ENSIGN COLLEGE OF PUBLIC HEALTH

KPONG, EASTERN REGION, GHANA

Unmet Oral Health Needs of Basic School Pupils in The Lower Manya Krobo Municipality of The Eastern Region of Ghana

BY

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BY

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DECLARATION

I hereby declare that except for the references to works by other authors, which have been duly acknowledged, this is my own work and that, it has neither in whole nor in part been presented for a degree in this university or elsewhere.

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DEDICATION

This work is dedicated to my beloved husband and lovely children.

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Definition of Terms

Access	The means or opportunity to approach or enter a place.
Attitude	A settled way of thinking or feeling about something.
Behaviour	The full range of physical and emotional behaviours that humans engage in; bologically, socially, intellectually which are influenced by culture, attitudes, emotions, values, ethics, authority, rapport, persuasion, coercion and/or genetics.
Cancer	A disease caused by an uncontrolled division of abnormal cells in a part of the body.
Circuit	A line encompassing an area.
Cleft lip	A congenital split in the upper lip on one or both sides of the center often associated with a cleft palate.
Demographic	Relating to the structure of populations or statistical characteristics of a population.
Dental Caries	A breakdown of teeth due to acids made by bacteria.
Disease	A disorder of structure or function in a human, animal, or plant, especially one that produces specific symptoms or that affects a specific location and is not simply a direct result of physical injury.

Edentulous	Lacking teeth.
Epidemiology	The branch of medicine, which deals with the incidence, distribution, and possible control of diseases and other factors relating to health.
Fluorosis	A chronic condition caused by excessive intake of fluorine compounds, marked by mottling of the teeth and, if severe, calcification of the ligaments.
Indicator	A thing that indicates the state or level of something.
Knowledge	Facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject.
Municipality	A primarily urban political unit having corporate status and usually powers of self-government.
Non communicable	A disease that is not transmissible directly from one person to another.
Oral Hygiene	The practice of keeping the mouth clean and healthy by brushing and flossing to prevent tooth decay and gum disease.
Oro-dental	Relating to the teeth and mouth.
Periodontal	Relating to or affecting the structures surrounding and supporting the teeth.

Plaque	A sticky deposit on teeth in which bacteria proliferate.
Prevalence	A statistical concept referring to the number of cases of a disease that are present in a particular population at a given time.
Pupil	A person who is taught by another, especially a schoolchild or student.
Questionnaire	Set of printed or written questions with a choice of answers, devised for the purposes of a survey or statistical study.
Risk Factor	A risk factor is any attribute, characteristic or exposure of an individual that increases the likelihood of developing a disease or injury.
Rural	A geographic area that is located outside towns and cities.
Trauma	Physical injuries of sudden onset and severity.
Urban	A location characterized by high human population density and many built environment features in comparison to the areas surrounding it.

Abbreviations and Acronyms

AIDS	Acquired Immuno Deficiency Syndrome
ART	Atraumatic Restorative Treatment
CPITN	Community Index of Periodontal Needs
CPI	Community Periodontal Index
DFMT	Decayed Missing Filled Teeth (Permanent teeth)
dfmt	Decayed Missing Filled Teeth (Primary Teeth)
DMFS	Decayed Missing Filled Surface
FDI	World Dental Federation
HIV	Human Immunedeficiency Virus
KAB	Knowledge Attitude Behaviour
NCD	Non Communicable Disease
NHIS	National Health Insurance Scheme
NOMA	Necrotising Ulcerative Stomatitis
WHO	World Health Organisation
YLD	Years Lived with Disability

ABSTRACT

Introduction

Epidemiological studies have shown that there is prevalence of caries in young children throughout the world, both in low and high-income countries. Parents' perception is a huge contributor in dental nonattendance of children. Reduction in prevalence of periodontal disease can help reduce associated systemic diseases as well as minimize their financial impact on the health-care systems. This research seeks to assess the oral disease burden of basic school pupils living in the Lower Manya Krobo Municipality of the Eastern region of Ghana and the knowledge, attitudes and beliefs of the pupils and their caregivers.

Method

The study employed a school-based cross-sectional design. It was conducted in February 2019. Four schools (two private and 2 public) from two randomly selected educational circuits were used in the study. A total of 300 study subjects were selected through a multi-stage sampling procedure and their oral health status assessed. The pupils and their caregivers were interviewed on their knowledge, attitude and behaviour towards oral health. Ethical clearance was obtained from Ensign College of Public Health's Institutional Review Committee and the Municipal Office of the Ghana Education Service. Administrative permission was also sought from the heads of the school. Data collected was analyzed with Stata.

Results

The prevalence of dental caries was found to be 26.67% and it was found not to be significant with age, consumption of sweets and drinks, and with frequency of teeth cleaning. A mean DMFT score of 1.05(± 2.68) was obtained with only a decay component. Periodontal disease affected more than half (59.33%) of the study subjects and was significant with gender (p value = 0.03) and those with high consumption of sweets. Prevalence of other oral diseases were low with the occurrence of fluorosis being high among rural children. Although the knowledge and attitude of caregivers was good, their behaviour was average affecting the outcome of oral diseases amongst pupils.

Conclusion

Oral health of the school pupils was poor and prompt measures need to be implemented to control the problem. Health education and promotion programs on healthy diet and adequate oral hygiene practices should be promoted in schools' curricula.

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CHAPTER ONE

1 INTRODUCTION

1.1 Background

The World Dental Federation (FDI) identifies one of the most serious challenges facing low-income countries in Africa and South America to include poor access to adequate dental care, lack of availability of quality dental materials at affordable prices and inadequate investment in dental care. This problem is further compounded by prevailing economic and social inequalities (FDI World Dental Federation, 2015).

"Oral health is multi-faceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort and disease of the craniofacial complex" (Glick et al., 2016)

"Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 2018).

Health behaviour can be defined as "the activities undertaken by people in order to protect, promote or maintain health and to prevent disease (Ahamed et al., 2015).

Oral disease in children and adults is higher among the poor and disadvantaged population groups. Risk factors for oral diseases include an unhealthy diet, tobacco use, harmful alcohol use and poor oral hygiene, and social determinants (Pöyhiä, 2000).

In many societies, individuals are living longer because of modern technology in medicine (International Labour Organization, 2009). This increase in longevity is not commensurate with prolonged quality of life which is often fraught with a variety of oral health challenges and reduced quality of life (Jakab, 2018). Non-communicable chronic diseases known to be

dominant in lower-middle- and upper-income countries, are becoming increasingly prevalent in many of the poorest developing countries of late. This has created a double burden of disease for these countries (Schooling and Leung, 2010). The challenge therefore, is for dental and oral care to respond to the increase in disease burden and contribute to the implementation of World Health Organization's Global Action Plan for the Prevention and Control of Non-communicable diseases 2013-2030 (WHO, 2013). Prevalence of oral diseases among school children has led to the inclusion of school oral health program within the framework of the WHO Health Promoting Schools Initiative. In addition, global goals for oral health by the year 2020 are specified for development of quality of oral health systems (Pöyhiä, 2000).

Epidemiological studies have shown that there is high prevalence of caries in young children throughout the world, both in the high-income and in the low-income countries (Jawdekar, 2013). This appears to be more severe in low socio-economic communities where dental caries usually go untreated. This has a significant impact on the general well-being and quality of life of infants and toddlers even though it is preventable through correct management of common risk factors. (Anil and Anand, 2017). Strategies recommended for the management of early childhood caries have been spelt out (Prakash et al., 2012) and includes the prevention of, as early as possible, the development of caries through encouragement of early start of tooth brushing with fluoride toothpaste and the modification of social behavioral factors (WHO, 2016).

The Decayed, Missing, Filled (DMF) index is the traditional method of measurement for caries experience in dental epidemiology. It is well established as the key measure and has been used for almost 80 years (Nordström, 2018).

The Community Periodontal Index of Treatment needs (CPITN) is a tool for measurement of periodontal diseases and the FDI-WHO Joint Working Group 1 supports its use and modification. Oral health behavior is significantly associated with oral health attitudes; as the behavior score improves, DMFs score declines and both child and caregiver overall oral health status improves (Cutress et al., 1987). Parent perception is a huge contributor in dental care of children (Calvasina et al, 2014). Dental care workers need to facilitate public enlightenment on the need for regular dental checkup to affect change successfully. Attitudes and behaviors also need to be managed (Schrader and Lawless, 2004).

1.2 Problem Statement

Oral disease is one of the commonest chronic health problems in the world and more especially in children (Benjamin, 2010). In the Tamale Municipality, there is high prevalence of oral disease ranging from 52% to 68% for periodontal disease and 12% to 24% for caries with poor knowledge and attitudes towards oral health (Amoateng et al, 2000).

Studies done in the Ho Municipality showed a high prevalence among children. Approximately eighty percent of the children had calculus and gum bleeding. Only 2.4% had visited the dentist in their lifetime whilst 92.9% with dental pain tend to seek self- medication (Tuosie Beni, 2009). Among peri-urban school children in Accra, plaque scores ranged from 78.9% to 97% in the 4-6-year-olds (Bruce, et al., 2002).

It is important to target children for early intervention because healthy behaviors and lifestyles developed at younger ages are more sustainable (Al Subait et al., 2016). The Oral Health status of children in the Lower Manya Krobo Municipality is scanty. Awareness of this problem and

actions taken may to a large extent depend on the knowledge attitude and beliefs that pertain in this community. Yet, knowledge attitude and behavior towards oral care in the community, including oral disease prevalence amongst children within the community is undocumented and therefore the reason for the study.

1.3 Justification for the Study

Oral health is of importance in children because it has a direct impact in the overall quality of life in adulthood. Globally, over 60–90% of school children and almost 100% of adults have dental cavities (Global et al., 2014). In a study, diabetes mellitus, cardiovascular disease and respiratory diseases were found to be associated with a higher severity of periodontal disease (Oberoi *et al.*, 2016). Cardiovascular patients with diabetes have been shown to have higher numbers of missing teeth than those suffering from cardiovascular disease alone (Aoyama et al., 2018). A high number of tooth loss may increase the risk of mortality from pneumonia in community-dwelling populations (Oberoi *et al.*, 2016). Periodontal therapy improves glycemic control in type 2 diabetic subjects. Periodontitis is also related to maternal infection, preterm birth, low birth weight, and preeclampsia. Reduction in prevalence of periodontal disease can help reduce its associated systemic diseases and can minimize their financial impact on the health-care systems (Nazir, 2017).

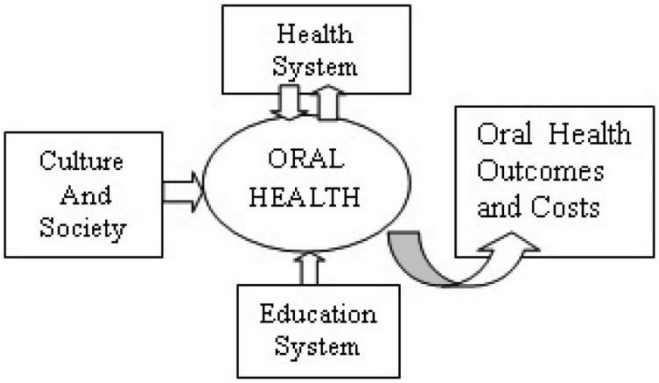
"Oral health should be considered as an integral part of general health and a basic human right, and we must ensure cost-effective solutions become available to all. This can be achieved by promoting further research and obtaining valid data to help us achieve this objective"(Petersen, 2003)

A review of the out-patient department (OPD) cases at Atua Government Hospital of the Lower Manya Krobo District in the Eastern Region of Ghana from 2016 to 2017 reveals a 3% drop in

the patronage of dental services among children. This research is therefore relevant since it will assess the oral health status (unmet needs), provide data on the prevalence of oral diseases among children and explore the knowledge, attitudes and beliefs of their parents and guardians who are people living in the municipality. Data from this study can be used by the Municipal Health Directorate in planning for oral health interventions for school children in the municipality.

The research therefore seeks to know the oral disease burden in the children and the knowledge attitudes and beliefs of people living in the Lower Manya Krobo Municipality.

