinic activities
8	Lawal and Alade, 2017	Ibadan	16–59 years	Mean DMFT was 0.7 ± 1.6	Improve the dental and preventive dental care	General field and clinic activities

partnership, related risk factors, and limited availability and accessibility of oral health services.^[33-35]

The recommended approaches for caries prevention in this study appear superficial, which might be due to the training received. It has been suggested that the cariology curriculum of academic dental institutions require updation to enable undergraduate dental students acquire evidence-based knowledge for promotion, caries preventive strategies, patient care and provide safety nets for the vulnerable and underserved.^[36-40]

The major limitation of this study was paucity of national surveillance surveys, the poor quality of many of the reviewed papers mostly with regard to sample size, subjects, and national spread. Another limitation was the limited number of publications on the subject before 1999. The inadequate number of studies, subjects, and quality of the studies make it difficult to conduct a meta-analysis in Nigeria. This review is, however, a good starting point for systematic review and meta-analysis of dental caries prevention strategies.

The consistent caries prevention approaches include the need for continuous caries monitoring (surveillance), comprehensive preventive and restorative programs, primary prevention, use of fluorides, oral health education, and atraumatic restorative treatments in public schools and primary health care (PHC) centers. These should be taken into consideration in policy formulation utilizing best practices of the methods. It is necessary to augment these approaches with undergraduate cariology curriculum review of dental schools, public-private partnership initiatives, and oral health policy implementation with emphasis on prevention.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

AUTHORS CONTRIBUTIONS

Dr Sunny Okeigbemen was involved in the study conception, preliminary literature search, data extraction, data interpretation and manuscript writing. Dr Olushola Ibiyemi was involved in independent review and interpretation of the data and manuscript writing. Both authors approved the final version of the manuscript for publication.

ETHICAL POLICY AND INSTITUTIONAL REVIEW BOARD STATEMENT

Not applicable.

PATIENT DECLARATION OF CONSENT

Not applicable.

DATA AVAILABILITY STATEMENT

The authors confirm that the data supporting the findings of this study are available within the article or its supplementary materials.

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