

**EFFECTIVENESS OF SCHOOL BASED ORAL HEALTH PROGRAMME IN
THE REDUCTION OF DENTAL DISEASES IN NIGERIA.**

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Master of International Health

September 14, 2015 – September 7, 2017

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A thesis submitted in partial fulfilment of the requirement for the degree of
Master in International Health

By:

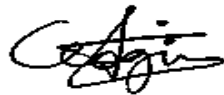
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Declaration:

Where other people's work has been used (either from a printed source, the internet or any other source), this has been carefully acknowledged and referenced in accordance with departmental requirements.

The thesis **Effectiveness of school based oral health programme in the reduction of dental diseases in Nigeria** is my own work.



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Master of International Health

September 14, 2015 – September 7, 2017

KIT (ROYAL TROPICAL INSTITUTE)/ Vrije Universiteit Amsterdam

Amsterdam, Netherlands

September 2017

Organised by:

KIT (Royal Tropical Institute) Health Unit

Amsterdam, The Netherlands

In co-operation with:

Vrije Universiteit Amsterdam/ Free University of Amsterdam (VU)

Amsterdam, Netherlands

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Acknowledgement

My sincere gratitude goes to God Almighty, the Author and Finisher of my faith for seeing through till the end of this journey. I thank you, Jesus.

I also wish to extend my gratitude to my supervisor whom despite her busy schedules have found time to patiently and professionally guide me through the project. I thank my back-stopper for her brilliant contributions and guidance throughout this project.

To the course coordinators, lecturers, administration, and course mates of Royal Tropical Institute, University of Bergen, and the University of Barcelona, I say a big thank you. It was a great pleasure ever knowing you.

I also appreciate the support of my cousin Uchenna Nnadi as well the entire Grooters family especially Elsemieke Grooters for her love and faith in me.

Most importantly, I wish to thank my family for their spiritual, emotional and financial support. Special thanks go to my father – Chief Barnabas Ogwo, my mother – Lolo Theresa Ogwo and my one and only brother – Emenike Ogwo.

God bless you all.

Glossary

Dental Caries – Tooth decay.

Periodontitis – Inflammation of the supporting structures of the tooth.

Noma – This is a kind of gangrene of the face caused by bacteria and affects young children often due to malnutrition and immunosuppression.

Pits and Fissure – Deep grooves that make up the chewing surfaces of your teeth.

Dental Fluorosis - A change in the appearance of the tooth's enamel surface due to the high deposit of fluoride.

Abstract

Oral diseases affect nearly 58% school aged children in Nigeria with the most common being dental caries and gum diseases which often times have severe consequences. 80% of these diseases are untreated due to inaccessible and unaffordable oral health services. Most of these diseases are preventable and more especially when the interventions are implemented at an early stage of life. School Based Oral Health Education(SBOHE) is one of the World Health Organisation(WHO) recommended cost effective strategy for improving oral health care, especially in low resource settings. Despite the favourable school infrastructure, supportive school health policy and a supportive national oral health policy, school based oral health programme has not been implemented in Nigeria. This study objective was to determine the effectiveness of school based oral health education intervention in the reduction of dental diseases in selected Sub-Saharan African countries and in India in order to suggest a strategy of implementing school based oral Health interventions in Nigeria. The result showed that oral health education leads to reduced oral diseases incidence, improved oral health knowledge, attitude and practice(KAP), and improve oral hygiene of school children. The collaboration of the oral health professionals, the teachers, the parents and the community, is crucial for an effective SBOHE programme. The support of stakeholders is needed for the initiation, execution and evaluation of SBOHE programme. School based oral health intervention is feasible and achievable even in resource poor settings.

Given that school based programmes are only implemented in 5% of the school in Nigeria there is a need for collaboration with the health sector to establish school health programmes as a basic programme for underpinning the SBOHP. The high enrollment of children in primary school in Nigeria will offer an easy path for the implementation of this intervention. Pilot studies should be done using 6 states to test the feasibility of this intervention in Nigeria.

Key words: School, Oral, Health, Education, Nigeria

Word count: 10,086

List of Abbreviations

ANUG – Acute Necrotising Ulcerative Gingivitis

DANIDA - Danish International Development Agency

DMFT – Decayed, Missing, Filled Teeth

DMFS - Decayed, Missing, Filled Surfaces

ECD – Early Child Care Development

LMIC- Low and Middle-Income Countries

SBOHE – School Based Oral Health Education

SBOHP - School Based Oral Health Programme

SOHP – School Oral Health Programme

MDG – Millennium Development Goals

MoH – Ministry of Health

NEEDS – National Economic Empowerment and Development Strategy

NOHP – National Oral Health Policy

NUFFIC - Netherlands University Foundation for International Cooperation

OHE – Oral Health Education/Promotion

PHC – Primary Health Care

RCT – Randomised Controlled Trials

WHO –World Health Organisation

Introduction

Oral diseases are huge global public health problem and have been ranked as the most prevalent diseases affecting man.¹ Poorly treated, and untreated dental conditions can have a significant effect on the quality of life of children which may lead to deterioration of the general well-being of the child.² The delay in treatment not only worsens the disease but also costs of care are substantially increased as a consequence.³ In Nigeria, the prevalence of dental caries and periodontal diseases are 48.0% and 58% respectively, and about 98.6% of these oral diseases in school aged children remain untreated.^{4,5,6} There is a massive shortage of oral health care professionals, high cost of dental treatment and oral health awareness is poor.^{2,7,8-10} Oral health education has been a recommendation by WHO as possible means of reducing the burden of oral disease in low-income countries.¹¹

My choice of this topic was as a result of my personal and professional experiences. At age 12, I was fortunate to benefit from a school based oral health education outreach carried out by a group of dental therapy students in my school. Prior to their visit, my oral hygiene knowledge and attitude were poor, and I have never had any form of education on how to take care of my mouth. The oral health education I received from this programme reshaped my knowledge of oral health and had kept me caries free till date.

My 3 years of experience as a dentist working in a district hospital in Nigeria and conducting community outreaches also prompted my choice of this topic. It gave me an insight into the depth of oral health situation and knowledge gap in Nigeria. Most of the individuals I treated had life threatening oral disease sequelae which otherwise could have been prevented. They lacked the basic knowledge of oral health and couldn't afford the treatment cost. The oral health care system was under funded and patients paid out of their pocket.

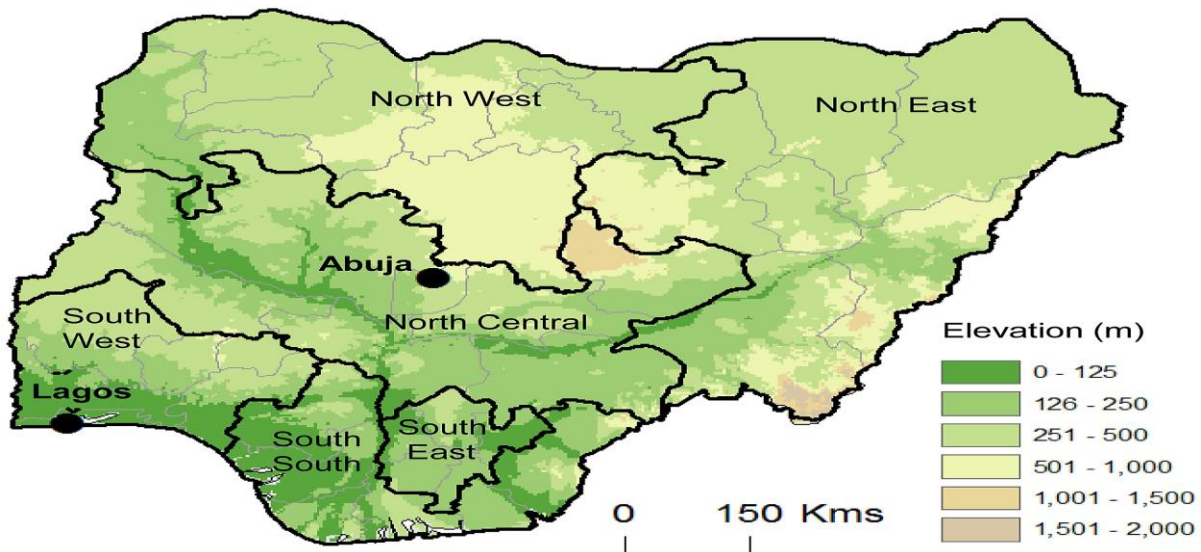
I hope that at the end of this thesis that I would be able to convince various stakeholders to adopt school oral health programme as a cost-effective means of tackling the oral health problem in Nigeria. I also hope to highlight the setbacks in previous interventions and devise a more robust intervention that will yield a maximal result.

Chapter 1 focuses on the background information on Nigerian Health care system. Chapter 2 talks about the problem statement, justification, objectives, theoretical and analytical framework of the study. Chapter 3 outlines the results and were discussed in Chapter 4. The thesis ended with recommendation and conclusion as chapter 5.

1. BACKGROUND

Nigeria is located in West Africa has the 14th largest in land mass in Africa occupying 923,768 square kilometres.¹² Nigeria is the most populous country in Africa with a population of over 190 million inhabitants.¹³ According to 2017 United Nations World Population Prospects revision, about 44% of the Nigerian population is between the age 0 to 14 years while 53% are between the age 15 to 65 and the life expectancy is 54.1 years.¹³ Nigeria has 36 states which are divided into six geopolitical zones; North East, North West, North Central, South South, South East and South West zones.¹² The country is ranked as a lower middle-income country and remains the largest exporter of oil in the African continent with gross domestic product (GDP) of \$405 billion according to the 2016 world bank data.¹⁴ According to UNESCO 2015 literacy evaluation, Nigeria has a literacy level of 54%.¹⁵

Figure 1. Map of Nigeria showing the six geopolitical zones¹⁶



1.1 The Nigerian Health system

The Nigerian Health System is decentralised with the Federal Ministry of Health overseeing the entire health care system.¹² In 2004, the National health policy was formulated with the goal of providing adequate access to primary health care services (through local government managed dispensaries), secondary health care services (through state operated general hospitals), and tertiary health care services (through university teaching hospitals, Federal Medical Centres) for the entire Nigerian population.¹⁷ Primary health care was identified as the framework to achieve improved health for the Nigerian population and was focused on health education; adequate nutrition; safe water and sanitation; sexual and reproductive health like family planning; immunisation; provision of essential drugs; and disease control.¹²

1.2 Oral Health care sector in Nigeria

The oral health care system in Nigeria is embedded into the overall health care system, and there is no precise definition of the oral health care system, and therefore, less priority is placed on oral health than other health aspects.¹⁸ The health sector in Nigeria is largely dominated by the medical professionals with the ratio of medical doctor to a dentist of 11:1.¹⁹ There is a critical shortage of oral health care professionals.²⁰ There is a dentist to population ratio of 1:46,667 and a dental hygienist to population ratio of 1:350,000

(lower than the WHO recommended ratio of 1:1000) ^{20,21} and a yearly output of 100 dentists from the six existing dental schools which is too little to offset the therapeutic and preventive dental needs of the Nigerian population.^{7,22} As at 2010, there were only about 446 public and private dental clinics serving the entire Nigerian population of over 190 million with above 50% of these facilities situated in the southern part of the country.^{13,23} The private sector constitutes about 50% of all the oral health care providers in the south of Nigeria, and more than half of these clinics are located in Lagos alone.²² Most of the dental clinics are in urbanised areas due to the availability of amenities like electricity and water. 80% of dentists in Nigeria work in the cities and the rest 20% work in rural settlements which further stretches the inequality in oral health care between the urban and rural areas.²² The private sectors as well as the public sectors, charge direct user fees for dental treatments.²⁴ Out-of-pocket payments remain the mainstay of oral health care financing in Nigeria due to weak and malfunctioning private and public insurance system thereby creating a financial barrier to accessibility of oral health care within the populace.^{10,25}

Thus, oral health services are not accessible to the majority of the population and community would occasionally seek care when the condition is painful and unbearable.^{26,27} Consequently, most oral diseases remain untreated.