1.4 Conceptual Framework



Modified from (Wood *et al.*, 2003)

Figure 1-1 Conceptual Framework

Health related quality of life has multiple dimensions. A healthy mouth enables people to speak, to eat and socialize without discomfort, pain or embarrassment. Oral health is prerequisite to overall health quality of life, and wellbeing. Conversely, social factors have a huge influence on the oral health status of people, most especially, children. This is because children are not fully responsible for decisions taken which affect their oral health status. This has led to the

conceptual model in which social indicators are measured to determine their association with oral health. This is needed to broaden the rather narrow focus of oral epidemiology, which previously, was only concerned with the clinical parameters of the disease.

Effects of impairments and disability and reduced opportunity due to poor oral health can be mediated by knowing where to place interventions targeting personal and environmental factors for improved oral health.

1.5 Research Questions

1. What is the prevalence of unmet oral health needs of school pupils within the Lower Manya Krobo municipality?
2. What is the level of knowledge and what are some attitudes and practices impacting oral health of children in the Lower Manya Krobo municipality?
3. Is there any association between oral health status of pupils and sociodemographic factors?

1.6 General Objective of the Study

The general objective of the study to investigate the unmet oral health needs of school pupils within the Lower Manya Krobo municipality.

1.7 Specific Objectives of the Study

The specific objectives of the study are to:

1. To assess the prevalence of oral disease in basic school pupils in the Lower Manya Krobo District.

2. To explore the knowledge attitudes and practices impacting oral health of children in the Lower Manya Krobo Municipality.
3. To explore the association if any, between oral health status and sociodemographic factors

1.8 Scope of the Study

The study was to determine the prevalence of oral diseases among school going pupils in selected schools in Lower Manya Krobo. The study also aimed to determine the relationship between knowledge, attitudes and behavior of caregivers and oral health among the children.

1.9 Organization of Thesis

Chapter one contains the background: what an oral health need is and how it affects general health. Chapter two provides an overview of available literature. Chapter three describes the method used in obtaining the data. Chapters 4 -6 discuss the results of the study and conclusion drawn.

CHAPTER TWO

2 LITERATURE REVIEW

2.1 Overview

Oral health is a key indicator of overall health, wellbeing and quality of life. According to the World Health Organization, oral health is a state of being free from chronic mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking, and psychosocial wellbeing. It contributes to an individual's wellbeing and quality of life by affecting physical and mental wellbeing positively, appearance and interpersonal relationships (Ogunsile et al.,2011).

Oral hygiene is a state in which the surfaces of all the teeth are plaque free (Löe, 2000). Good oral hygiene is essential in the promotion of oral health. Poor oral hygiene status often leads to the accumulation of dental plaques which harbour bacteria that play a crucial role in the etiology of dental caries, gingivitis and periodontitis (Meyer et al, 2018) . Caries incidence, can also be prevented by efficient oral care (Bratthall *et al.*, 2006) and can be virtually eliminated by the regular careful removal of plaque by a professional (Ur Rehman et al, 2014).

The public health problems associated with oral disease are a serious burden on countries around the globe (WHO, 2013) and in spite of the great triumphs in oral health, burden of oral health diseases remains high in many communities around the world - particularly among underprivileged groups in high-income and low-income countries (Petersen, 2003). This could be a result of a myriad of reasons but mainly because of the lack of acceptance of healthy oral

habits that are crucial in preventing the most common oral diseases such as, dental caries and periodontal disease which are considered as behavioural disease (Kasila *et al.*, 2006). Countries where oral disease preventive programs have not been implemented still remain in the shadow of high prevalence of dental caries (Al Subait *et al.*, 2016). Currently, the dental caries level is high in several American and European countries, while it appears less severe in most African countries (Petersen, 2004).

Oral health in Africa is characterized by i) low caries prevalence and severity, with little increase; ii) few oral care personnel and an imbalance between personnel types and population needs; and iii) rural and peri-urban communities without basic care or with emergency care only, due to the high cost or unavailability of other treatment. These are exacerbated by logistics problems and unreliable services as well as the low priority given to oral health care due to the presence of several general health problems and enormous development needs (Thorpe, 2006).

It is evident from various published literature that socio-behavioral and environmental factors play a crucial role in the maintenance of good oral health (Murphey, 2013). These factors include nutritional status, tobacco use, alcohol, hygiene, stress, systemic conditions such as diabetes mellitus and many others (Prakash *et al.*, 2012). Maintenance of good general health requires that an individual has good oral health since the mouth is a reflection of the body. Oral health, directly or indirectly affects the quality of life of an individual. The negative impact of oral diseases on quality life of especially children have been reported for many years (Petersen, 2003). The burden of oral disease in young children restricts activities in school, work, and home leading to loss of many potential working hours leading to loss of millions of school and work hours each year, the world over (Al Subait *et al.*, 2016; WHO 2003). Maintaining good

oral hygiene is considered a lifelong habit. Moreover, these oral health habits such as brushing and flossing to prevent tooth decay and gum disease are said to begin in an early stage of life (Al Subait *et al.*,2016).

2.2 Oral Diseases

Seven oral diseases and conditions account for most of the oral disease burden. They include dental caries (tooth decay), periodontal (gum) diseases, oral cancers, oral manifestations of HIV, oro-dental trauma, cleft lip and palate, and noma (Petersen, 2008). Almost all diseases and conditions are either largely preventable or can be treated in their early stages.

2.2.1 Dental Caries (Tooth Decay)

Dental caries result when microbial biofilm (plaque) formed on the tooth surface converts the free sugars contained in foods and drinks into acids that dissolve tooth enamel and dentine over time. With continued high intake of free sugars, inadequate exposure to fluoride and without regular microbial biofilm removable, tooth structures are destroyed, resulting in development of cavities and pain, impacts on oral-health-related quality of life, and, in the advanced stage, tooth loss and systemic infection (WHO, 2018).

The Decayed, Missing and Filled Teeth or Surface (DMFT and DMFS) indices describe the severity of dental caries in an individual. DMFT expresses the caries prevalence in permanent dentition (WHO, 1997) with evidence of caries attack as seen in a carious lesion, a filling or a missing tooth. DMFT and DMFS are obtained by calculating the number of teeth (T) or tooth surfaces(S) that are Decayed (D), missing due to caries (M) and Filled (F). The DMFT(S) is used to estimate the number of teeth that have become affected by caries on the day of

examination. Indices are either calculated for 28 permanent teeth, not including teeth numbers 18, 28, 38, and 48 which are the wisdom teeth or for all 32 teeth. The caries index score (DMFT) is arrived at by adding the number of teeth /tooth surfaces that have caries, the number of teeth/tooth surfaces that have been lost due to tooth decay and those that have fillings or crowns.

2.2.2 Periodontal (Gum) Disease

Periodontal disease affects the tissues that surround and support the tooth. It often presents as bleeding or swollen gums (gingivitis), pain and sometimes as bad breath. In a more severe form, loss of gum attachment to the tooth and supporting bone causes "pockets" and loosening of teeth (periodontitis) (WHO, 2018).The main causes of periodontal disease are poor oral hygiene and tobacco use (Petersen *et al.*, 2005).

2.2.3 Tooth Loss

Dental caries and periodontal diseases are major causes of tooth loss. Severe tooth loss and edentulism (no natural teeth remaining) are widespread and particularly seen among older people. Severe tooth loss and edentulism was one of the leading ten causes of Years Lived with Disability (YLD) in some high income countries due to their aging populations (Ji*n et al.*, 2016).

2.2.4 Oral Cancer

Oral cancer includes cancers of lip and all sub-sites of the oral cavity, and oropharynx. The age-adjusted incidence of oral cancer in the world is estimated at 4 cases per 100 000 people. However, there is wide variation across the globe: from no recorded cases to around 20 cases per 100 000 people (WHO, 2018). It is more common in men, older people, and varies strongly

by socio-economic condition. Annual incidence of oral cancer is estimated as 25 cases per 100,000 people in Africa (Abid et al., 2015).

2.2.5 Oro-dental trauma

Oro-dental trauma is an impact injury to the teeth and/or other hard or soft tissues within and around the mouth and oral cavity (Lam, 2016). The world prevalence of traumatic dental injuries in either dentition (primary and permanent) is around 20% (Petti *et al.* 2018). Oro-dental trauma can be caused by oral factors (e.g. increased overjet); environmental factors (for example, unsafe playgrounds or schools); risk-taking behaviour; and violence (Glendor, 2009). Treatment is costly and lengthy and sometimes can even lead to tooth loss, resulting in complications for facial and psychological development and quality of life.

2.2.6 Noma

Noma is a necrotizing disease that affects children between the ages of 2 and 6 years suffering from malnutrition, affected by infectious disease, living in extreme poverty and with weakened immune systems (Srour *et al* , 2017).

Noma is mostly prevalent in sub-Saharan Africa, but rare cases are reported in Latin America and Asia. It starts as a soft tissue lesion, a sore, of the gums, inside the mouth. The initial gum lesion then develops into an ulcerative, necrotizing gingivitis that progresses rapidly, destroying the soft tissues and further progressing to involve the hard tissues and skin of the face (WHO, 2018). .

In 1998, WHO estimated that there were 140 000 new cases of Noma annually. Without treatment, Noma is fatal in 90% of cases. Where noma is detected at an early stage, its progression can be rapidly halted, through basic hygiene, antibiotics and nutritional rehabilitation. Such early detection helps to prevent suffering, disability and death. Survivors suffer from severe facial disfigurement, have difficulty speaking and eating, face social stigma, and require complex surgery and rehabilitation (WHO, 2016).

2.2.7 Oral Manifestations of HIV Infection

Oral diseases related to HIV/AIDS can include oral lesions such as candidiasis and herpetic ulcers leading to pain, discomfort and a constant source of opportunistic infections About 50% of HIV-positive people are affected by oral fungal, bacterial or viral infections resulting in a growing burden for fragile oral health care systems. Two-thirds of the world's HIV-positive children and adults live in Sub-Saharan Africa, where access to oral health care is severely limited (Weil, 2016).

2.2.8 Cleft Lip and Palate

Clefts of the lip and palate are heterogeneous disorders that affect the lips and oral cavity and occur either alone (70%) or as part of a syndrome, affecting more than 1 in 1000 new-borns worldwide (WHO, 2018). Although genetic predisposition is an important factor for congenital anomalies, other modifiable risk factors such as poor maternal nutrition, tobacco consumption, alcohol and obesity during pregnancy also play a role (Gwanmesia, et al, 2012). In low-income settings, there is a high mortality rate in the neonatal period (Mossey et al, 2012). If lip and palate clefts are properly treated by surgery, complete rehabilitation is possible.

2.3 Prevalence of Oral Diseases

Oral diseases are the most common non-communicable diseases (NCDs) and affect people throughout their lifetime, causing pain, discomfort, disfigurement and sometimes even death (WHO, 2018). The Global Burden of Disease Study 2016 estimated that oral diseases affected half of the world's population (3.58 billion people) with dental caries (tooth decay) in permanent teeth being the most prevalent condition assessed. Globally, it is estimated that 2.4 billion people suffer from caries of permanent teeth and 486 million children suffer from caries of primary teeth (Global Burden of Disease, 2016). Dental caries and periodontal diseases have historically been considered the most important global oral health burdens. Severe periodontal (gum) disease, which may result in tooth loss, was estimated to be the 11th most prevalent disease globally (Richard, 2013).

Dental caries refer to enamel, dentine or cementum destruction due to bacterial acid produced in dental plaque leading to a cavity in the tooth crown or root (Nimako-Boateng *et al*, 2016). Usually, dental caries progresses slowly as a chronic disease although its rate of progress varies. Dental caries constitute the single most prevalent chronic childhood disease worldwide. It affects 60-90% of school going children in most high-income countries and in several low-income countries the prevalence rates are increasing (Ul Hasan *et al.*, 2015). According to Petersen (2004) and Varenne *et al*. (2004), although incidence of caries appears to be lower in most African countries, it is predicted to rise due to increasing consumption of sugars and decreasing exposure to fluorides.

Dental caries and gum disease are the commonest oral diseases in children and may be associated with severe pain. The pain may interfere with food intake and affect the normal

growth of the child (Bruce, et al, 2002). Dental caries is a multi-factorial disease. Various factors such as socio-demographic and behavioural predispose an individual to have increased risk of caries experience and these include: presence of plaque, poor oral hygiene, increasing age, gender, inadequate tooth-brushing habits, frequency and timing of consumption of sugar-containing drinks (Ul Hasan *et al.*, 2015).