1.3 The National Oral Health Policy (NOHP)

The NOHP was developed in 2012 with the major goal of addressing the rising burden of oral diseases in Nigeria.¹⁷ One of the key strategies proposed by WHO for enhancing oral health at the primary health care (PHC) level is the incorporation of oral health into school health programmes.¹¹ The NOHP prioritised on oral health promotion and prevention of oral diseases by making oral Health care part of the Primary Health care system (Table 1).¹⁷

Table 1. NOHP strategies of incorporating oral health into PHC¹⁷

1.	Incorporation of Oral Health into school health programmes, Health promotion/education programmes, and maternal and child Health programmes.
2.	Introduction of the Basic Package of Oral Care (urgent oral treatment, affordable fluoride toothpaste and atraumatic restorative treatment) into the PHC
3.	Oral health education should be carried out in schools, antenatal clinics, markets, religious gatherings, community meetings and work places.
4.	Oral health section should be added to the policies on health facilities, community, school, and workplace.
5.	Use of social marketing and participatory strategies as a tool for advocacy.
6.	Use of the media for oral Health promotion.
7.	Involve Community Based Organisations, Non-Governmental Organisations, Faith Based Organisations in the promotion of oral Health.

1.4 The School health programme in Nigeria

The education system in Nigeria presents an opportunity to implement the school health programme especially with the advent of the Universal Basic Education system (UBE). The Nigerian education system is structured into the 6-3-3-4 system (primary, junior secondary, senior secondary and university).

The first nine years of schooling (early childcare development (ECD), primary school and junior secondary school) is compulsory and free of charge under the UBE.^{28,29} The age covered within this structure are children between six to fourteen years of age and involves only the public schools.²⁹ According to the 2010 UBE data, Nigeria has 23,249 public ECD centres, 59,007 primary schools and 11,295 Junior Secondary schools (Table 2).²⁸ The net enrolment for primary education is 17,984,827 pupils. The net enrolment in junior secondary school is 3,109,331 students (Table 2).²⁸ In 2013, the country recorded a primary school gross enrolment rate of 93.65% and secondary school enrolment rate of 55.70%.¹⁵ This implies that school based oral health interventions will reach nearly all primary school pupils.

Table 2. Number of schools and Net enrolment in the six geopolitical regions of Nigeria²⁸

Region	ECD centres		Primary		Junior Secondary		Total	
	Number of schools	Net enrolment	Number of schools	Net enrolment	Number of schools	Net enrolment	Number of schools	Net enrolment
North East	1,236	95,910	9191	2,776,671	1,687	367,451	12,114	3,240,032
North west	4096	323,343	17496	5,722,597	2,191	737,394	23,783	6,783,334
North Central	2,761	144,409	59007	3,089,810	2,335	428,777	64,103	3,662,996
South South	4,572	255,498	5950	2,083,312	1,733	451,853	12,225	2,790,663
South East	4394	329,136	5424	1,827,647	1,251	420,428	11,069	2,577,211
South West	6190	381,015	8171	2,534,790	2,098	703,393	16,459	3,619,198
Total	23,249	1,529,311	59,007	18,024,827	11,295	3,109,296	139,753	22,673,343

There is an existing National School Health Policy in Nigeria which was formulated in 2006 to help actualise the millennium development goals (MDG) of education and health, National Economic Empowerment and Development Strategy (NEEDS), and all education related campaign of the Federal Government of Nigeria.³⁰ Despite some evidence in favour of School Health programme as a cost-effective strategy for achieving child health needs in a resource deficient settings,^{31,32} the school health policy is implemented in less than 5% of Nigerian Schools^{33, 34,35-37}

The policy focuses on the following areas; i) Personal Health, ii) Diseases including HIV/AIDS, iii) Mental and Social Health, iv) First Aid & Safety Education, v) Community Health, vi) Family Life Education, vii) Environmental Health, viii) Maternal and Child Health, ix) Nutrition, x) Consumer Health, xi) Drug Education, xii) Ageing and Death (Bereavement) Education, xiii) Parts of the human body, xiv) Health Agencies.³¹ It is apparent that oral health has not been incorporated into the Nigerian School Health policy.

2. PROBLEM STATEMENT, OBJECTIVES, JUSTIFICATION, METHODS, THEORETICAL BASIS OF THE STUDY, ANALYTICAL FRAMEWORK

2.1 PROBLEM STATEMENT

Despite the favourable school infrastructure, supportive school health policy and a supportive national oral health policy, school based oral health programme has not been implemented in Nigeria.³⁰ Implementation of the School based programmes could adequately address the rising burden of dental disease among school children in Nigeria.

2.1.1 Global Burden of Oral Health Diseases

Oral diseases are ranked as the number one prevalent condition out of 291 diseases listed in the Global Burden of Disease Study.¹ The most common oral diseases are dental caries, periodontitis or gum disease, cancer of the mouth, oral infectious diseases, and traumatic injuries.²¹ In developing countries, dental caries affects between 60-90% of children.²¹ Poorly treated and untreated dental conditions can have a significant effect on the quality of life by causing pain, discomfort, sleepless nights, loss of self-esteem, individual's ability to chew, smile, speak and bite and loss of school or work.² The delay in treatment not only worsens the disease but also costs of care substantially increases as a consequence.³ Oral infections such as periodontitis could lead to systemic diseases and conditions like diabetes, heart diseases, low birth

weight and pancreatic cancer and even death.¹ Recent incidence figure for Noma shows 20 cases per 100 000 annually in sub-Saharan Africa.²¹

Oral diseases are prevalent among school aged children with the most common being dental caries, and gum diseases which often times have severe consequences.^{38,39} These diseases have serious negative impact on the social, economic, emotional and physiological well-being in children. Children with poor oral health are about 12 times more likely to have more non-productive days, including being absent from school than those who do not. Each year over 50 million hours are lost from school and work due to oral diseases causing a severe economic burden.⁴⁰

These oral health problems are exacerbated by lifestyle related factors such as high consumption of sugary snacks and carbonated drinks, poor oral hygiene habits among children and adolescents which can be prevented through school health education on proper oral hygiene practices.⁴¹ In Africa, there is an expected drastic rise in the incidence of dental caries in the near future due to the rise in sugar consumption and insufficient fluoride exposure.⁴² Despite being preventable, dental caries affects between 60-90% of children in developing countries in Asia, sub-Saharan Africa, and North America and more than 40% global prevalence of untreated dental caries in permanent for all age groups.^{1,21} Many oral health problems are preventable with reversible early onset. However, in several countries, many children,

parents, and teachers have limited knowledge of the causes and preventive strategies of oral disease, compounded by lack of affordable fluoridated toothpaste and poor accessibility to oral health care.⁴¹

2.1.2 Burden of Oral Diseases in Nigeria

The prevalence of dental caries in Nigeria in school children is between 11.2% and 48.0% while gum disease has a prevalence of about 58%.^{4,5,43} There is also a growing incidence and prevalence of oral diseases like periodontal diseases, acute necrotizing ulcerative gingivitis (ANUG), Noma and increased number of untreated and complicated dental caries among children.³⁸ More than 80% of tooth decay among adolescents in Nigerians are pits and fissure lesions and are largely untreated due to lack of accessibility to oral health service.³⁹ The restorative treatment need in Nigeria is about 80% which is very high compared to that of the USA which is about 10-24%.^{44,45} The incidence of traumatic injuries in the oro-facial region is high, and there is an apparent increase in the occurrence of oral tumours.⁷ Studies have shown a very low level of oral health knowledge, attitude, and practice in Nigeria which has led to increased incidence and prevalence of some of these conditions.^{46,47} The burden of oral disease among school going children is of great public health importance considering the fact that Nigeria has an estimated 23 million children in primary and junior secondary school (Table 2).²⁸ These diseases are increasing due to low levels of oral health education levels among

the Nigerian institutions and communities as well as dietary changes resulting from massive urbanization.^{5,46,47} Furthermore, nearly 98.6% of dental caries in school children in Nigeria is untreated thus resulting in morbidity and sometimes mortality.⁶ The oral health problem is further complicated by the fact that there are no adequate oral health care facilities and insufficient dental health care professionals to address the rising burden of oral diseases, especially in the rural areas.^{20,21} The burden of dental diseases in Nigeria especially among school children needs to be urgently addressed.

Countries that have implemented school health programmes have demonstrated that these programmes are effective in reducing the incidence of dental diseases, improving the oral hygiene knowledge and practices and reducing the economic burden of oral diseases^{31,32}.

Despite a high social and economic burden of oral diseases, they are still neglected by both national and international health authorities, and there is a dearth of studies or literature to show the impact and effectiveness of school-based oral health education (OHE) programmes in low-income countries like Nigeria.⁴⁷

2.2 MAIN OBJECTIVE:

To determine the effectiveness of school based oral health education interventions in the reduction of dental diseases in selected Sub Saharan

African countries in order to suggest a strategy of implementing school based oral Health interventions in Nigeria.

2.3 SPECIFIC OBJECTIVE

1. To analyse school based oral health education interventions in Nigeria and other countries with similar sociodemographic features
2. To discuss the effectiveness of the school based oral health education intervention in the reduction of dental diseases.
3. To provide evidence to show that school based oral health intervention is feasible and achievable even in a resource poor setting.
4. Based on the study findings, to suggest an effective implementation strategy for oral health education intervention within Nigeria.

2.4 JUSTIFICATION

Oral health promotion in schools is a highly cost-effective strategy to address the global burden of oral disease.^{11,48} It empowers students to acquire personal skills, behaviour, and knowledge about oral health which are be retained till adulthood and are transferable to their families, communities, and nation.^{49,50} Involvement of teachers, families, communities not only reinforces the learned behaviour at home thus ensuring sustainability but it also educative to the teachers and parents to enhance their own personal oral hygiene ^{32,49}

Incorporation of oral health education and intervention programme into the school curriculum reduces implementation costs, and promote behavioural changes which are sustainable as well as transferable to the society and the next generation.⁵¹ Being a preventive and promotive intervention, oral health education does not need sophisticated equipment but affordable materials such as flip charts, yet they are effective in reducing the high cost of treating dental diseases and the economic burden of dental diseases.^{11,52} The implementers are mainly teachers in schools who are already enumerated by the government and parents or community at home.³⁰ This approach thus will address the shortage of dentists in poor resource settings. When fully implemented, nearly all children in primary schools and a majority of junior schools will have access to oral health care in their learning environment. A dollar spent on preventive oral care yields an average of US\$28 in return, stressing on the importance oral health promotion.¹

2.4.1 School Based Oral Health Programme

In most countries low and middle-income countries (LMIC), formal education is mostly limited to primary or secondary level.¹¹ Therefore, implementing oral health education interventions at this level might be the best possible chance to pass on proper and ideal knowledge, work on the attitude which will influence a change in oral health care practices and of course, reduce dental disease incidence.^{2,52}

According to WHO, some of the strong arguments for oral health promotion through schools include the following (table 3).¹¹

Table 3. The WHO argument for oral health promotion through school.¹¹

1.	Pupils and students can be reached during their formative years which are from childhood to adolescence. Life-long oral health related behaviour, as well as beliefs and attitudes, are being developed at this stage thus, a critical stage.
2.	Schools can provide a supportive environment for oral health promotion. Accessibility of safe water, for example, may create room for general and oral hygiene programmes. Also, the risk of accidents and dental trauma can be reduced by providing a safe physical environment in schools.
3.	There is a significant burden of oral disease in children. Most established oral diseases are irreversible and lifelong and have an impact on quality of life and overall health of the individual.
4.	Physical environment, education for health and school policies are critical in order to achieve good oral health and control of the risk factors to poor oral health such as sugar containing foods and drinks, tobacco and alcohol.
5.	Schools can provide an avenue for the provision of oral health care, i.e. both preventive and curative services.

2.5 METHODS

This research is a literature based study focusing primarily on published journals, papers, abstracts, and articles relating to school based oral health education and dental disease in school children in Nigeria. Relevant materials were obtained by searching the internet data bases like the google scholar, Pub Med, Embase, CINAHL, Cochrane library and other relevant journals. Non-internet based search was done to obtain more relevant articles. Boolean connectors were applied in search strategy using the following terms: Oral

Health Education AND Dental Disease Reduction; Oral Health Education AND dental caries; Oral Health education AND Oral hygiene; Oral health education AND Nigeria; School based oral health education AND Oral hygiene; School based oral health education AND Oral hygiene AND Nigeria; School based oral health education OR Dental disease reduction AND Nigeria; Oral health promotion in School OR School based oral health education AND Dental disease reduction AND Nigeria. The relevant publications were chosen after the review of the whole document. In order to obtain more related studies, the reference lists of all studies that meet the inclusion criteria were also examined.

Inclusion criteria for literature selection:

Full articles on intervention studies (cohort, quasi-experimental, pure experimental) measuring the effectiveness of oral health education on dental disease reduction or behavioural change

- Studies carried out within a 25-year span (1991 – 2016)
- Behavioural interventions such as tooth brushing, healthy dietary habit, and oral health education.
- Low socioeconomic countries in sub-Saharan Africa
- Studies from India due to the similarity in sociodemographic features and burden of oral diseases.

- The study should include children within the age group of 5 to 17.
- The literature must be written and published in English language.

2.6 THEORETICAL BASIS OF THE STUDY

In order to better analyse and create a better understanding of this research, constructs from social cognitive theory will be used. Three constructs from Social Cognitive Theory will be adopted for this study. The constructs include self-efficacy, observational learning, and facilitation/behavioural capability.⁵³

Social Cognitive Theory

The social cognitive theory delineates how people adopt and maintain a particular behavioural pattern which in turn provides the basis for the specific intervention strategy being used.⁵³ According to Bandura, behavioural change can be achieved through the interplay of environment, personal and behavioural factors and these three factors have a constant influence on each other.^{53,54} The environmental factors consist of social and physical environments. Examples of social environment include schoolmates, playmates, parents, siblings, and teachers. The physical environment is the room temperature, the security, weather condition or the availability of resources. The state infers that a person's behaviour can be altered by their cognitive and mental representation or perception of their environment.⁵⁴

Observational learning construct stresses on the fact that behavioural changes can occur when an individual observes the performance of an action by another person as well as the reinforcements the individual receives.⁵³ This construct theorises that certain health behaviours could be enhanced by observing similar people or role models (persons they look up to) perform the new behaviour. This means oral hygiene practices of children can possibly be enhanced by using their school teachers, parents, celebrity and popular cartoon figure.

In self-efficacy, it is believed that increasing the confidence or belief of an individual's capability to perform a given task will help enhance their behaviour or attitude towards those tasks.⁵³ This implies that increasing the confidence of the school children in their ability to engage in proper oral hygiene practices, will make them actually improve their oral health practices.

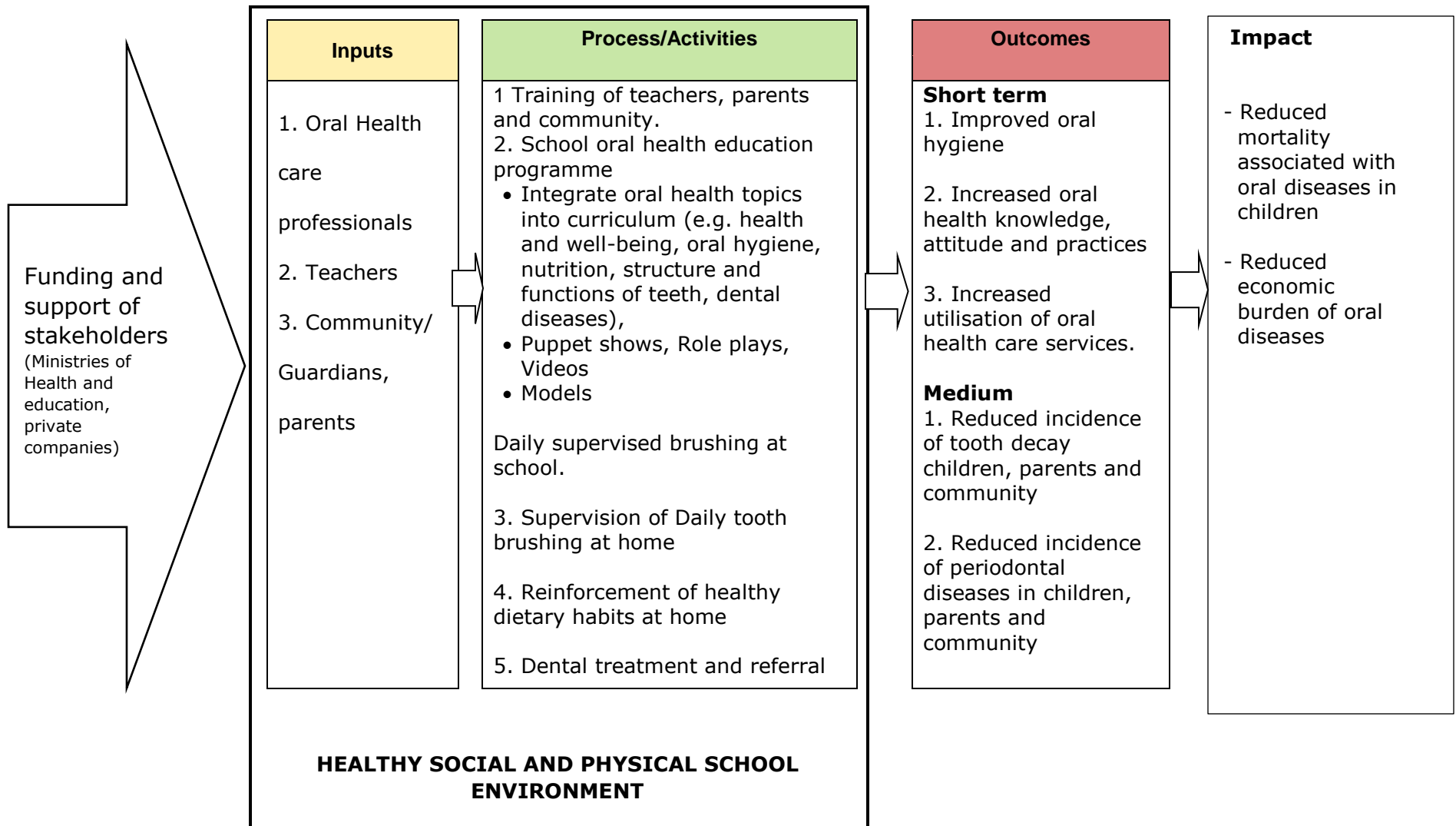
Behavioural capability implies that for an individual to perform a particular behaviour, he must have a knowledge of what the behaviour is and possess the required skills to complete the behaviour.⁵³ Changes in environmental and material resources help ease the performance of new routines/activities.¹¹ This implies that training the students and teachers and parents on how to perform certain oral health practices as well as provision of good learning environment and health education curriculum can help improve the uptake of some of the good oral hygiene practices.