Studies have indicated that socio-economic factors are associated with caries prevalence in both adults and children. Dental caries was shown to be most prevalent in school children from poorer families who had greater number of untreated oral lesions (Bruce et al., 2002).

In America, approximately 21 percent of children have untreated dental caries (tooth decay) in their primary teeth. The prevalence of untreated tooth decay is higher among non-hispanic black and Mexican American children 27 percent and 31 percent, respectively than 18 percent in non-Hispanic white children(Holst et al, 2012).

A study in India by Moses *et al*. (2011), observed dental caries in 1484 (63.83%) of the total study population. Children belonging to group II, 9-11yrs old, had high percentage of caries. Ul Hasan, S. *et al.* (2015) also found that among children who brushed their teeth regularly 84 (55.3%) had dental caries. The children who had satisfactory oral hygiene, 80(52.6%) had dental caries.

A survey in Nepal in 2004 found caries prevalence and mean /DMFT score of 5-6-year-olds and 12 - 13-year-olds to be 52%, 1.59 and 41%, 0.84 respectively. An increasing trend in decayed, missing filled teeth (dfmt) was seen with increasing age (Prasai Dixit *et al.*, 2013b).

In Africa, a survey on oral health carried out in the Gambia on 5 and 12-year-old found caries prevalence to be 88% and 73% of the examined 5 and 12 year old children respectively with prevalence being higher among boys (Kosovic et al, 2001). However, a study in Nigeria reported a low prevalence with the highest reported dental caries prevalence of 13.9% among 12-year old suburban Nigerian school children with decayed teeth contributing the majority of the DMFT index (Adekoya-Sofowora *et al.*, 2006).

In Ghana, a cross-sectional study on the oral health status of 15 – 24 year olds in the Wa Municipality found the mean DMFT of the whole population to be 0.6. Caries experience was higher among those in school with mean DMFT of 0.84 than those out of school who had a DMFT of 0.46; this was found to be statistically significant. Another study carried out among school children in Ho reported a very low mean DMFT of 0.24(standard deviation 0.75) and a caries prevalence of 12.5% (Tuosie , 2009). Ndanu *et al.* (2002) found overall caries prevalence to be 17.4% but (19.9%) in the public and (15.1%) in the private school. It was higher in the females (19.3%) than the males (15.1%) in both private and public schools.

Periodontal disease is the most common oral condition of human population. Periodontal diseases are prevalent both in high-income and low-income countries and affect about 20-50% of global population (Nazir, 2017). High prevalence of periodontal disease in adolescents, adults, and older individuals makes it a public health concern. Several risk factors such as smoking, poor oral hygiene, diabetes, medication, age, hereditary, and stress are related to periodontal diseases(Nazir, 2017). The Community Periodontal Index of Treatment Needs (CPITN) is the accepted method for undertaking epidemiological and screening studies for

periodontal diseases. The index teeth that are used are 17, 16, 11, 26, 27, 37, 36, 31, 46, 47 (Cutress, Ainamo and Sardo-Infirri, 1987).

Periodontal disease and dental caries constitute major oral health problems in Nigeria with the prevalence being particularly high among young children and adolescents and the occurrence closely related to oral hygiene and socioeconomic class (Akpata, cited in Ogunsile and Ojo, 2011). In a national study on periodontal status and treatment need among Nigerian children, prevalence of dental caries was as high as 30% and 43% among Nigerians aged 12 years and 15 years respectively (Ogunsile and Ojo, 2011). In Ghana 9 out of 10 school children have the disease (Manual on oral health care, cited in Tuose 2009).

Plaque scores ranged from 78.9% in the 4-5-year-olds to a high of 97% in the 6-year-olds with the older age groups occupying intermediate levels. Gingival disease increased with age from slight to low in the lower age groups and increasing significantly from 12 years to 16 years (Bruce *et al*,, 2002). Poor oral hygiene therefore allows the bacteria in the plaque to thrive and then ferment sugars in foods to produce acid that leads to dental caries.

2.4 Access to Dental Care

Access to oral healthcare is determined by the one's ability to utilize and benefit from oral healthcare. Access to dental care is important to enhance and maintain good oral health, because oral health is an integral component of general health (Obeidat *et al*, 2014). In many low-income countries, access to oral health services is very limited, while in high-income countries and in some industrial countries, access to oral healthcare is much better (Petersen, 2004).

FDI World Dental Federation has identified the most serious challenges facing developing countries in South America, Africa, and Asia in their pursuit of optimal oral health. They include poor access to adequate care, lack of quality dental materials at an affordable price and insufficient investment in dental care. The average density of dentists to head of population in Africa is 1 to 150,000. Low expenditure on dental health in low-income countries severely undermines oral care.

The damage to oral health due to poor access to care is exacerbated by the fact that many low-income countries are disproportionally affected by several oral diseases. For example, an estimated 140,000 people, mainly in Sub-Saharan Africa, South America and Asia, are affected by Noma, a neglected, deadly and disfiguring disease of poverty affecting mainly children *(FDI World Dental Federation*, 2014). The combination of high risk of oral disease and low access to care, results in many patients not getting adequate treatment in time. In the case of Noma, this can result in an 80% mortality rate (Weil, 2016).

Access to proper dental care is affected by health disparities which add another layer of complexity. Oral diseases disproportionately affect disadvantaged communities, especially children, the elderly, and racial/ethnic minority groups. In America, only one in five school-aged children from low-income families receives dental sealants to prevent dental caries. Furthermore, 40% of Mexican American children aged 6–8 years have untreated tooth decay, compared with 25% of non-Hispanic white children. More astonishing is the 87% of American Indian and Alaska Native children aged 6–14 years and 91% of the 15- to 19-year-olds who have a history of tooth decay (Benjamin, 2010).

In many African countries, access to oral health services is limited and teeth are often left untreated or are extracted to relieve pain or discomfort (Petersen *et al.*, 2005). The main barriers to providing good-quality oral health care services in African countries are related to infrastructure, services, and resource availability. Some examples, with regards to services include barriers such as clean, pressurized water and electricity, which are unreliable or absent; transport and communication, which are difficult, expensive, and non-existent in some seasons; an infrastructure and organization that cannot sustain services; and financial, human, and physical resources that are few and stretched throughout many priority areas (Thorpe, 2006).

2.5 Knowledge, Attitude and Behaviour of Children and Parents

Children's oral health behaviour originates mainly from the family. Parents or caregivers play an important role in promoting oral health and are largely responsible for teaching their children proper hygiene skills and developing effective oral hygiene habits. Therefore, in attempts to achieve the best oral health outcomes for children, parents should be considered as key persons in ensuring the well-being of young children. This can improve the preventive dental care children receive at home and their use of professional dental services (Kamolmatyakul, 2012). Reports show that children whose caregivers demonstrate better knowledge of oral health, attitude and behaviour are more likely to have good oral health (Liu *et al.*, 2017).

Knowledge means that the individual has all the information required to understand what oral disease is and how it arises, as well as to understand the protective measures that need to be adopted. Theoretically, this knowledge should lead to a change in attitude, which will result in the individual making changes in their daily life (Al-Darwish, 2016).

Evidence has showed that an increase in knowledge about risk factors for oral disease and strong knowledge of oral health demonstrates better oral care practices that aim to promote healthy habits (Al-Omiri et al., 2006). Furthermore, school children with inadequate oral health knowledge are twice as likely to have caries as school children with adequate knowledge. Researchers have identified different sources of oral health information which have direct influence on the oral health knowledge of school children which in turn influences their caries prevalence. These sources include parents, school teachers, dentist, media and relatives (Al-Darwish, 2016). Many researchers have tried to assess the relationship between attitude, knowledge and practice of oral health. Smyth et al., (2007) indicated that strong knowledge of oral health resulted in better oral care practice. This change to healthy attitude and practice can be created by providing adequate information, motivation and practice. Also, people with a more positive attitude towards oral health were predisposed by better knowledge in how to take care of their teeth (Al-Omiri et al., 2006).

A study in India found that the children lacked knowledge regarding use of fluoridated toothpaste and did not use them. Children with low knowledge had significantly higher odds of having DMFT ≥ 1, not using fluoridated toothpaste, and being afraid of going to the dentist due to possible pain (Suprabha *et al.*, 2013).

In a study among school children in North Jordan, children had positive attitudes toward their dentists; nevertheless, they feared dental treatment and toothache was the major driving factor for dental visits. The children recognized the importance of oral health to the well-being of the rest of the body. The study also found that parents were not proactive in making sure that their children received regular dental care. Parents' knowledge and attitudes about the importance of

oral health care and their fears about dental treatment influenced their children's dental care (Al-Omiri et al., 2006).

CHAPTER THREE

3 METHODOLOGY

3.1 Study Method and Design

The study was carried out using a cross-sectional study design which involved the administration of a questionnaire and oral examination of school pupils in 4 selected schools in Lower Manya Krobo and the administration of questionnaire to their caregivers in February, 2019. The examination was done using an Oral examination tool for school pupils and adolescents modified from the World Health Organization from the Oral Health Survey Basic Methods (5th Edition) Annex (2 and 8). A multistage random selection method was used in selecting study participants and parents of selected students were interviewed. A standard structured questionnaire consisting of both open and close-ended questions adopted and edited from literature was used in the survey after the research team sought approval from the School heads.

3.2 Instrument for Data Collection

Data collection was done by administering questionnaires to school pupils and their parents/caregivers and oral examination of selected students. Questionnaires were administered through face to face interviews. Study participants were informed to bring their parents to school. Teachers were trained as part of the research team and parents were interviewed. Parents who did not turn up in the schools were followed up, however not all were captured. Selected pupils who were in school on the day of the survey and who have been residents in the municipality for at least one year were interviewed by the research team. An open oral clinic was conducted in all four selected schools where students were examined using mirror probe

and WHO periodontal probe under adequate lighting. The survey tools consisted of three forms; form 1 – oral health survey/assessment form for children modified from the WHO Oral Health Survey Basic Methods 5th Edition (Appendix 2), form 2 - Interview questionnaire on study population characteristics and oral health practices modified from WHO Appendix 8 and form 3 – Interview questionnaire adopted and modified from Chhabra *et. al* (2012) assessing the knowledge, attitudes and behavior among the parents/caregivers (Appendix 3).

Questionnaires were administered after pretesting by trained data collectors. The pupil questionnaires were administered just before clinical examination. Questionnaires were administered within 15 minutes per participant. Self-assessment questionnaires were completed by interview because some participants were unable to read and write. Questions were translated into local languages for better understanding of study participants.

3.3 Study Area

The Lower Manya Kobo Municipal District (Figure 3-1) is one of the 26 administrative districts in the Eastern Region of Ghana with Odumase-Krobo as its capital. The traditional area is made up of six divisions with the head known as the Konor. The main festival, the Ngmayem is celebrated in every last of week of October every year. The population are predominantly

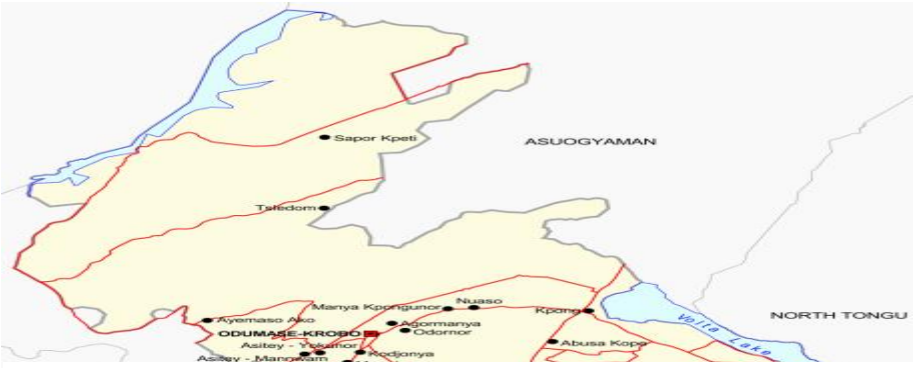


Figure 3-1 Map of Lower Manya Krobo Municipality

Krobos, Ewes and Akans with Hausas and others. A mixture of cultures and religion are also present of which majority are Christians, some Muslims and Traditionalists. The economic activities are subsistence farming and trading. Thirty-one percent of the population are under fifteen years of age (Ghana Statistical Service, 2010).

Table 3-1 Educational Circuits in Lower Manya Krobo

Circuits	Number Of Schools
Odumase A	7
Odumase B	7
Agormanya	9
Manyakpongunor	9
Kpong	8
Akuse	6
Middle Belt East	7
Middle Belt West	7

3.4 Study Population

Table 3-2 Enrolment of Pupils in Public Schools by Levels

Public School Level	Male	Female	Total
Kindergarten (Kg)	1140	1078	**2218**
Primary School	4815	4867	**9682**
Junior High School	2488	2492	**4980**
Grand Total	**8443**	**8437**	**16880**

Table 3-3 Enrolment in Private Schools by Levels

Private School Level	Male	Female	Total
Kindergarten (Kg)	1581	1519	**3100**
Primary	3723	4293	**8016**

Junior High School	1110	1256	**2366**
Grand Total	**6414**	**7068**	**13482**

The study involved school pupils from Kindergarten to Junior High School who are residents in the Lower Manya Krobo Municipality and parents/caregivers. The study included two of the WHO index ages 5 year olds and 12 year olds.

3.5 Study Unit

The study unit was any school pupil, male or female living in the Lower Manya Krobo Municipality and primary or junior high of any of the four selected schools in the municipality.

3.6 Sample size

The total population of basic school children in Lower Manya Krobo Municipality estimated at 30,362 was obtained from the Municipal Education Directorate. Previous studies in Ghana show high prevalence of periodontal disease. A study conducted among school children in Ho Municipality showed calculus prevalence to be 79.6 % (Tuosie Beni, 2009) and this was used in determining the sample size based on Cochran' Formula ((Pourhoseingholi, Vahedi and Rahimzadeh, 2013). Providing for an allowance of 5% for error, at 95% confidence level the sample size was calculated as shown.

$$n = \frac{Z^2 \times pq}{e^2}$$

where

i. n is sample size

ii. p is the prevalence of oral disease prevalence in Ho (79.6%) (Tuosei Beni, 2009)

iii. q = 1 – 0.796 = 0.204

iv. z is the score at 95% confidence interval = 1.96

v. e is the margin of error (5%)

Hence,

$$= \frac{(1.96)^2 \times (0.796 \times 0.204)}{(0.05)^2} = 250$$

Non response rate of 20% of the projected sample size was computed (250 x 20% = 50) and added to the figure, thereby bringing the total sample size to 300.

3.6.1 Sample size calculations for the schools:

A proportion based calculation was used to derive the number of study participants in the four (4) schools selected for the research.

This was given by;

$$Participants/school = \frac{\text{School Population}}{\text{Circuit Population}} \times \text{Study Sample Size}$$

Table 3-4 Circuit and School Population

School	Circuit Population	School Population	Sample Size
Middle Belt West			
Oborpa M/A School	1068	347	**98**
Odumase A			
Samer Royal School	3147	501	**48**
Kpong			
Our Lady of Fatima	3010	827	**82**

Kpong R/C School		726	**72**
Grand Total	**7225**	**2401**	**300**

3.6.2 Inclusion criteria

- Children attending basic school in Lower Manya Krobo.
- Parents/guardians and children living in Lower Manya Krobo in the last one year.
- Schools with classes from kindergarten to junior high school.
- Schools that have been in existence within the municipality for at least one year.

3.7 Study variables

3.7.1 Clinical Assessment

i. Dental Caries: refers to the presence of a cavity on any of the five surfaces (occlusal, medial, distal, buccal, lingual/palatal) of a tooth and can be detected by the use of a dental probe.

ii. Periodontal Disease: refers to the presence of calculus (calcified deposits) on the index teeth and the presence of bleeding gums on probing.

iii. Enamel fluorosis: is a common disorder, characterized by hypo-mineralization of tooth enamel caused by ingestion of excessive fluoride.

iv. Oral mucosal lesion: is any lesion that occurs on the mucous membrane of the oral cavity.

v. Dental erosion: is the loss or wear of dental hard tissue by acids (from especially drinks) not caused by bacteria.

vi. Dental trauma: is injury to the teeth, gums, and jawbones.

3.7.2 Risk Factor Assessment

i. Use of oral health services

ii. Knowledge, attitude and behavior towards oral health

iii. Exposure to fluoride: use of fluoride toothpaste

iv. Modifiable risk factors such as diet: consumption of sugary food

3.8 Questionnaire and scoring criteria

The adult questionnaire included 47 items for the evaluation of the oral health knowledge, attitude and behavior of parents (Appendix 3).

3.8.1 Oral health knowledge

- This included 19 questions on the basic knowledge of oral health and purpose of maintaining oral health. Questions were in the form of multiple choice questions and parents were asked to select the correct response. A point was given for each correctly answered question and no score was given for wrong answers and “don’t know” answers. Three knowledge score categories were created, excellent (15+), good (10-14) and poor (0-9) scores.

3.8.2 Attitude towards oral health

The use of 8 questions to assess attitude of parents based on their view on maintenance of oral health was performed. Questions were yes/no type questions. Scoring was done by awarding one point for a positive attitude and no mark for negative attitude. Two attitude score categories were created; poor (0-3) and good (4-7) scores.

3.8.3 Behaviour or practices of parents and their children towards oral health maintenance

This comprised 12 questions which covered basic measures carried out by parents to ensure good oral health practices and maintenance of oral health. Questions were both multiple choice and yes/no type question. Each correct answer was scored one and for the yes/no questions, the score of one given for questions with correct answers.

3.8.4 Pupil questionnaire

This included 13 questions. Questions gathered information on demographic characteristics, self-assessment of status of teeth and gum, professional dental care, oral hygiene and fluoride use.

3.9 Sampling method

There are 8 Education Circuits in Lower Manya; 6 urban and 2 rural circuits namely Odumase A, Odumase B, Agormanya, Manyakpongunor, Kpong, Akuse, Middle Belt East and Middle Belt West. A multistage random selection method was employed. Circuits were clustered into rural and urban groups. The circuits were numbered on pieces of paper, one educational circuit was randomly selected from each cluster and used in the study by paper balloting. That is, the assigned numbers were written on pieces of paper, folded and then accordingly picked at random without replacement. The two educational circuits selected were Kpong and Middle Belt West. There were a total of 60 public and 90 private schools respectively in the municipality. The list of schools from the two selected circuits was obtained and assigned numbers and four schools randomly selected by paper balloting. Two schools, which satisfy the

inclusion criteria, were randomly chosen from each cluster. One public school and one private school were selected from each of the two circuits. The selected rural circuit (middle belt east) had no private school that fulfilled the inclusion criteria hence a school in the neighbouring circuit with similar characteristics Odumase A, was selected. At each of the four schools, based on the sample size calculations, three to five pupils were purposefully selected from each class, starting from kindergarten to JHS. The selected pupils were examined for oral diseases and interviewed. Adult questionnaires were administered to parents/caregivers of the selected school children. All children in the selected schools had an equal opportunity to participate in the study.

3.10 Oral Examination

Instruments for oral examination included the following:

i. Plane mouth mirror
ii. WHO CPI (Community Periodontal Index) periodontal probes
iii. Adequate lighting

Adequate infection control was obtained by using high-level disinfection solution of sodium hypochlorite. The oral cavities were examined with the aid of dental instruments and the use of personal protective equipment. This reduced the risk of cross infection. Single use disposable face masks and gloves were also used by all examiners (dentists) whilst examining the children. Containers were provided for used or contaminated instruments.

3.10.1 Pretesting

Pretesting of the questionnaire was done among 10 conveniently sampled school pupils from Agormanya R/C Primary and Junior High School and 10 adults who did not form part of the final sample for the study. All errors and ambiguities identified were corrected to ensure clarity of questions.

3.11 Data Handling

Data collected from the participants was double entered into Microsoft Excel 2016 and cleaned to ensure consistency and eliminate errors. Field supervisors checked all the forms manually to ensure correct pairing of child's questionnaire and parent/caregivers questionnaire as well as for completeness and consistency. Errors were resolved by reference to the original questionnaires/form. Filled questionnaires were kept in sealed envelopes. The cleaned data was imported into STATA for analysis.

3.12 Data Analysis

Data was analysed using STATA Statistical software package (*StataCorp.2007. Stata Statistical Software. Release 14*. StataCorp LP, College Station, TX, USA). Descriptive statistics was generated by conducting univariate analysis of selected variables. Prevalence of oral diseases were calculated using the recommended indices DMFTs and CPITN. Bivariate analyses (Chi square) was used to test the association/relationship between the prevalence of oral diseases and socio-demographic characteristics, knowledge, attitude and behaviors among the school pupils and their caregivers.

3.13 Ethical Considerations

Ethical approval was obtained from the Ensign College of Public Health's Institutional Review Committee. Permission was also obtained from the Municipal Education Directorate of the Ghana Education Service and from Head teachers of the selected schools. Interviewers were trained. The purpose and process of the survey was described to the pupils and caregivers before the examination. Verbal consent was obtained from the school pupils selected for the study. Informed Consent was also obtained from adults who participated in the study. Pupils who were within the study population who were willing to take part in the survey were included. Selected pupils and parents who no longer wished to participate in the study were allowed to withdraw. Pupils who were found in need of dental treatment were referred to the Atua Government Hospital. Data was collected anonymously using identification numbers to ensure accurate pairing/matching. All the participants were assured of anonymity and confidentiality.

3.14 Reliability and validity of data

Training and calibration of examiners was done to ensure that there was close agreement between the results obtained from the population by the different examiners to reduce variability. To correct for variation, duplicate examination was performed on 10% of the samples at the beginning of data collection. Clinicians took 5 minutes break after examining 10 children to reduce fatigue Intra interviewer and inter-interviewer variability was reduced by training interviewers to ask questions using the same phrases in a consistent manner and recoding exactly what the interviewee said.

3.15 Limitations

- Some pupils who may be siblings with the same caregiver could duplicate answers to the questionnaires.

- Caregivers may not give factual answers because of social desirability or conformity.
- Given that the study was cross-sectional, it may have missed the capture of some pupils who were exposed to oral health diseases.
- The use of only daylight without the aid of radiographs during the oral examination could have resulted in an underestimation of dental caries.
- The size of the sample will not allow the generalization of the study findings to a much larger population.

3.16 Assumptions

- It was assumed that oral disease prevalence would be high among the school children.
- Oral health is not prioritized by people living in Lower Manya Krobo municipality.
- Knowledge and attitude towards oral health was also expected to be low.

CHAPTER FOUR

4 RESULTS

4.1 Introduction

This chapter presents the results from the analysis of various variables for the study for the purpose of achieving the objectives of the study and providing answers to the research questions. The aim of this study was to assess the prevalence of oral disease in basic school pupils in the Lower Manya Krobo Municipality, with specific objectives to explore the knowledge attitudes and practices of basic school pupils and their parents/guardians affecting the oral health of the pupils. In addition, the study sought to explore the possibility of association between oral health status and sociodemographic factors.

4.2 General Descriptive Statistics and Data Summaries

Table 4-1 Demographic Characteristics of School Pupils

Demographic Characteristics of Pupils	**Frequency**		**Total Pupils N (%)**
	Urban School N (%)	**Rural School N(%)**	
Gender			
Male	66 (22.00)	67 (22.33)	133 (44.33)
Female	88 (29.33)	79 (26.34)	167 (55.67)
Total	**154 (51.33)**	**146 (48.67)**	**300 (100%)**
Age Group			
4-9years	52 (33.77)	61 (41.78)	113 (37.67)
10-15years	88 (57.14)	70 (47.95)	158 (52.67)
15+Years	14 (9.09)	15 (10.27)	29 (9.67)
Total	**154 (51.33)**	**146(48.67)**	**300(100%)**
Mean Age = 10.78		**Standard Deviation= 3.58**	

From Table 4.1, a total number of 300 school pupils between the ages of 4 years and 20 years with the mean age as 10.78 years and standard deviation of ± 3.58 years made up the study population. School pupils belonging to the age group 10-15 years constituted the greatest percentage (52.67%) of the sample. One hundred and fifty-four (51.33%) urban and one hundred and forty-six (48.67%) rural school pupils were examined. Males constituted 44.33% and females 55.67% of the study population.