2.7 ANALYTICAL FRAMEWORK

School based oral health programme involves preventive, promotive and curative oral health strategies carried out within the school environment to improve the oral health of school children.⁴⁰ Its success is an interaction of activities between oral health care professionals, teachers, parents/communities, and stakeholders which jointly contribute to making a healthy school environment (Figure 2).^{40,55,56} School based oral health education focuses more oral health behaviour as a way to enhance oral health knowledge, attitude and practices and in turn improve oral hygiene and reduce the incidence of oral diseases.³⁸

The analytical framework for this study is an adaption of the health-promoting school model as described by Kwan et al.⁴⁰ and the strategies for the integration of oral health in health promoting school according to WHO recommendation.¹¹ The model shown below has restructured the components of the Kwan et al.⁴⁰ model for easy understanding and explanation of the various factors that enhance the effectiveness of school based oral health education as well as highlight other factors peculiar to Nigeria.

Figure 2. Analytical framework for the effectiveness of SBOHP in Nigeria adapted from Kwan et al.⁴⁰



3. RESULTS

3.1 EFFECTIVENESS OF SCHOOL BASED ORAL HEALTH PROGRAMME IN NIGERIA

Based on the aforementioned eligibility criteria, five studies from the African region - Nigeria, Zimbabwe, Tanzania - were considered (Tables 3 and 4).

Only two studies were found in Nigeria and were carried out solely in the South-western part of Nigeria.^{57,58} This reflects the dearth of studies and negligence of SBOHE programme as a strategy for reduction of oral diseases in Nigeria despite the WHO recommendation.⁴⁰ It also portrays the inequality associated with the dissemination of oral health care in Nigeria by Geopolitical zones.⁵⁹

Additional articles from India were also considered and reviewed for comparison. The choice of articles from India was based on the similarity in sociodemographic variables, educational system, and oral health indicators.

The studies were analysed based on the key indicators of SBOHP highlighted in Figure 2.

3.1.1 Stakeholders in SBOH programme

Stakeholders play a lead role in the success of a school based oral health promotion in Nigeria as demonstrated by Esan et al.⁵⁷ and Bankole et al.⁵⁸ studies. They are needed at every stage of any SBOH intervention (from

initiation to evaluation) and provide support for both the input and the processes.

In the study conducted by Esan et al.,⁵⁷ two major stakeholders played a role in the execution of the programme; GlaxoSmithKline, that provided the funding and the Ministry of Education that served as the gate keeper to the schools and granted permission for the intervention. This intervention however lacked the involvement of the Ministry of Health which is vital for the success, continuity of programme and integration into the PHC as in the polio eradication programme in Nigeria.⁶⁰ Frencken et al.⁶¹ further demonstrated the importance of the collaboration of the Ministry of Education and the Ministry of Health in the initiation and support of the SBOHE programme which might have contributed to the sustainability of the programme for 4 years. van Palenstein et al.⁶² also showed that foreign sponsorship like the Netherlands University Foundation for International Cooperation (NUFFIC), Netherlands; Danish International Development Agency (DANIDA), Denmark, can be useful in the initiation and long-term maintenance of SBOHE programmes.

Lack of stakeholders' involvement leads poor implementation of SBOHE intervention and short duration of the intervention as shown in some of the studies.^{63,64,65-67} Bankole et al.⁵⁸ study also revealed that the universities could function as sponsors for SBOHE intervention in Nigeria but lacks the capacity

for its sustainability. This finding is supported by the Nyandindi et al.⁶⁸ study where the University of Kuopio provided funding for the implementation of SBOHE in Tanzania which lasted for only four months. These findings could be as a result of the limited funding available to the universities for research or because of the quest for quick results by most academic researchers.

3.1.2 Input of SBOH programme

The input involves the oral health professional, teachers, community, and parents/guardians who should work together so as to conduct a more holistic, sustainable and successful SBOHE programme.

In Nigeria, oral health care professionals, trained teachers, the community and the parents of the school children were involved at different levels of the oral health education (OHE) intervention which is in agreement with the WHO recommendation for ideal SBOHP.⁴⁰

Oral health care professionals were identified to be one of the most important elements of input stage in Nigeria.^{57,58} Chachra et al.⁶⁶ study also showed that OHE delivered by a dentist had a more favourable outcome compared to that by the teachers. In Nigeria, oral health care professionals were also involved in the training of teachers, parents and community.⁵⁷ This finding conforms with studies from Zimbabwe and Tanzania that utilised the service of oral health care professionals only in the training of school teachers.^{61,62,68}

Teachers were shown to be a viable means of passing on OHE to school children in Nigeria and are needed for the maintenance of the SBOHE but should be monitored and evaluated periodically by an oral health care professional.⁵⁷ This is confirmed by some studies in other African countries where by OHE delivered solely by the school teacher led to a less favourable outcome effect.^{61,62,66,68}

The role of the community and parents/guardian in the success of SBOHE programme was demonstrated in Esan et al study.⁵⁷ However, there is limited evidence from other studies to ascertain the actual impact of this component. Nonetheless, it points to the fact that school based oral health education intervention that involves the community and parents is achievable in Nigeria.

3.1.3 Processes/Activities of SBOH programme

The activities include training programmes for teachers, parents and community, health education programme for pupils, supervision of tooth brushing and dental treatment/referral.⁴⁰

The reviewed studies showed variations in the duration of the training programmes for teachers and parents and the community. In Nigeria, Esan et al.⁵⁷ gave a 30-minute oral health education intervention to community and parents of the school children for 12 months prior to the school programme. This finding was supported by the Nyandidi et al.⁶⁸ study where teachers used 30 minutes to deliver OHE to school children which resulted in a positive oral

health behaviour outcome. Other similar interventions have utilised 20 minutes to deliver OHE to the pupils with a positive oral health outcome.^{63,67} The oral health education curriculum used in one of the SBOHE programme in Nigeria was developed and introduced based on the American Association of Paediatric dentists' guideline.⁵⁷ Although the guideline was effective, it shows the lack of existing guideline for the integration of oral health education into the Nigerian school curriculum.

Bankole et al.⁵⁸ also demonstrated that a one- time video or verbal oral health education delivered in local language could be a vital process for an effective SBOHE intervention in Nigeria. Video OHE intervention was found to yield better result compared to the Verbal method. This finding was similar to the Shenoy et al.⁶⁷ study where school children that had video exposure had a better outcome with regards to knowledge (75%) and practice (38%) of tooth brushing twice daily when compared to those exposed to verbal interventions alone (70%;27.2%, respectively). Further, Chachra et al.⁶⁶ showed that OHE in a local language could be an effective approach to OHE.

The contents of OHE in Nigeria included lectures by oral health care professionals and/or teachers on healthy dietary habits, demonstration of the frequency and correct tooth brushing technique.⁵⁸ Similar OHE content was utilised in some of the reviewed studies and proved to be effective and feasible.^{61,64,65,67,68}

The OHE was delivered to pupils using different methods which were found to be feasible. They included audio-visual aids in form of PowerPoint presentations, animated videos, tooth brushing models and charts, models, coloured pictures, short stories for children, posters, photo albums, cartoon pamphlets, and projections.^{63,64,65-68} Drama, songs, and dances were also used to deliver the intervention and proved to be viable and attainable.⁶²

Supervised tooth brushing exercise by school children have been shown to be an active process for increasing the effectiveness of school based oral health education.^{62,68} However, there were no supervised tooth brushing or activities in the Nigerian studies and participants were only given toothpaste and toothbrush. This might have been because of lack of school infrastructure like running water.

There were no existing school health programme or oral health care programme within most of the selected studies which might have stalled the implementation of these programmes.^{57,58,61,63-67} This reflects the poor implementation of school health programmes in Nigeria and a potential setback in the implementation of SBOHE programmes.^{33,35,37}

3.1.4 Outcomes of SBOH programme

The outcomes of an oral health education intervention were observed in the short term, medium term and long term also referred to as the impact of the interventions. The long-term effect of oral health education intervention was

not discussed in any of the reviewed articles and thus was highlighted as a limitation of this study.

3.1.4.1 Short term outcomes

Oral hygiene status

The assessment of the short-term outcome in Nigeria after six months of OHE interventions, showed a 28.6% (CI = 0.141 to 0.579) improvement in oral hygiene status after the video OHE intervention and 23.4% (CI = 0.119 to 0.458) increase after the verbal OHE intervention.⁵⁸ This finding aligns with the Nyandidi et al.⁶⁸ which showed a significant reduction of plaque score from 12.0 (SD 4.4) to 10.5 (SD 4.7) after an OHE intervention. van Palenstein et al.⁶² also observed a significant decline in dental calculus score and dental plaque score from baseline in their study.

Additionally, Reddy et al.⁶⁴ reported a significant reduction of plaque score (62%) among the school children that received the intervention more than once and 32.6% reduction among those that received the intervention only once at the end of a 30-day study period. This also conforms with the 20% and 10% reduction in plaque score observed among school children that received 3 weeks and 6 weeks repetition intervals respectively.⁶⁷

Knowledge, Attitude and Practice of Oral Hygiene

According to Esan et al.⁵⁷ study, OHE conducted in Nigerian schools led to increased use of fluoridated toothpaste (Odds ratio OR = 0.12; Confidence interval CI = 0.04 to 0.39), increase in tooth brushing frequency (OR = 0.47; CI = 0.23 to 0.92) and practice of oral self-care (OR = 0.59; CI = 0.22 to 1.64) among those that received the intervention. This finding agrees with the Nyandidi et al.⁶⁸ study where there was about 71.43% improvement in tooth brushing frequency in among participants in Tanzania that received school based oral health education intervention. Singh et al.⁶³ study showed that 3 months OHE yielded 5.25 and 8.5 times increase in the knowledge and practice of brushing twice daily respectively in children that have been exposed to video OHE. There was also a 10-fold increase in knowledge of circular brushing technique and 12.5-fold increased practice of circular brushing technique among those that received the video intervention compared to those that got only the verbal intervention.

Similarly, Chachra et al.⁶⁶ revealed that six months after the intervention, the knowledge of tooth brushing increased by almost 10% in the three groups of participants examined with about 60% increase in the use fluoridated toothpaste. Another study showed a 123.3 % increase in oral hygiene knowledge and 21.9% increase in oral hygiene practice among school children that received the intervention.⁶⁵

Oral health education was found cause an increase in dietary attitude and practices among school children. This is evidenced by Singh et al.⁶³ study which found a 35% increase in dietary practices and attitude among the children exposed to OHE intervention. This was further confirmed by Chachra et al.⁶⁶ where the knowledge of correct dietary practice rose from 2.12% to 52.76%, 74% to 51.13% and 17.59% to 28.70% in three different study groups.

The studies clearly portrayed the effectiveness of SBOHE in increasing the oral health knowledge, attitude and practice which will consequently lead to the reduction of oral diseases in Nigeria.