Figure 4-1 shows that females were the most represented in three of the four schools. About

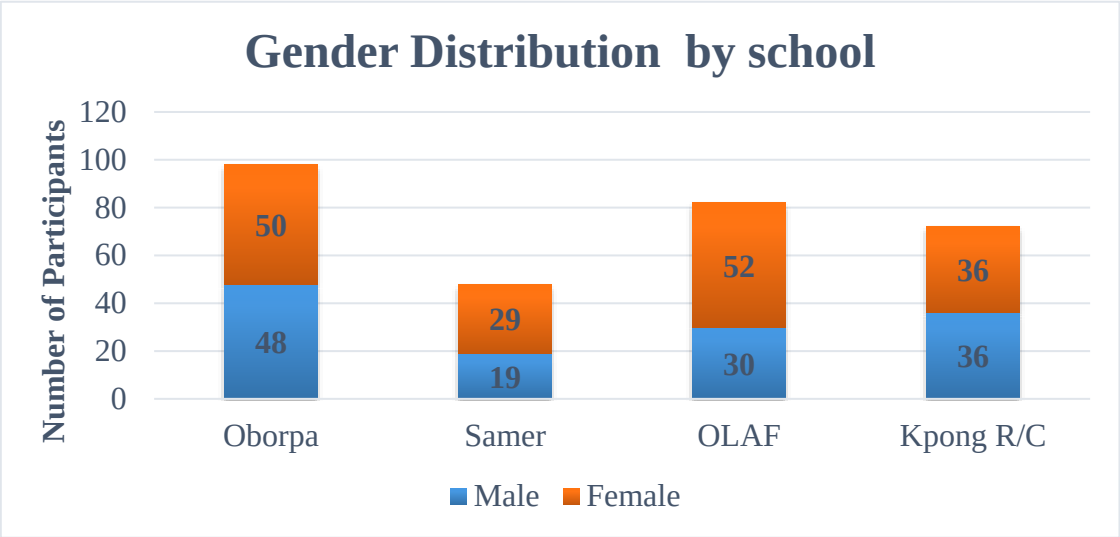


Figure 4-1 Gender Distribution of pupils

167 were females constituting 55.67 percent of the study sample.

Table 4-2 Demographics Characteristics of Caregivers

Caregiver Demographics	Frequency (%)		Total
	Urban (N 114)	Rural (N = 113)	
Male	54 (23.79)	50 (22.03)	104 (45.82)
Female	60 (26.43)	63 (27.75)	123 (54.18)
Total	**114 (50.22)**	**113 (49.78)**	**227**
18 – 40 Years	57 (25.11)	62 (27.31)	119 (52.42)
41 – 60 Years	52(22.91)	46 (20.26)	98 (43.17)
61 – 75 Years	5 (2.20)	5 (2.20))	10 (4.41)
Total	**114**	**113**	**227**

Single	25 (11.01)	27 (11.89)	52 (22.91)
Married	74 (32.60)	75(37.44)	149 (65.64)
Co-Habiting	2 (0.88)	1 (0.44)	3 (1.32)
Widow	7 (3.08)	6 (2.64)	13 (5.73)
Divorced	6 (2.64)	4 (1.76)	10 (4.41)
Total	**114**	**113**	**227**
Ga-Adangme	30 (13.22)	102 (44.93)	132 (58.93)
Akan	13 (5.73)	2 (0.88)	15 (6.61)
Ewe	66 (29.07)	6 (2.64)	72 (31.72)
Other	5 (2.20)	3 (1.32)	8 (3.52)
Total	**114**	**113**	**227**
No Formal Education	5 (2.20)	9 (3.96)	14 (6.16)
Primary	14 (6.17)	18 (7.93)	32 (14.10)
Junior High	31 (13.66)	39 (17.18)	70 (30.84)
Senior High	31 (13.66)	32 (14.10)	63 (27.75)
Tertiary	33 (14.54)	15 (6.61)	48 (21.15)
Total	**114**	**113**	**227**
Unemployed	4 (1.76)	2 (0.88)	6 (2.64)
Self Employed	79 (34.80)	98 (43.17)	175 (77.09)
Private Employment	20 (8.81)	8 (3.52)	28 (12.33)
Government	11 (4.85)	5 (2.20)	16 (7.05)
Total	**114**	**113**	**227**
Mother	40 (17.62)	55 (24.23)	95 (41.85)
Father	40 (17.62)	40 (17.62)	80 (35.24)
Guardian	23 (10.13)	17 (7.49)	40 (17.62)
Other	11 (4.85)	1 (0.44)	12 (5.29)
Total	**114**	**113**	**227**

As detailed in Table 4-2, two hundred and twenty-seven (227) caregivers were effectively sampled out of three hundred (300). This gave a response rate of 75.67%. Caregivers included adults who were either mother, father, guardian or other relation. Majority of caregiver respondents were female, 54.19%. The predominant ethnic group was Ga-Adangme which constituted 58.15% of the respondents. Majority of caregivers were married (65.64%). Most caregivers had secondary school level education or below, 6.17% had no formal education. The dominant occupation was through self- employment with most respondents involved in trading activities.

4.3 Descriptive Statistics for Dental Caries

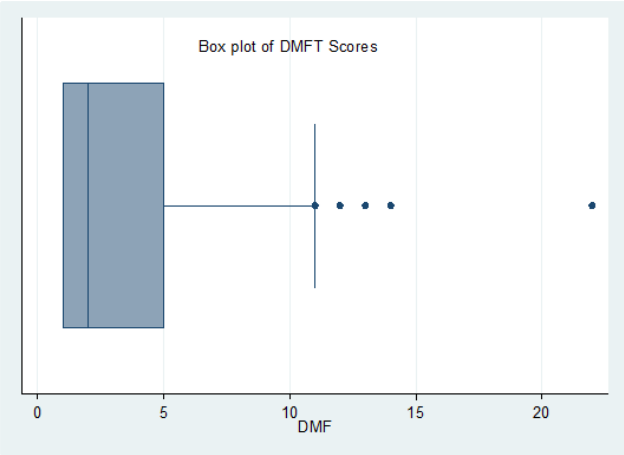


Figure 4-3 Box Plot of DMFT Scores

From Figure 4-2, the mean DMFT of the study population was 1.05 (±2.68). The minimum and maximum DMFT recorded were 0 and 22 respectively with the majority between 0 and 5. Decayed teeth was the only observed component of the DMFT index. Approximately 73.33% of school pupils were caries free.

Table 4-3 DMFT Distribution by Gender

Variable	DMFT Scores (Frequency)																Total
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	22	DMFT>0
Gender																	
Male	94	11	11	6	2	2	1	0	1	1	0	0	1	2	1	0	39
Female	126	13	8	4	4	0	3	2	1	0	3	2	0	0	0	1	41
Total	**220**	**24**	**19**	**10**	**6**	**2**	**4**	**2**	**2**	**1**	**3**	**2**	**1**	**2**	**1**	**1**	**80**
Mean DMFT = 1.05									**Standard Deviation = 2.68**								

Table 4-3. There were 80 school pupils with caries (DMFT > 0) indicating a caries prevalence of 26.67%. Females had a slightly higher caries prevalence, 41 pupils, than the males 39.

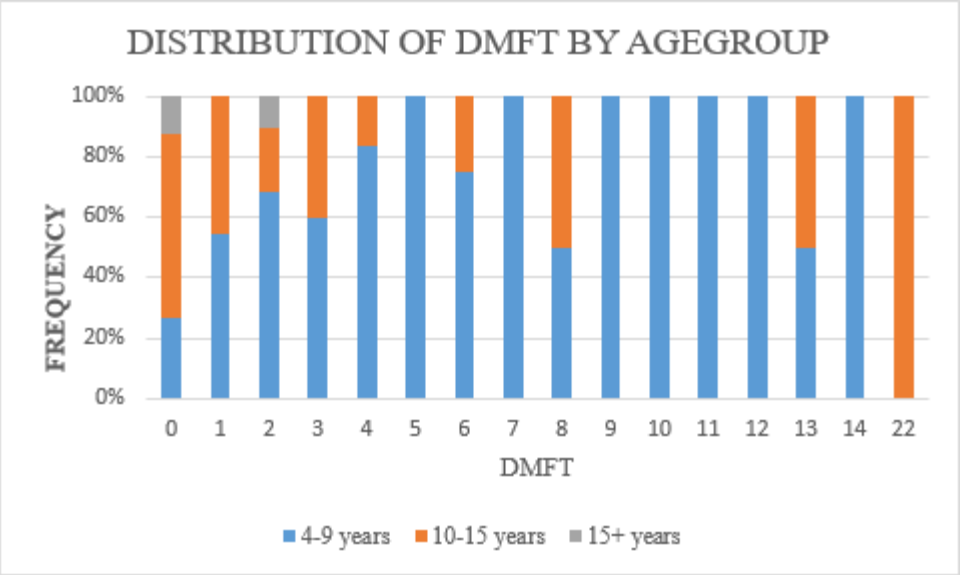


Figure 4-4 DMFT by Age Group

Figure 4-3 illustrated caries distribution among the age groups. Pupils belonging to 4-9 years age group recorded the most caries prevalence with DMFT score ranging between 0 and 14. The highest DMFT recorded was 22 in the 10-15year age group. The oldest age group tend to have DMFT score of 0.

Table 4-4 DMFT score in Primary and Permanent Teeth

Type of Teeth	Pupils with Caries	Mean DMFT	Minimum teeth affected	Maximum teeth affected
Primary teeth	46	2.80 ± 2.33	1	11
Permanent teeth	27	4.40 ± 4.92	1	22
Both sets of teeth	7	9.57± 3.87	3	14

Seven children had dental caries in both the primary and permanent dentition (Table 4-4) and they had the highest mean DMFT. Pupils with primary teeth were the most affected. Mean DMFT of pupils with primary teeth was found to be 2.80 (standard deviation 2.33) Mean DMFT in permanent teeth was 4.40 (standard deviation 4.92).

4.4 Periodontal Indices

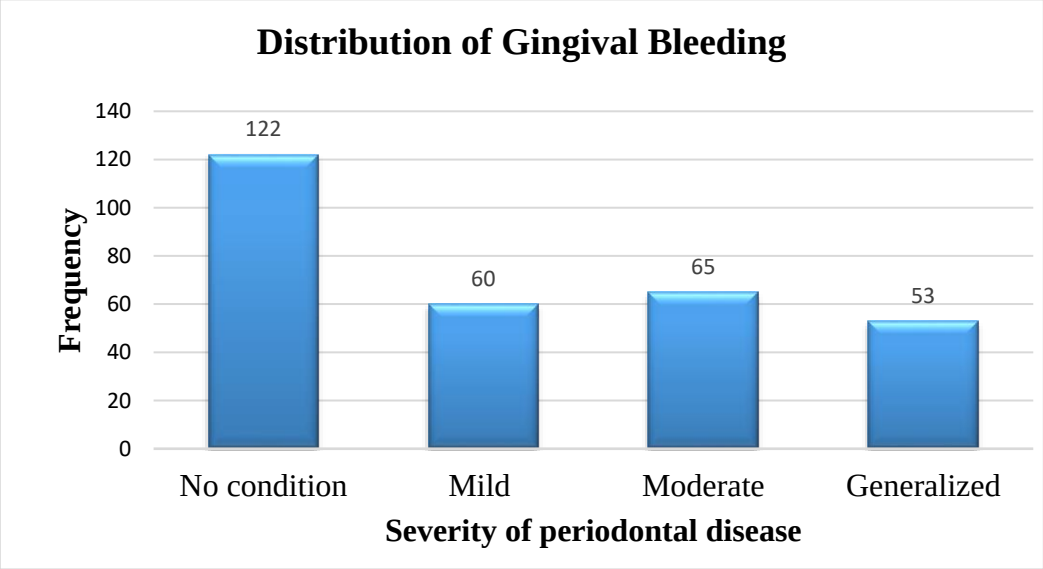


Figure 4-5 Distribution of Gingival Bleeding Among the School Pupils

Figure 4-5 showed that 122 pupils did not have any obvious gingival bleeding whilst the rest had different degrees of gingiva bleeding. Severe bleeding was identified in fifty-three pupils.

Table 4-5 DMFT Score and Gingival Bleeding

	DMFT															
PERIODONTAL	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**22**
No bleeding	81	8	9	5	5	2	2	2	1	0	1	2	1	2	1	0
Mild	45	6	4	3	0	0	1	0	0	0	1	0	0	0	0	0
Moderate	50	4	3	2	1	0	1	0	1	1	1	0	0	0	0	1
Generalized	44	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**220**	**24**	**19**	**10**	**6**	**2**	**4**	**2**	**2**	**1**	**3**	**2**	**1**	**2**	**1**	**1**

Table 4-5 showed that 81 children had neither gingival bleeding nor dental caries. Pupils with higher numbers of decayed teeth, tended to have fewer incidence of gingival bleeding.

4.5 Oral Mucosal Lesion of Pupils

Table 4-6 Prevalence of Oral Mucosal Lesions

Mucosa Lesions	Freq.	Percent	Cum. Freq.
Normal condition	294	98	98
Abscess	2	0.67	98.67
other condition	4	1.33	100
Total	**300**	**100**	

Finding of oral mucosal lesions was uncommon. Only 6 children had this condition, two of which was a medical emergency.

4.6 Fluorosis in Pupils

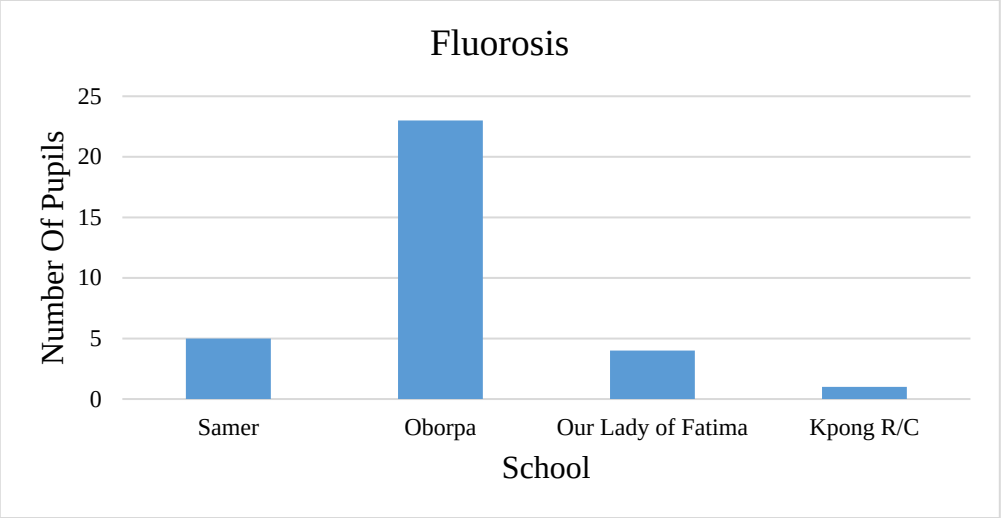


Figure 4-6 Fluorosis Prevalence by School

Oborpa school recorded the highest prevalence of fluorosis among the study sample as shown in Figure 4-5.

4.7 Intervention Urgency amongst Pupils

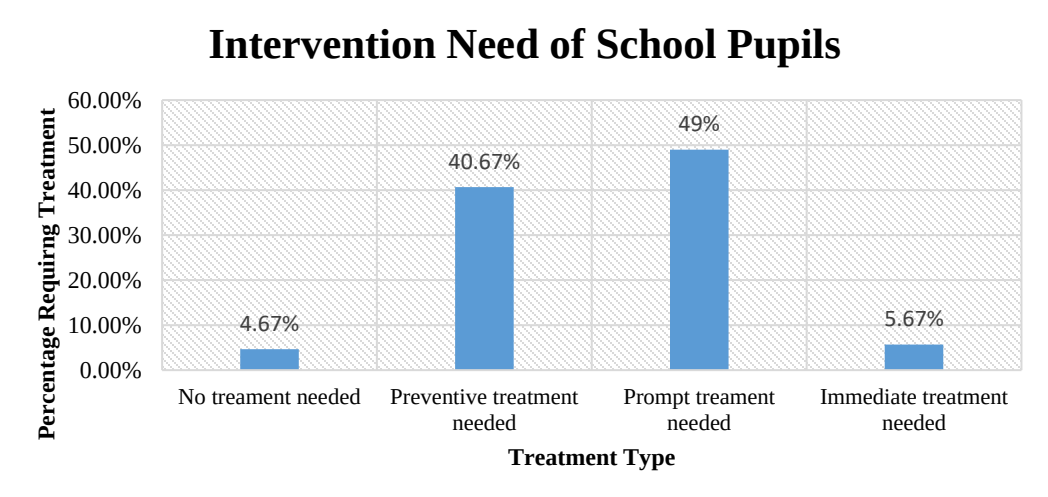


Figure 4-7 Invention need of Pupils

Figure 4-6. Most of the pupils needed professional intervention. Only 4.6% did not need any intervention whilst 5.67% needed immediate treatment.

4.8 Summary Oral Conditions amongst Pupils

The most prevalent oral condition was gingival bleeding occurring in 59.3% of pupils. Dental

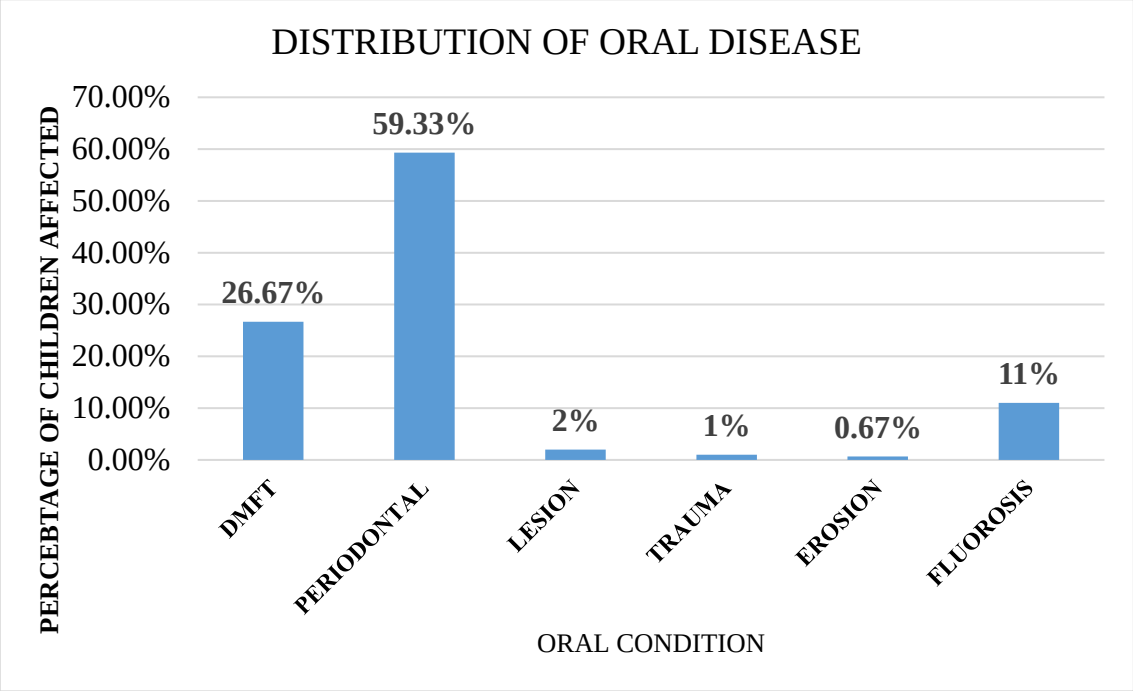


Figure 4-8 Summary of Oral Conditions

erosion occurred the least, affecting 0.67% of the sample population. Oral mucosal lesions were 2% and 11% respectively.

4.9 Descriptive Statistics for the Perception and Behavioural Patterns of Basic School Pupils Concerning Oral Health

Table 4-7 Frequency of Perception and Behaviour of School Pupils

Variable	Samer	Oborpa	OLAF	Kpong R/C	Total N(%)
Perception about health of teeth					
Excellent	15	23	26	18	82 (27.33)
Very Good	9	37	19	23	88 (29.33)
Good	10	27	19	24	80 (26.67)
Average	10	7	5	3	25 (8.33)
Poor	1	4	4	3	12 (4.00)
Very poor	2	0	2	1	5 (1.67)
Don't know	1	0	7	0	8 (2.67)
Total	**48**	**98**	**82**	**72**	**300 (100)**
Perception about health of gums					

Excellent	17	23	30	21	91 (30.33)
Very Good	6	42	14	23	85 (28.33)
Good	10	23	20	22	75 (25.00)
Average	13	8	5	3	29 (9.67)
Poor	0	2	4	2	8 (2.67)
Very poor	1	0	1	0	2 (0.67)
Don't know	1	0	8	1	10 (3.33)
Total	**48**	**98**	**82**	**72**	**300 (100)**
Toothache or discomfort from teeth within the last 12 months					
Often	5	11	15	3	34 (11.33)
Occasionally	22	8	11	1	42 (14.00)
Rarely	0	4	16	10	30 (10.00)
Never	20	75	37	54	186 (62.00)
Don't know	1	0	3	4	8 (2.67)
Total	**48**	**98**	**82**	**72**	**300 (100)**
Visit to the dentist within the past 12 months					
Once	6	3	11	0	20 (6.67)
Twice	0	0	2	1	3 (1.00)
Three times	0	0	1	1	2 (0.67)
Four times	0	0	2	0	2 (0.67)
More than four times	0	0	1	1	2 (0.67)
No visit	8	6	65	56	135 (45.00)
Never visited	33	86	0	12	131 (43.67)
Don't know	1	3	0	1	5 (1.67)
Total	**48**	**98**	**82**	**72**	**300 (100)**
Reason for last dental visit					
Pain with teeth/gum	2	3	9	1	15 (5.00)
Treatment	2	0	0	0	2 (0.67)
Check up	3	0	6	1	10 (3.33)
Don't know	0	9	1	0	10 (3.33)
Total	**48**	**98**	**82**	**72**	**300 (100)**
Frequency of cleaning teeth					
Several times a month	0	0	1	2	3 (1.00)
Several times a week	0	1	0	1	2 (0.67)
Once a day	32	58	34	30	154 (51.33)
Two or more times a day	16	39	47	39	141 (47.00)
Total	**48**	**98**	**82**	**72**	**300 (100)**

Table 4-7 shows the following: Most of the school pupils described their teeth and gum as good (26.67%), very good (29.33%) or excellent (27.33%) whilst 11.33% of respondents reported experiencing toothache often in the last12 months. About 45% of the respondents had not visited the dentist in the last 12 months whilst 43.67% had never visited the dentist. Only 5% had visited the dentist in the past 12 months mainly because of pain with the teeth and gum.

Approximately 47% of the study sample brushed their teeth at least twice daily; 1 % reported brushing of teeth less than once daily.

Table 4-8 Oral Hygiene Aide Use

Variable	Frequency (N)	Percentage (%)
Do You Use Toothbrush To Clean Your Teeth Or Gum		
Yes	300	100.00
No	0	0.00
Total	**300**	**100**
Do You Use Wooden Toothpick To Clean Your Teeth Or Gum		
Yes	54	18.00
No	246	82.00
Total	**300**	**100**
Do You Use Wooden/Plastic Toothpick To Clean Your Teeth Or Gum		
Yes	61	20.33
No	239	79.67
Total	**300**	**100**
Do You Use Dental Floss/Thread to Clean Your Teeth or Gum		
Yes	5	1.67
No	295	98.33
Total	**300**	**100**
Do You Use Charcoal to Clean Your Teeth or Gum		
Yes	26	8.67
No	274	91.33
Total	**300**	**100**
Do You Use Chewing Stick to Clean Your Teeth or Gum		
Yes	84	28.00
No	216	72.00
Total	**300**	**100**
Do You Use Other Objects to Clean Your Teeth or Gum		
Yes	21	7.00
No	279	93.00
Total	**300**	**100**
Do You Use Toothpaste to Clean Your Teeth		
Yes	298	99.33
No	2	0.67
Total	**300**	**100**
Do You Use Toothpaste That Contain Fluoride		
Yes	277	92.33
No	4	1.33
Don’t Know	19	6.33

Total	**300**	**100**

Table 4-8: All 300 pupils reported using a toothbrush. Approximately ninety-nine percent use toothpaste to clean their teeth and 28% use chewing stick. All other oral hygiene aides were infrequently used by the pupils.