Utilisation of oral health care services

In contrast to the above results, the outcome on the dental service utilisation (OR = 3.80; CI = 1.67 to 8.64) was reduced post intervention.⁵⁷ However, this outcome was not measured by the other reviewed studies. Therefore, no concrete statement on the influence of OHE on this outcome can be drawn.

These outcomes are however short-term outcomes and failed to reflect the direct impact of the intervention on the incidence of dental caries and periodontal diseases (medium term outcomes). Nevertheless, studies have shown an association between improved oral hygiene practices and oral disease reduction.^{69,70}

3.1.4.2 Medium term outcomes

Dental Caries

Dental caries outcome was not measured in the Nigerian studies however, study in Zimbabwe showed that oral health education reduced the incidence of dental caries to 4% compared to those without the intervention which has 19%. This observation was further confirmed by Chachra et al.⁶⁶ where DMFT score was also found to be lower among those that received the intervention. Contrary to these findings, a study in Tanzania showed that after 36 months of the OHE, there was no difference in DMFT between the experimental group (0.9 ± 0.3) and control group (0.9 ± 0.3).⁶²

Periodontal Diseases

Although the effect of the oral health education interventions on periodontal diseases were not mentioned in Nigeria,^{57,58} the under listed outcome observations can inform the possible effect of OHE in Nigeria because of the sociodemographic similarity.

van Palenstein et al.⁶² study reported a significant difference in gingival bleeding 36 months after the intervention between the experimental group (-0.1 ± 0.5) and the control group (0.7 ± 0.2). This agrees with D'Cruz and Aradhya⁶⁵ findings of reduction of the gingival index score by 10.3% to 25.7% after nine months of exposure to oral health education intervention. Shenoy

et al.⁶⁷ also observed that children that received the OHE with 3 weeks repetition intervals recorded 14.7% reduction in gum diseases while about 10% reduction in gingival scores were found among those with 6 weeks repetition interval.

Table 4. Studies in Nigeria, from 1991-2016, on SBOH programme

Author/Year of pub	Settings (Rural/urban)	Age	Type of Intervention	stakeholders, teachers, community and Parents	Type of Study	Duration of study	outcomes
Esan A. et al. ⁵⁷ - 2015	Ile-Ife central government - Suburban	4 to 13-year-olds	Oral Health instruction - Verbal	Stake holders - GlaxoSmithKline, Ministry of education Community, parents, and teachers involved	Randomised controlled trials	4 years	Knowledge, Attitude, and Practice Increased use of fluoridated toothpaste; Increased tooth brushing frequency; Reduced daily dental flossing; Increased sugar consumption
Bankole O. et al. ⁵⁸ - 2013	Ibadan - Rural	11 to 12-year-olds	Oral Health education using indigenous language	Stake holders - University of Ibadan No teachers involved No community and parents' involvement	Randomised controlled trial	Six weeks	Calculus Index Reduced calculus index Oral hygiene index improved oral hygiene

Table 5. Studies in other African Countries, from 1991-2016, on SBOH programme

Author/Year of Pub	Settings (rural/urban)	Age of the population	Type of Intervention	Stakeholders, Teachers, Community and Parents	Type of Study	Follow up period	outcomes
Frencken J.E. et al. ⁶¹ - 2001	Mutoko district, Zimbabwe - Rural	Grade 2 and Grade 4 primary school children	A 3-day teacher's training as a tool for oral health education	Stakeholders - Ministry of Health, Ministry of Education Teachers involved No community and parents involvement	Randomised controlled trial	3.5 years	<u>Plaque Score</u> No statistically significant differences were found. <u>Dental caries</u> No significant change in dental caries incidence
Helderman et al. ⁶² - 1997	Tanzania	9 to 14 years	1-day teachers workshop as a tool for oral health education.	Stake holders - NUFFIC, Netherlands; DANIDA, Denmark Teachers involved No community and parent involvement	Quasi-experimental study	3 years	<u>Dental Caries</u> No difference between experimental group and control <u>Oral hygiene status</u> Improved OH status compared to baseline
Nyandindi et al. ⁶⁸ - 1996	Tanzania - Rural and urban	6 - 15 years	Modified OHE - 30 mins lecture session and 1hour demonstration delivered by the teacher	Stake holders -University of Kuopio, School administrators Teachers involved No community and parents involvement	Quasi-experimental study	4 months	<u>Knowledge, Attitude, and Practice</u> Increased knowledge, attitude and practice of OH <u>Oral hygiene status</u> Improved oral hygiene status with modified OHE compared to control group

Table 6. Studies in India from 1991-2016, on School Based Oral Health Programme

Author/Year of Publication	Settings (rural/urban)	Age of the population	Type of Intervention	Partnership (Stakeholders and parents)	Type of Study	Follow up period	Outcome
Singh Neha et al. ⁶³ - 2015	Pune, Maharashtra, India Rural	10 to 13-year-olds	Audio visual aids and pamphlet with demonstration	No stake holders No teachers involved No community and parents involvement	Randomised controlled trial	3 months	<u>Knowledge, attitude, and practice</u> Improvement in knowledge attitude and practice
Reddy Padma et al. ⁶⁴ - 2016	Balapur, Hyderabad, India Urban	12-year-olds	Audio-visual aids	No stake holders No teachers involved No community and parents' involvement	Randomised controlled trial	30 days	<u>Plaque score</u> Significant reductions in plaque
D'Cruz et al. ⁶⁵ - 2012	Bangalore, India Urban	13-15 year	PowerPoint and professional instructions	No stake holders No teachers involved No community and parents' involvement	Quasi-experimental studies	9 months	<u>Knowledge, Attitude, and Practice</u> Improvement in oral hygiene knowledge <u>Gingival/Plaque score</u> Significant reductions in both the scores
Chachra et al. ⁶⁶ - 2011	Chandigarh, India Urban	5 to 16 year-olds	Coloured photos, fluoride mouth rinse, tooth brush, professional instruction in Hindi	No stake holders Teachers were involved in the study No community and parents involvement	Randomised controlled trial	6 months	<u>Knowledge, Attitude, and Practice</u> Significant increase in oral health KAP <u>Dental Caries</u> Highly significant decrease in DMFT and DMFS scores
Shenoy et al. ⁶⁷ - 2010	Mangalore city, India Urban	12 to 13 years old school children	Professional instructions using Audio-visual aids	No stake holders No teachers involved No community and parents involvement	Quasi-experimental studies	9 months	<u>Knowledge attitude and practice</u> Improved oral hygiene knowledge attitude and practice. <u>Gingival/Plaque score</u> Significant reduction in gingival/plaque score

3.2 DETERMINANTS OF EFFECTIVE SCHOOL BASED ORAL HEALTH INTERVENTION

3.2.1 The role of stakeholders

Oral health interventions are expensive to implement, more so because of the need to create a conducive school environment as described in Figure 2, the need for continuous monitoring and evaluation of the activities and duration of time needed to sustain acquired knowledge.^{18,40,72} Multiple exposures enable the children to learn the behaviour and increases their likelihood of adopting the behaviour.⁵³ This calls for stakeholders' collaborations, especially in resource poor settings.

The stakeholders include policy makers, the Ministry of Education, the Ministry of Health, oral health product manufacturing industries, politicians, food production industries, the dental professionals, the community and the teachers. Stakeholders ensure the smooth running of the intervention, by direct funding ensuring the continuity of the programmes or by supporting activities such as the formulation of policies, adoption of the policy within the community and the school.¹⁸ Other functions of the stakeholders include monitoring and evaluation, provision of training materials for teachers, social mobilization, media campaigns, provision of commodities e.g toothbrushes and tooth paste, fluoride rinses, and provision of technical support.⁴⁰ Some of the major stakeholders encountered in this review were foreign academic

bodies (NUFFIC, Netherlands; DANIDA, Denmark), ministries of education and health, a private organisation (GSK) and Universities.^{57,58,61,62,68} All the programmes executed within the African region got administrative support and were funded by stakeholders.^{57,58,61,62,68} This underlines the need for external funding for successful implementation in resource poor settings. The review also showed that financial support is needed for longer duration of intervention and evaluation which is required to sustain the newly acquired skills.^{49, 57,58,61,62,68} Before implementing the programmes in Nigeria, there will be a need to map various stakeholders at different stages of implementation, to convince them of the importance of the SBOHP, to seek their acceptance and to define their roles in order to streamline their activities.

3.2.2 The role of oral health care professionals

Oral health care professionals function in the training and supervision of teachers, parents and the community, direct delivery of oral health education messages to the children, teachers and parents and direct delivery of oral health services to the children.⁴⁰ Their supervisory role is to ensure that the correct message is being passed on to the children and for sustainability of the oral health behaviour. They also function in the referral of cases to the local dental clinics for further examination and treatment.⁴⁰ All the studies reviewed made use of oral health care professionals as facilitators for their programme. In the Tanzanian and Zimbabwean studies,^{61,62,68} the oral health care professional had no direct contact with the children and might have been

the reason for the poor result obtained from these studies. In these studies, OHE was delivered only by the school teachers who were trained in workshops by the oral health care professionals. In a study by Chachra et al.⁶⁶ to compare the effectiveness of OHE delivered by dental personnel and that delivered by non-dental personnel, dental personnel were found to be more effective in the delivery oral health messages. Therefore, in addition to empowering teachers, SBOHP should be designed to include direct contact and supervision by oral health care professionals for continued evaluation and delivery of the accurate information. The shortage of dentists especially in the rural areas in Nigeria,^{20,21,22} could be addressed by shifting the tasks to the teachers, parents and the community to deliver OHE to the school children but with close supervision by the dentists to allow more technical tasks of curative care to the dentists. This might be the only chance some of the participants might have to come in contact with a dentist and receive treatment and will to some extent help balance the rural-urban inequality in accessing to oral health care in Nigeria.