Table 4-9 Reduced Quality of Life Due to Condition of Teeth and Gums

Variable	Frequency	Percentage (%)
I Am Not Satisfied With Appearance Of My Teeth		
Yes	84	28.00
No	209	69.67
Don't Know	7	2.33
Total	**300**	**100**
I Often Avoid Smiling And Laughing Because Of My Teeth		
Yes	22	7.33
No	276	92.00
Don't Know	2	0.67
Total	**300**	**100**
Other Children Make Fun Of My Teeth		
Yes	29	9.67
No	267	89.00
Don't Know	4	1.33
Total	**300**	**100**
Toothache/Discomfort Caused Missed Class/School For Days		
Yes	19	6.33
No	278	92.67
Don't Know	3	1.00
Total	**300**	**100**
I Have Difficulty Biting Hard Foods		
Yes	91	30.33
No	208	69.33
Don't Know	1	0.33
Total	**300**	**100**
I Have Difficulty in Chewing		
Yes	47	15.67
No	252	84.00
Don't Know	1	0.33
Total	**300**	**100**

Table 4-9: Generally, school pupils were satisfied with their teeth and ability to smile confidently. Approximately 9.67% had suffered teasing due to their teeth whilst 6.33% had discomfort in their teeth. About 30% of the population had difficulty biting hard food and 6.3% of the school pupils missed school because of toothache or discomfort with the teeth.

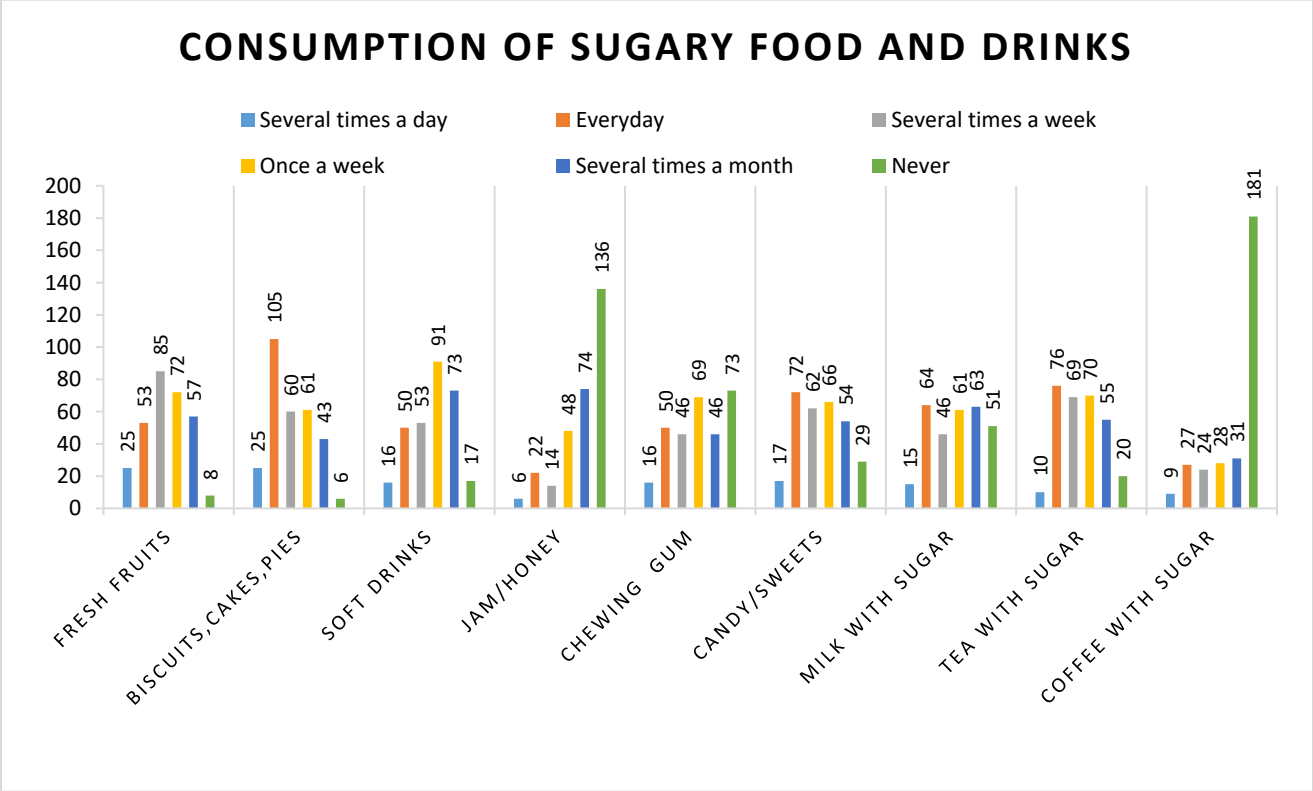


Figure 4-9 Graph of Sugary Food Consumption Pattern

Figure 4-8. Fresh fruits were consumed most frequently several times a week. Coffee and jam were rarely consumed whilst a large proportion of the school pupils took biscuits every day.

Table 4-10 Periodontal Disease Prevalence Against Teeth Brushing Frequency

	Teeth Cleaning Frequency	

Periodontal Disease	Several times a month	Several times a week	Once a day	Two or more times a day	Total
Healthy Gum	1	1	62	58	**122**
Bleeding gum	2	1	92	83	**178**
Total	**3**	**2**	**154**	**141**	**300**

Among the pupils with bleeding gum, 92 brush their teeth once a day and 83 pupils brush two or more times a day. About 65 (81.25%) of the pupils with caries and 178 (80.34%) of pupils with periodontal disease described the health of their teeth and gums as excellent, very good or good. Approximately 39% of children with caries claimed they did not have any pain or discomfort in their teeth. Only 10% (8) and 9.6% (17) of pupils infected with caries and gingival bleeding visited the dentist.

4.10 Caregiver Knowledge, Attitude and Behaviour

Table 4-11 Caregivers' Knowledge, Attitude and Behaviour

Variable	Frequency				
	Samer	**Oborpa**	**OLAF**	**Kpong R/C**	**Total**
Knowledge on oral health					
Poor	10 (21.28)	16 (24.24)	6 (12.77)	20 (29.85)	52 (22.91)
Good	31 (65.96)	45 (68.19)	30 (63.83)	45 (67.16)	151 (66.52)
Excellent	6 (12.77)	5 (7.58)	11 (23.40)	2 (2.99)	24 (10.57)
Total	**47 (100)**	**66 (100)**	**47 (100)**	**67 (100)**	**227 (100)**
Attitude towards oral health					
Poor	2 (4.26)	13 (19.70)	3 (6.38)	11 (16.42)	29 (12.78)
Good	45 (95.74)	53 (80.30)	44 (93.62)	56 (83.58)	198 (87.22)
Total	**47 (100)**	**66 (100)**	**47 (100)**	**67 (100)**	**227 (100)**
Behaviour towards oral health					
Poor	3 (6.38)	3 (4.55)	1 (2.13)	4 (5.97)	11 (4.85)
Average	40 (85.11)	60 (90.91)	40 (85.11)	57 (85.07)	197(86.78)
Good	4 (8.51)	3 (4.55)	6 (12.77)	6 (8.96)	19 (8.37)
Total	**47 (100)**	**66 (100)**	**47 (100)**	**67 (100)**	**227 (100)**

Table 4-11: Oral health behaviour among the guardians was average (Scored between 40-70%). Majority (66.52%) had good knowledge (scored >70%) of oral health. Also, their attitude

towards oral health was good. Classification of parents' knowledge, attitude and behaviour into the groups was adopted and modified from Shabeer Ahamed *et al.*, (2015).

Table 4-12 Reason Why Frequent Dental Visit Is Not Important

Reason	Frequency	Percentage
Fear	4	11.74
High Cost	16	47.06
Difficult Access	4	11.74
Lack Of Time	2	5.88
No Specific Reason	8	23.53

Most caregivers who did not believe frequent visit to the dentist was important gave high cost as the main reason for this.

Table 4-13 Caregivers' Knowledge On Oral Health

Variable	**Frequency**	**Percentage**
Does frequent exposure to sticky food affect dental health		
Yes	206	90.75
No	21	9.25
Total	**227**	**100**
What happens when you chew sticky food		
Holes in teeth	170	74.89
Calcium deficiency	16	7.05
Bleeding gum	33	14.54
Don't know	8	3.52
Total	**227**	**100**
Can crooked teeth be straightened		
Yes	88	38.77
No	139	61.23
Total	**227**	**100**
What causes dental caries		
Lack of calcium	41	18.06
Bacteria	123	54.19
Lack of vitamin C	13	5.73
Don't know	50	22.03
Total	**227**	**100**
Does NHIS cater for dental services		
Yes	94	41.41

No	133	58.59
Total	**227**	**100**
Is fluoride Important		
Yes	217	72.33
No	10	3.33

Most of the caregivers (90.75%) agreed that frequent exposure to sticky food affects dental health, although a lesser proportion (74.89%) understand what happens sticky foods get stuck in the teeth. Few caregivers knew crooked teeth can be straightened (38.77%). Majority (58.59%) were not/ aware of NHIS covering dental services.

Majority of parents (72.33%) acknowledged that fluoride is important for good dental health and majority of the school pupils (92.33%) use fluoride toothpaste.

Table 4-14 Caregivers Attitude Towards Oral Health

Variable	**Frequency (%)**
Is Visit to Dentist Important	
Yes	192 (84.58)
No	35 (15.42)
Total	**227 (100)**
Why Not	
None	192 (84.58)
Fear	4 (1.76)
High cost	16 (7.05)
Difficulty in access	4 (1.76)
Lack of time	2 (0.88)
No specific reason	4 (1.76)
Other reason	5 (1.67)
Total	**227 (100)**
Is Dental Visit A Waste Of Time	
Yes	38 (16.74)
No	189 (83.26)
Total	**227 (100)**
Is Tobacco Chewing Bad	
Yes	211 (92.95)
No	16 (7.05)
Total	**227 (100)**
Smoking Is Unhealthy	
Yes	218 (96.04)
No	9 (3.96)

Total	**227 (100)**
Bristle Brush Not Good For Teeth	
Yes	190 (83.70)
No	37 (16.30)
Total	**227 (100)**
Immediate Missing Teeth Replacement Is Good	
Yes	161 (70.93)
No	66 (29.07)
Total	**227 (100)**
Dental Visit Important For Treatment And Not Prevention	
Yes	134 (59.03)
No	93 (40.97)
Total	**227 (100)**

Most (84.58%) caregivers believe regular dental visit is important. Majority of the caregivers reported that dental visit was important for treatment and not prevention of dental disease. Caregivers agreed that smoking was unhealthy.

Table 4-15 Caregivers' Behaviour Towards Oral Health

Variable	**Frequency (%)**
Teeth brushing Frequency	
Once	56 (24.67)
Twice	165 (72.69)
More than two times	5 (2.20)
Occasionally	1 (0.44)
Total	**227 (100)**
Role Played In Teeth Cleaning Of Child	
Observe and guide	177 (77.97)
Advise but not monitor	38 (16.74)
I am not involved	12 (5.29)
Total	**227 (100)**
Tobacco Smoking	
Yes	7 (3.08)
No	220 (96.92)
Total	**227 (100)**
Visited Dentist Before	
Yes	83 (36.56)
No	144 (63.44)
Total	**227 (100)**
Reason for Visit	
No reason	144 (63.44)
For treatment	40 (17.62)

For check up	40 (17.62)
Other reason	3 (1.32)
Total	**227 (100)**
Frequency of Child's Dental Visit	
Regularly	18 (7.93)
With problem	84 (37.00)
Never	125 (55.07)
Total	**227 (100)**
External Influence on Dental Care Decision	
Yes	90 (39.65)
No	137 (60.35)
Total	**227 (100)**
Influencer	
Spouse	19 (8.37)
Family/Friend	41 (18.06)
Healthcare provider	30 (13.22)
None	137 (60.35)
Total	**227 (100)**
Oral Care Knowledge	
Home	149 (65.64)
School	74 (32.60)
Other	4 (1.76)

Table 4-15: Most caregivers reported their wards cleaned their teeth twice daily (72.69%) and they mostly observed and guided the child. Majority (63.4%) of caregivers who do not visit the dentist for professional care say they have no reason and those who visited went for check- up or treatment purposes. About 55.07% had never taken their children to see a dentist.