3.2.3 The role of teachers

The result of the review shows that teachers play a significant role in the success of a school based oral health education programme. A study by Kowash et al.⁷¹ has shown that involvement of teachers functions in the sustainability of oral health behaviour. Only five of the ten reviewed articles

involved teachers as part of the intervention.^{57,61,62,66,68} There were no major differences in oral health knowledge attitude and practice in these studies compared to the interventions that did not involve teachers. However, this result should be interpreted with great caution because of the interaction of other factors such as duration of the teachers training and involvement of other players. The five studies that involved teachers had a one-time teachers' training which could have led to the delivery of wrong oral health message or nondelivery of the oral health message hence poor oral health outcome.^{57,61,62,66,68} This problem was highlighted in the Helderman study⁶¹ where teachers delayed the delivery of the intervention due to their lack of confidence to do so. There was no continued follow up, or evaluation of the quality of OHE being delivered by the teachers. Studies that only used the teachers as a tool for delivery of the OHE^{61,62,68} had no significant decline in caries and periodontal disease incidence, and lower oral health knowledge attitude and practices compared to the studies that combined teachers with oral health care professionals^{57,66} which show the importance of an interdisciplinary approach to improving oral health. Interactive and practical involvement of teachers during OHE training helped improve the oral health outcome of school children. Nyandidi et al.⁶⁸ study showed that students who were taught by teachers equipped with the practical skills had better oral hygiene knowledge, attitude and practice compared to those who did not. This finding has an important implication for Nigeria where there are numerous

trained teachers who are permanently employed by the Government thus making it sustainable to initiate school health programmes and school based oral health education.^{28,68} Collaboration with the oral health care professionals and allocation of funds to sufficiently train the teachers are vital steps to initiating school based oral health programmes.^{40,56}

3.2.4 The role of Community/Parents

Community and parents function both in the reinforcement and maintenance of the oral health behaviour learnt in school and thus are a crucial component for an effective school based oral health education.⁵⁵ Their roles in achieving an effective intervention have also been acknowledged by several studies.^{60,68} Only the Esan et al.⁵⁷ study included the community and parents as part of the intervention. The community and parents participated in a 30 min OHE held in public places like mosques, churches, and parents-teachers meeting which helped disprove the misconceptions regarding oral health. The outcome of the intervention showed an increase in tooth brushing frequency, and use fluoridated tooth paste among school children in the intervention group when compared to the control group.⁵⁷ In contrast to the findings above, there was a decline in healthy dietary habits, reduced dental visit and reduced flossing among those that received the intervention when compared to the control group which could have been either as a result of the influence of the community level intervention (since both intervention and control group were

equally exposed) or due to lack of perception of the need for good oral health practices. Therefore, there is a need to involve the community in reshaping the mindset of participants and increase the acceptability of the intervention.⁷³ This study also showed that parents and community participation in school health programme is feasible in this setting and confers an additional advantage.^{40,51,57} In order to achieve an effective school based oral health intervention, a similar intervention should be extended to the community and parents of the children through community outreach or parents-teachers meeting.¹⁷ There are existing community health structures in Nigeria like the services rendered by community health workers.⁷⁴ Oral health messages can be incorporated into their services thereby functioning as an easy means of disseminating oral health messages to the community. These communities are always open to accept new health reform and are willing to adapt to changes if approached the right way.⁷⁵

3.2.5 Age of participants

Children between the age of 5 and 15 have generally been known to favour school health education interventions as they tend to assimilate faster and are able to perform these learned behaviours themselves.² This age group coincides with the age of most primary school children in Nigeria.²⁸ This implies that schools oral health programmes would reach nearly all primary school children if fully implemented since the enrolment in primary education

is up to 93.5%.¹⁵ It should, however, be noted that the age of the participants determines the materials and technique to be used in the delivery of oral health education.^{11,76} Designing an age appropriate oral health education material as done in Chachra et al. study is paramount for an effective school based oral health education intervention.⁶⁶ Short stories were found to be appropriate for children aged 5 – 9 years and coloured photographs for children between 10 -16 years.⁶⁶ As described in Chapter 1, Nigeria has different age groups in various levels of education.²⁸ Planners, policy makers and implementers of oral health education should, therefore, bear in mind the division of the Nigerian school system being ECD, Primary and junior secondary schools when implementing the SBOHPs.

3.2.6 Duration of the intervention

The duration of the OHE intervention may also influence the outcome. Short term interventions with short duration may not elicit long term adoption of oral health behaviour and benefits in the prevention of oral diseases such as dental caries, and periodontitis. Most interventions observed had a varying duration ranging from 10 mins to one hour with an average duration of about 20 minutes.^{63,64,67,68} However, no effect was observed on the outcome of the interventions relating to duration. This is a valid observation because the interventions were not similar in all studies. The number of exposure to the school based oral health education intervention is important as suggested by

Alberto et al. study.⁷⁷ The more the oral health education is reinforced, the more likely that the oral health behaviour will be learned, internalised and maintained.^{11,51,52,67} Esan et al.⁵⁷ had a minimum of five oral health education reinforcements per academic year while Reddy et al.,⁶⁴ D’cruz et al.,⁶⁵ and Chachra et al.⁶⁶ had a reinforcement time intervals of 3 months, 15 days and 15 days respectively which could have contributed to the success recorded in their programmes. Shenoy et al.⁶⁷ compared the reinforcement at different time intervals and found out that interventions delivered at shorter time intervals had a better outcome than those performed at a longer time interval. They also discovered that after 36 weeks that there was no further change in outcome among those that received short reinforcement intervals probably because the behaviour has been adopted.⁶⁷ Most of the reviewed articles had a very brief study duration and were evaluated just once through the entire study period. Despite this short study duration, as in the case of Reddy et al.⁶⁴ and Bankole et al.⁵⁸ study with only 30 days and 6 weeks study period respectively, there was still an improvement in oral hygiene knowledge and practices. This implies that SBOHE is effective and can yield a commendable short-term outcome. Due to the one time evaluation of some of the studies, the conclusion on the maintenance of some of the studies cannot be drawn because maintenance is measured through scheduled evaluations which could be costly. As aforementioned, it is paramount to design an intervention in Nigeria that incorporates the sufficient duration of intervention and study,

constant reinforcement and scheduled evaluations. This is required for the sustainability of the programme and improve compliance in this setting. This also helps improve the self-efficacy of the children.

3.2.7 Type, scope and mode of oral health education intervention

The scope and the type of oral health education intervention are very vital to the success of a school based oral health education intervention.¹¹ The articles reviewed highlighted the scope of interventions in school based oral health programme, and they were in line with WHO expert recommendations.⁴⁰ The studies reviewed utilised in the following daily supervised brushing, reinforcement of healthy dietary habits, provision of tooth paste and brush, training of teachers, parents and community, mouth prophylaxis, direct OHE delivery by oral health care professional using indigenous language, models, videos, guides, pamphlets, coloured albums, power point presentation, and verbal presentation.^{57,58,61-68} Programmes that used more than one component had a better outcome than those that used just one component. Singh et al.⁵⁷ and Bankole et al.⁵⁸ studies demonstrated that the use of audio visual aids yields a better outcome when compared to using the only verbal method. However, the down side of this particular intervention in this setting is the continuity due to lack of money to purchase the required electronic gadgets and lack of steady power supply. Practical demonstration and involvement of participants were shown to produce a better outcome

compared to the non-participatory approach.^{65,68} Chachra et al.⁶⁶ and Bankole et al.⁵⁸ used their local languages in the delivery of their interventions and obtained a positive outcome. Therefore, OHE interventions should be tailored to suit the ethnic, social and religious background of the participants without losing the vital components of SBOHE. Since Nigeria is a multi-ethnic and multi-lingual society, this might be a challenge to develop oral health education programme in 371 languages that exist in Nigeria. Therefore, OHE materials should be formulated in English which is the official language of instruction in schools and translated into the local language if the need arises.

3.2.8 Existing school health programmes

An existing school health programmes will facilitate the integration of an oral health education programme by providing a platform for its institutionalisation and sustainability.¹¹ It will make easier for students and teachers to adapt and adopt the new programme whereby minimal structural changes will be required for the programme to thrive.⁴⁰ None of the studies had an existing school health programme except the Tanzanian studies.^{62,68} The existing school health programme could have facilitated the successful long term evaluation of the Tanzanian study after three years.⁶² In Nigeria, only five percent of the schools implement the school health programme.^{33,36} There is a need for collaboration with the dental department with the general health programmes to establish school oral health programmes alongside school

health programmes for sustainability. Pilot studies could be implemented in schools with established health programme to test the acceptance and integration of the oral health programme.

4. DISCUSSION

Despite the dearth of studies on school based oral health interventions in Nigeria and other African countries, this study has been able to provide evidence that school based oral health education is an effective way of reducing the burden of oral diseases in Nigeria. SBOHE could be feasible and implementable in Nigeria and other low and middle-income countries with the poorly developed oral health care system.

This study has also shown that school based oral health education intervention reduces the incidence of tooth decay and gum infections as well as increases the knowledge, attitude and practice of school children which needed for long term impact.

The study was able to point out the central role of stakeholders for the funding, initiation and smooth running of oral health programmes in schools. In Nigeria, school based oral health programmes are poorly funded by both governmental and non-governmental bodies which might have led to the decline in research and implementation of this programmes. Oral health programmes need to be implemented in Nigerian schools in accordance with the school health policy and the national oral health policy. Oral diseases are largely neglected and under researched in Nigeria. There are very few intervention studies regarding oral health in Nigeria and the whole of Africa.

In Nigeria, there are several short-term benefits of SBHOE on school children as well as the parents and community. However, medium and long-term

benefits of school based oral health education in this setting are still questionable and therefore should be investigated.

The average duration of OHE intervention was about 20 mins with at least once a month reinforcement interval. Audio visual aids like PowerPoint projections and videos are the most effective method of OHE delivery in schools, and oral health programmes should be tailored to suit the children's ethnic, religious and social background for easy understanding and adaptability of the intervention.

Age of the participant determines the type of message to deliver and the technique to utilise and must be considered in designing an SBOHE intervention. Active involvement of students in the intervention helps increase their self-efficacy and facilitates their acceptance and retention of the oral health behaviour. One-time school oral health programmes do not give conclusive effects in this setting and should be avoided. Periodic reinforcement and evaluation is a highly powerful tool for the monitoring and maintenance of OHE in schools.

Oral health care professionals play a superior role in the delivery of OHE intervention in this setting and should always be involved in the direct delivery of OHE interventions to the children, teachers, parents and community. To create a healthy school environment, oral health care professionals, teachers, parents and the community ought to work synergistically in the promotion and maintenance good oral health both in the school and community.⁵⁶ Parents

and community is needed for the reinforcement and transfer of acquired behaviour to the community and generate a long-term ripple effect. Lessons obtained from the studies is not only relevant to oral health but can be applied to other chronic diseases especially in the face of limited funding.

In Nigeria, the oral health education programmes are not done within a school health programme and are poorly or minimally evaluated. This makes their findings non-generalisable. Fortunately, the many schools in Nigeria will provide a platform for the gradual implementation of oral health education at various levels of education and in different states. No study has been carried out to accurately test the feasibility thus there is a need for pilot studies before full implementation of this intervention.

The analytical framework used in this study was clear and concise in the analysis of the school based oral health education programme in Nigeria while highlighting the various stages involved in an effective school based oral health education programme. It showed how the stakeholders of oral health care in Nigeria interact with the input and process to create a healthy school environment with a favourable outcome.

4.1 Limitations

The types of studies used in the reviewed articles were mainly randomised controlled trials and quasi-experimental studies, and there were limited studies on oral health education interventions in Nigeria as well as other African countries. Randomised controlled trials are known to be accurate and

provide the highest epidemiological evidence thus, increasing the credibility of this study. However, it is expensive and difficult to implement. Quasi-experimental studies are less accurate and provide lower evidence compared to the RCTs due to nonrandomisation of participants but give reliable information of the effects.

Most of the studies missed either one or more vital components of an effective school based health education programme as recommended by WHO. Although most studies showed evidence of the effectiveness of SBOHE in improving oral health, the extent of these effects was largely undermined by the lapses seen in the reviewed literature. The sample size of articles reviewed ranged from 120 to 972 and had no effect on the outcome. The primary outcomes observed in this present study were Knowledge, attitude and practice of oral hygiene – measured by frequency of tooth brushing, dietary habit, and oral health knowledge; oral health status – measured by gingival and plaque score, and dental caries – measured by DMFT and DMFS. Dental caries was the least evaluated outcome probably because of the time required to obtain a true picture of the disease. Some the outcome effect observed were either exaggerated or masked due to Hawthorne effect resulting from contamination of participants.

There was no evidence found on the long-term impact of SBOHE in Nigeria or in any of the other countries reviewed. This may be because the researches

are not long enough to elicit those outcomes and lack of a robust epidemiological platform to carry out such an extensive evaluation. This outlines the need for long term assessment and continuous research into the impact of this interventions.

As stated in the analytical framework (Fig 2.), dental treatment or referral is an important component of the processes involved in SBOH programme. Unfortunately, none of the studies reviewed included it as a component of their intervention which could have been as a result of the high cost of carrying out dental treatment in this setting and the uncondusive environment. This implies that school children identified with oral diseases are not catered for and remain in the same state even after the programme.

5. CONCLUSIONS AND RECOMMENDATIONS

School based oral health education is effective in reducing the oral diseases even in the Nigerian context. The intervention is feasible and implementable in Nigeria because of the availability of many ECD, primary and secondary schools in addition to the numerous trained teachers being remunerated by the Nigerian government. The various determinants of effective SBOHE intervention, if holistically considered during the design of SBOHE intervention, have the potential of boosting the effect of school based oral health education programme in Nigeria.

The School oral health programmes should be implemented within an existing school health programme for effective implementation and sustainability. Due to the potentially enormous cost of implementation, I recommend a pilot project in six states (one from each geopolitical zone) to test the feasibility and acceptability of the intervention. Furthermore, the Nigerian government (Ministry of Health and Ministry of Education) should collaborate with other stakeholders such as other global policy makers, sponsors, researchers, oral health care professionals and the community for successful implementation. Stakeholders' collaboration should aim at subsidizing the cost of dental treatment for school children and provision of essential oral hygiene aids like toothbrushes, tooth paste and dental floss free of charge or at highly subsidised rates.

Considering the aforementioned benefits and educational structure in Nigeria, I recommend the adoption and utilisation of school based oral health education as a solution to the rising burden of oral diseases in Nigeria, particularly at the primary education level.

Ministry of Health(MOH)

- a. Nigeria has supportive policy to incorporate oral health into the primary health care system. The MOH should consider incorporating oral health into schools with already existing school health programmes and encourage the adoption of SBOHP by schools that have not.
- b. Training of more dental health professionals to meet the increasing demand in Nigeria.
- c. Provision of the basic oral care package (urgent oral treatment, affordable fluoride toothpaste and atraumatic restorative treatment) and/or referral clinic for schools in Nigeria

Ministry of Education

The Ministry of Health should collaborate with the Ministry of Education

- a. To integrate OHE into the existing school curriculum.
- b. To include of oral health education into the teachers training curriculum. This will boost their confidence and reduce reluctance in OHE delivery as well as improve the quality of OHE being delivered.

- c. To provide a healthy and conducive learning environment by the provision of running taps, electricity, learning aids and healthy food options in schools.

Stakeholders/funding partners

MOH should map and collaborate with various stakeholders like tooth paste manufacturers, food traders, water companies should invest in this intervention as it will not only benefit the community as a whole but help their businesses. For example, improvement of tooth brushing habit would mean an increased utilisation of tooth brushing products thereby improving product sales and also creating a healthy community.

Considering the findings of this study, an effective implementation strategy for school based oral health intervention should involve:

- a. Existing school health programme – SBOHE should be performed under an existing school health programme for easy adoption and integration of the programme. Oral health education should be made part of the school curriculum.
- b. Age of school children – Each intervention should be tailored to suit a particular age. The programme should be exciting, dynamic, and tally with the learning ability demonstrated by the child at each particular educational level. Short stories should be used for children 5 to 9 years of age while pictures should be applied for 10 to 16 years.

- c. Duration of intervention – There should be at least 20 mins for each OHE session for the children and at least monthly reinforcement for not less than 36 months. Similarly, at a 30 mins OHE session with active participation should be held for the parents, teachers and the community.
- d. Evaluation - Evaluations should be done to determine if the programme is being implemented as desired, to assess the outcomes, impact and effectiveness of the programme and, if there is any issue, make adjustments. This should be done every 3 months.
- e. The method of delivery – Practical demonstration of tooth brushing should be done, and all children should be actively involved in the intervention. The OHE should be given in the local language as well as English. The OHE should be designed to fit the children’s ethnoreligious background. Even though audio-visual aids are known to be superior to the verbal method, a Verbal method of delivery is highly recommended especially in the rural areas with no electricity.
- f. The teachers, parents and the community should be included in the study for adoption and continuity of the acquired oral health behaviour.
- g. There should be community collaboration and partnership to help strengthen the intervention and build trust, respect, improve communication, and facilitate retention of the behaviour.

- h. Stakeholders should also be involved in the planning, evaluation and monitoring so as to avoid carrying out a haphazard intervention.
- i. Type of study – A randomised controlled trial with random allocation participants to interventions is highly recommended in the pilot studies. Use of behavioural theory such as social cognitive theory and Health belief model is highly recommended.

More studies should, therefore, be done on the effectiveness of school based oral health education in Nigeria and Africa using a randomised controlled trial and should be built on a particular behavioural theory.

I expect that this study will create a ripple effect with a long-term impact knowing that once cognitive and affective behaviour relating to oral health have been formed at a young age, they could later when the present children become parents pivot the improvement of the health-related behaviour of the next generation.

REFERENCES

1. The Challenge of Oral Disease – A call for global action. The Oral Health Atlas. 2nd ed. Geneva: FDI World Dental Federation; 2015.
2. Petersen PE. The World Oral Health Report 2003. Continuous improvement of oral health in the 21st century- the approach of the WHO Global Oral Health Programme [monograph on the internet]. Geneva, Switzerland: WHO; 2003 [cited 2013 Feb 15]. Available from-www.who.int/oralhealth/media/en/orh_report03_en.pdf.
3. Retna KN. Assessment of dental treatment required and analysis of cost in the management of dental caries among semi-urban primary school children of Kerala. *J Indian Soc Pedod Prev Dent*. 2000; 18(1):29-37.
4. Adegbembo AO, EL-Nadeef MA. National study of periodontal status and treatment need among Nigerians. *Int Dent J* 1995 45:197-203.
5. Adegbembo AO, EL-Nadeef MA. National study of periodontal status and treatment need among Nigerians. *Int Dent J* 1995 45:35-44.
6. Folayan MO, Chukumah NM, Onyejaka N, Adeniyi A, Olatosi O: Appraisal of the national response to caries epidemic in children in Nigeria. *BMC Oral Health* 2014, 14:76.
7. Akpata ES. Oral health in Nigeria. *Int Dent J* 2004 54: 361–366.
8. Sofola OO, Agbelusi GA, Jeboda SO. Oral health knowledge, attitude and practices of primary school teachers in Lagos state. *Niger J Med* 2002 11: 73–76.
9. Sofola OO, Orenuga OO. A survey of the knowledge, attitude and practices of antenatal mothers in Lagos, Nigeria about the primary teeth. *Afr J Med Med Sci* 2005 34: 285–291.

10. Osibogun A. Crises and challenges in the Nigerian health sector. *J Community Med Prim Health Care* 2004 16: 1–7.
11. Oral health promotion: an essential element of a health-promoting school. Geneva: World Health Organization; 2003. WHO Information Series on School Health. Document 11.
12. National Population Commission (NPC) [Nigeria] and ICF International. 2014. Nigeria Demographic and Health Survey 2013. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International.
13. United Nations, Department of Economic and Social Affairs, Population Division. 2017. World Population Prospects: The 2017 Revision, Key Findings and Advance Tables. Working Paper No. ESA/P/WP/248.
14. The World Bank. 2016. World Development Indicators 2016. Washington, D.C.: The World Bank (producer and distributor). <http://www.Worldbank.org/en/country/nigeria>
15. The United Nations Educational, Scientific and Cultural Organization (UNESCO). UNESCO Institute for Statistics: UNESCO; 2015. Available at <http://uis.unesco.org/en/country/NG>. Retrieved June 17, 2017.
16. Okorie NP, Ademowo GO, Saka Y, Davies E, Okoronkwo C, Bockarie, MJ, Molyneux HD, Kelly-Hope LA. Map of Nigeria and its geopolitical zones. 2013. doi.org/10.1371/journal.pntd.0002416.g001. Retrieved: 02:21, Aug 05, 2017 (GMT).
17. Federal Ministry of Health. National Oral Health Policy (draft). Abuja: FMOH; 2010.
18. Adeniyi AA, Sofola OO, Kalliecharan RV. An appraisal of the oral health care system in Nigeria. *International Dental Journal* 2012; 62: 292–300. doi: 10.1111/j.1875-595X.2012.00122.x

19. Akande OO. Dentistry and medical dominance: Nigerian perspective. *Afr J Biomed Res* 2004 7: 1–4.
20. World Health Organization. *The World Health Report 2006: Working Together for Health*. Geneva: WHO; 2006.
21. World Health Organization. Oral health Fact Sheet No. 318. 2012. Available from: www.who.int. Accessed June 19, 2017.
22. Ogunbodede EO. Gender distribution of dentists in Nigeria 1981 to 2000. *J Dent Educ* 2004 68: 15–18.
23. Adeleke OA. Report on the profile of oral (dental) health care facilities, manpower and training institutions in Nigeria. Jos: Regional Centre for Oral Health Research and Training Initiatives (RCORTI) for Africa; 2006.
24. Federal Ministry of Health. A report of the Technical Working Group for the Development of a Road Map for the Improvement of Oral Health in Nigeria. Abuja: FMOH; 2011.
25. Adegbembo AO. Household utilisation of dental services in Ibadan, Nigeria. *Community Dent Oral Epidemiol* 1994 22: 338–339.
26. Federal Ministry of Health. *National Health Insurance Scheme Handbook*. Abuja: FMOH; 1999.
27. Jeboda SO, Adeniyi AA, Ogunbodede EO. Assessment of preventive oral health knowledge and practices among rural and urban mothers in Lagos state. *Niger Postgrad Med J* 2009 16: 239–244.
28. Universal basic Education Commission (UBEC). *National and Regional Statistics, Basic Education Profile*; 2010. Available at <https://ubeconline.com/Pre/>. Retrieved June 17, 2017

29. Nigeria Educational Research and Development Council. About the Revised 9-Year Basic Education Curriculum (BEC);2003. Available at [www.facebook.com /NERDC/posts/734776969881272](http://www.facebook.com/NERDC/posts/734776969881272). Retrieved June 17, 2017
30. National School Health Policy: Federal Ministry of Education Nigeria Policy Document,2006. Available at [www.unicef.org/nigeria/school_health_policy .pdf](http://www.unicef.org/nigeria/school_health_policy.pdf). Retrieved September 13, 2013.
31. American School Health Association "About ASHA" from www.ashaweb.org/nutrition/cade/comprehensive-school-healthprogram/html.Retrieved December 10, 2012.
32. National School Health Service. "An editorial report". Nig J Paed 1975; 2(2): 31- 32.
33. Akani NA, Nkanginieme KEO, Oruamabo RS. The School health programme: A situational revisit. Nig J Pead. 2001;28(1):1- 6.
34. Akani NA and Nkanginieme KEO. School health programme. In: Azubike JC and Nkanginieme KEO,editors. Paediatric and Child Health in a tropical region, 2nd Ed. Owerri: African Educational Services 2007; 47-55.
35. Alex- Hart BA, Akani NA, Nkanginieme KEO. Evaluation of School Health Services in public primary schools in Bonny Local Government Area, Rivers State. Nig J Paed 2008; 35(3&4) :60-66.
36. Ofovwe GE, Ofili AN. Knowledge, attitude and practice of school health programme among head teachers of primary schools in Ego Local Government Area of Edo State, Nigeria. Ann Afr Med 2007; 6(3): 99- 103.
37. Ojugo AI. Status of health appraisal services for primary school children in Edo state. Nig Int Elect J Hlth Edu 2005; 8: 146- 152.
38. Peter Berthold. Noma: a forgotten disease. DENT Clin N Am 47 2003; 559-574

39. Akpata ES, Jackson. Caries vulnerability of first and second permanent molars in urban Nigerians. Arch Oral Biol 1978 23:795-800.
40. Kwan SYL, Petersen PE, Pine CM, Borutta A. Health-promoting schools: an opportunity for oral health promotion. Bulletin of the World Health Organization. 2005;83(9):677-85.
41. World Health Organization. World Report on Knowledge for Better Health. Geneva: WHO, 2004
42. Petersen EP, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral diseases and risks to oral health. Bulletin of the World Health Organization 83: 661-669, 2005.
43. MacGregor ID, Sheiham A. Patterns of periodontal pocketing in Western Nigeria Populations. J Periodontol 1974 45:402-409.
44. Akpata ES, Danfillo IS, Mafemi JO et al. Fluoride, dental fluorosis and caries experience in Nigeria. Jos: Intercountry Centre for Oral Health for Africa. ICOH, 2003.
45. Akpata ES. Pattern of dental caries in urban Nigerians. Caries Res 1979 13:241-249.
46. Varenne B, Petersen PE, Ouattara S. Oral health behaviour profile of children and adults in urban and rural areas of Burkina Faso, Africa. Geneva: WHO, 2003
47. Ramandeep Singh Gambhir et al., Impact of School Based Oral Health Education Programmes in India: A Systematic Review Journal of Clinical and Diagnostic Research. 2013 Dec, Vol-7(12): 3107-3110.
48. Nakre PD, Harikiran AG. Effectiveness of oral health education programs: A systematic review. Journal of International Society of Preventive & Community Dentistry. 2013;3(2):103-115. doi:10.4103/2231-0762.127810.

49. Gupte S. The Short Textbook of Paediatrics, 9th (Millennium edition.). New Delhi: Jaypee brothers medical publishers Ltd; 2001; 65-87.
50. National School Health Service. "An editorial report". Nig J Paed 1975; 2(2): 31- 32.
51. Research to improve implementation and effectiveness of school health programmes. In: Report of the School Working Group and the WHO Expert Committee on Comprehensive School Health Education and Promotion. Geneva: World Health Organization; 1996.
52. Currie C, Hurrelmann K, Settertobulte W, Smith R, Todd J, editors. Health and health behaviour among young people. Copenhagen: WHO Regional Office for Europe; 2000. WHO Policy Series: Health policy for children and adolescents. Issue 1. International Report.
53. Bandura A. Self-efficacy: Toward a unifying theory of behavioural change. Psychological Review.1977;84(2):191-215.doi:10.1037/0033-295x.84.2.191
54. Glanz K, Rimer BK, Lewis FM, Eds. Health behaviour and health education, 3rd Ed. San Francisco, CA; John Wiley & Sons 2002.
55. Booth MI, Samdal O. Health promoting schools I Australia: Models and Measurement. Australia and New Zealand Journal of Public Health 1997; 21:365-70.
56. Dental Health Foundation, Ireland. Oral Health in disadvantaged schools in the Eastern Region. Dublin: Dental Health Foundation, Ireland; 2001
57. Esan A, Folayan MO, Egbetade GO, Oyedele TA. Effect of a school-based oral health education programme on use of recommended oral self-care for reducing the risk of caries by children in Nigeria. International Journal of Paediatric Dentistry. 2015; 25:282-290. doi:10.1111/ipd.12143.

58. Bankole O, Ibiyemi O. Effects of information dissemination using video of indigenous language on 11- 12 years children's dental health. *Ethiopian Journal of Health Sciences*. 2013;23(3):201-208. doi:10.4314/ejhs.v23i3.2.
59. Olusile AO, Adeniyi AA, Orebanjo O. Self-rated oral health status, oral health service utilization, and oral hygiene practices among adult Nigerians. *BMC Oral Health*. 2014;14:140. doi:10.1186/1472-6831-14-140.
60. WHO Removes Nigeria from Polio-Endemic List. WHO. <http://www.who.int/mediacentre/news/releases/2015/nigeria-polio/en/>. Accessed August 13, 2017.
61. Frencken JE, Borsum-Andersson K, Makoni F, Moyana F, Mwashenyi S, Mulder J. Effectiveness of an oral health education programme in primary schools in Zimbabwe after 3.5 years. *Community Dentistry and Oral Epidemiology*. 2001;29(4):253-259. doi:10.1034/j.1600-0528.2001.290403.x
62. van Palenstein Helderma WH, Munck L, Mushendwa S, van't Hof MA, Mrema FG. Effect evaluation of an oral health education programme in primary schools in Tanzania. *Community Dent Oral Epidemiol* 1997; 25; 296-300.
63. Singh N, Ramakrishnan TS, Khera A, Singh G. Impact evaluation of two methods of dental health education among children of a primary school in rural India. *Medical Journal of Dr. D.Y. Patil University*. 2016;9(1):66-71. doi:10.4103/0975-2870.167988
64. Reddy PM, Lakshmi SV, Kulkarni S, Doshi D, Reddy BS, Shaheen SS. Impact of oral health education on plaque scores with and without periodic reinforcement among 12-year-old school children. *Journal of Indian Association of Public Health Dentistry*. 2016;14(2):116-120. doi:10.4103/2319-5932.183806

65. D'Cruz A, Aradhya S. Impact of oral health education on oral hygiene knowledge, practices, plaque control and gingival health of 13- to 15-year-old school children in Bangalore city. *Int J Dent Hyg.* 2012 Jun 30. doi: 10.1111/j.1601-5037.2012.00563.
66. Chachra S, Dhawan P, Kaur T, Sharma AK. The most effective and essential way of improving the oral health status education. *J Indian Soc Pedod Prev Dent.* 2011;29:216-21.
67. Shenoy RP, Sequeira PS. Effectiveness of a school dental education program in improving oral health knowledge and oral hygiene practices and status of 12- to 13- year old school children. *Indian J Dent Res.* 2010;21:253-9.
68. Nyandindi U, Milen A, Palin-Palokas T. Impact of oral health education on primary school children in Tanzania. *Health Promotion International* 1996; 11: 193–201.
69. Barkeling B, Andersson I, Lindroos AK, Birkhed D, Rossner S (2001) Intake of sweet foods and counts of cariogenic microorganisms in obese and normal weight women. *Eur J Clin Nutr* 55: 850-5.
70. Alm A (2008) On dental caries-related factors in children and teenagers. *Swed Dent J Suppl* 195: 7-63.
71. Kowash MB, Pinfield A, Smith J, Curzon ME. Effectiveness on oral health of a long-term health education programme for mothers with young children. *Br Dent J* 2000;188:201-5.
72. Petersen PE, Peng B, Tai B, Bian Z, Fan M. Effect of a school-based oral health education programme in Wuhan City, Peoples Republic of China. *Int Dent J.* 2004;54:33-41.

73. Folayan MO, Adeniyi AA, Chukwumah NM, et al. Programme guidelines for promoting good oral health for children in Nigeria: a position paper. *BMC Oral Health*. 2014;14:128. doi:10.1186/1472-6831-14-128.
74. Ordinioha B, Onyenaporo C. Experience with the use of community health extension workers in primary care, in a private rural health care institution in South-South Nigeria. 2010;9(4): 240-245
75. Diamond R, Litwak E, Marshall S, Diamond A. Implementing a community-based oral health care program: lessons learned. *J Public Health Dent*. 2003;63:240–243. doi:10.1111/j.1752-7325.2003.tb03506.x
76. Petersen PE, Christensen LB. Oral health promotion: health promoting schools project. Copenhagen: WHO Regional Office for Europe; 1995.
77. Alberto C, Mara S, Regina M. A school-based oral health educational program: the experience of maringa- pr, brazil. *J Appl Oral Sci* 2004; 12(1): 27-33.