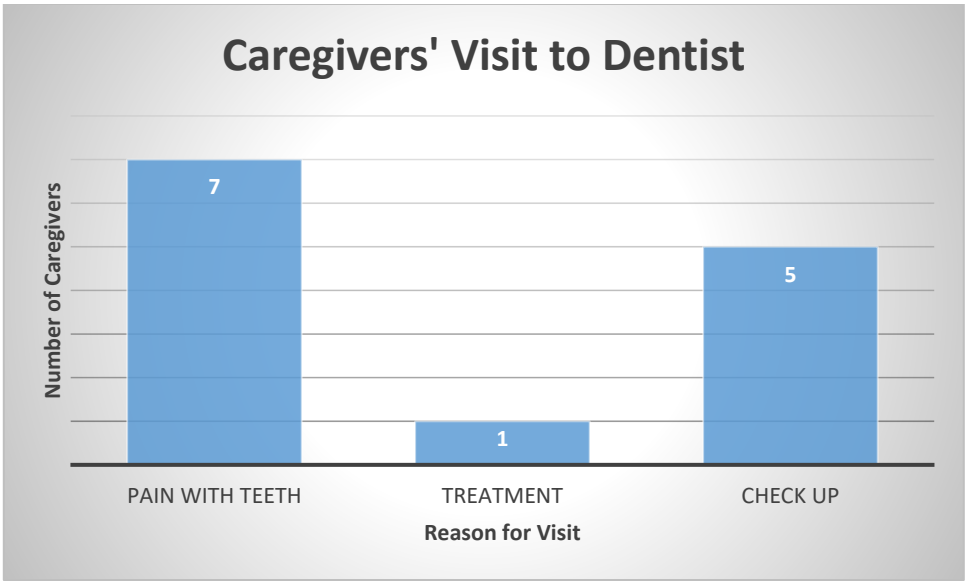


Figure 4-10 Caregivers' Reason for Dental Visit

Majority of caregivers who had visited the dentist visited because of pain in the tooth.

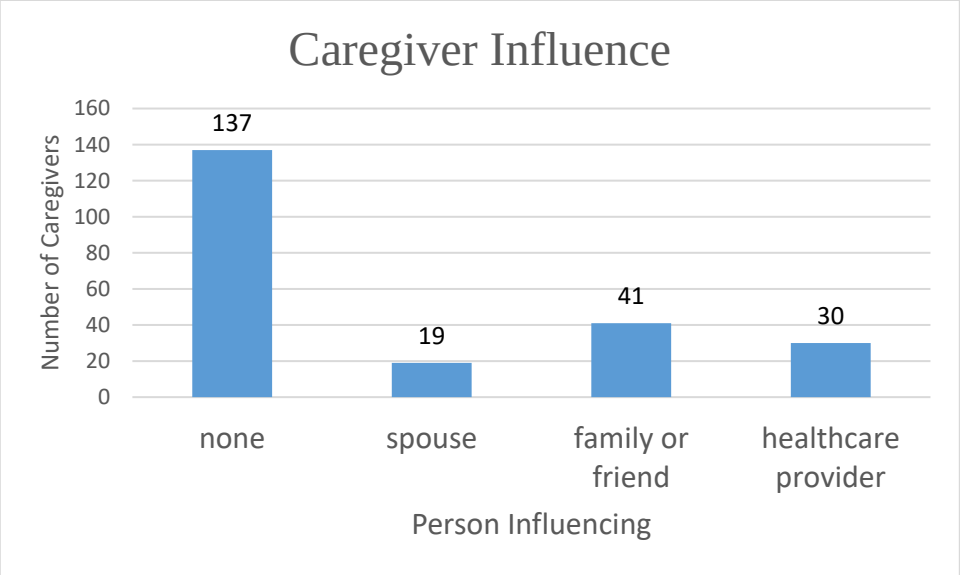


Figure 4-11 External Influencers on Caregivers Oral Health Decision for Child

Fig 4-13: Most caregivers were not influenced by other people on decisions concerning their child's oral health. Among those who were influenced, family and friends form the majority of the influencers.

4.11 Factors Associated with Oral Health of Pupils

Table 4-16 Bivariate Analysis between Demographic Characteristics of School Pupil and Caries

Variables	Category	Frequency	Presence of Caries	P-Value
Gender	Male	133 (44.33)	39 (29.32)	0.36
	Female	167 (55.67)	41 (24.55)	
Age group	4-9 years	113 (37.67)	54 (47.79)	
	10–15 years	158 (52.67)	24 (15.19)	
	15+ years	29 (9.67)	2 (6.90)	<0.001*
Location	Urban	154 (51.33)	39 (25.32)	0.60
	Rural	146 (48.67)	41 (28.08)	
School Type	Private	130 (43.33)	41 (31.54)	0.11
	Public	170 (56.67)	39 (22.94)	

Caries affected 29.32% of males and 24.55% of females. The prevalence of caries had no significant association with gender (p value 0.36). Pupils between 4-9 years were found to have

the highest caries prevalence. There was a significant association between caries prevalence and age group (p value < 0.001). There was no significant association between the occurrence of caries and location or school type (p values = 0.60, 0.11 respectively).

Table 4-17 Bivariate Analysis between Oral Habits of School Pupils and Caries

Variables	Category	Frequency	Number With Caries	P-Value
Frequency of toothache in last 12 months	Often	34 (11.33)	16 (47.06)	0.042*
	Occasionally	42 (14.00)	11 (26.19)	
	Rarely	30 (10.00)	4 (13.33)	
	Never	186 (62.00)	47 (25.27)	
	Don't know	8 (2.67)	2 (25.00)	
Frequency of dental visit in last 12 months	Once	20 (6.67)	6 (30.00)	
	Twice	3 (1.00)	1 (33.33)	0.45
	Three times	2 (0.67)	1 (50.00)	
	Four times	2 (0.67)	1 (50.00)	
	More than four times	2 (0.67)	0 (0.00)	
	No visit	135 (45.00)	37 (27.41)	
	Never visited	131 (43.67)	31 (23.66)	
	I don't know	5 (1.67)	3 (60.00)	
Frequency of teeth cleaning	Never	0	0 (0.00)	
	Several times a month	3 (1.00)	0 (0.00)	
	Once a week	0	0 (0.00)	
	Several times a week	2 (0.67)	0 (0.00)	0.53
	Once a day	154 (51.33)	38	
	2 or more times a day	141 (47.00)	42	
Frequency of biscuit/cake consumption	Never	6 (2.00)	5 (83.33)	0.002*
	Several times a month	43 (14.33)	10 (23.26)	
	Once a week	61 (20.33)	16 (26.29)	
	Several times a week	60 (20.00)	9 (15.00)	
	Everyday	105 (35.00)	28 (26.67)	
	Several times a day	25 (8.33)	12 (48.00)	
Sweet consumption	Low consumption	220 (73.33)	56 (70.00)	0.46

	High consumption	80 (26.67)	24 (30.00)	

Frequency of toothache and frequency of biscuit/cake consumption were significantly associated with caries prevalence (p- value 0.042, 0.002) respectively.

4.12 Association Between KAB of Caregivers and Oral Health Status of Pupils

Table 4-18 Association Between Caregivers' KAB and Their Education

	Knowledge Attitude and Behavior			P-value
	Low	**Medium**	**High**	
Educational level				
No formal education	1	12	1	<0.001
Basic education	16	73	13	
Secondary education	11	43	9	
Tertiary	5	21	22	

Knowledge, attitude and behaviour among caregivers of the study population was found to be significantly associated with their level of education (p value <0.001). Caregivers with higher level of education had better KAB.

Table 4-19 Bivariate Analysis of Caregiver's Knowledge, Attitude and Behaviour on Caries

Variables	Category	Frequency	Pupils With Caries	P- value
Knowledge	Poor	52 (22.91)	11	
	Good	151 (66.52)	43	
	Excellent	24 (10.57)	3	0.20
Attitude	Poor	29 (12.78)	4	0.17
	Good	198 (87.22)	53	
Behaviour	Poor	11 (4.85)	1	
	Average	197(86.78)	49	
	Good	19 (8.37)	7	0.27

Knowledge, attitude and behavior of caregivers on oral health was not significantly associated with the occurrence of caries among the pupils. Caries occurred mostly among pupils whose caregivers had average knowledge.

Table 4-20 Bivariate Analysis of Bleeding Gum and Oral Habits

VARIABLE	FREQUENCY	Gingival Bleeding		P-value
		Yes	No	
Frequency of tooth brushing				
	Once a day	92	62	
	Two or more times a day	83	58	
	Several times a week	1	1	
	Several times a month	2	1	0.980
Role played in child's teeth cleaning				
	I observe and guide	99	78	
	I advise but not monitor	23	15	0.504
	I am not involved	8	4	
	Not applicable	48	25	
Reason for child's dental visit last month				
	No reason	118	92	
	Tooth decay	3	0	
	Pain	4	2	
	Swelling	1	0	0.048
	Regular check up	4	0	
	Other reason	0	3	
	Not applicable	48	25	

Frequency of tooth brushing and caregiver's role played in child's cleaning were not significantly associated with bleeding gum observed (p-value = 0.98, 0.50 respectively). However, the reason for child's dental visit last month was found to be borderline significant.

Table 4-21 Chi Square Test Between NHIS and Reason Why Dentist Is Not Important

	National Health Insurance covers dental services		P value
	Yes	No	
Reason			
Not applicable	83	110	
Fear	1	3	
Lack of access	8	14	< 0.001
Other reason	2	6	

Caregivers' knowledge on dental service coverage by insurance was significantly associated with their reason for frequent dental visit not being important as shown in Table 4-20.

Table 4-22 Association Between Intervention Need Among Pupils and Caregiver Education Level

	Intervention Need				P value
	No intervention	Preventive treatment	Prompt treatment	Immediate treatment	
Educational level					
No formal education	0	9	4	1	
Basic education	5	34	60	3	
Secondary education	3	29	28	3	0.17
Tertiary	3	23	18	4	

There was no significant association between caregivers' educational level and the need for intervention among the pupils. Pupils whose caregivers had high school education only had greater need for intervention.

Table 4-23 Factors Associated With Flourosis Prevalence

Factor	Fluorosis		p-value
	Yes	No	
School Location			
Samer	5	43	
Oborpa	23	75	
Our Lady of Fatima	4	78	<0.001*
Kpong R/C	1	71	
Toothpaste contain fluoride			
Yes	30	247	
No	1	3	
Don't know	2	17	0.32
Teeth cleaning frequency			
Less than once a day	0	5	0.55
Once a day	21	133	
Two or more times a day	12	129	
Do other children tease you about your teeth			
Yes	3	26	
No	28	239	
Don't know	2	2	0.03*

Are you satisfied with the appearance of your teeth/gum			
Yes	8	76	0.83
No	24	185	
Don't know	1	6	

There was an association between school location and the occurrence of fluorosis (p –value <0.001).

Table 4-24 Factors Associated With Intervention Need Among Pupils

Factor	Intervention Needed		P-value
	Yes	No	
Gender			
Male	127	6	0.28
Female	159	8	
Age group			
4 – 9 years	110	3	
10 – 15 years	147	11	
15+ years	29	0	<0.001*
School type			
Private	118	12	<0.001*
Public	168	2	
KAB			
Low	33	0	
Medium	138	11	
High	0	45	0.39

The school one attended as well as the age of the pupil were found to be significantly associated with the need for intervention (treatment required).

Table 4-25 Bivariate Analysis of Appearance of teeth and oral diseases

Condition	Appearance		P value
	Yes	No	
Erosion			
No erosion	82	218	0.12
Enamel lesion	2	0	
Trauma			
No injury	84	212	
Treated injury	0	1	

Enamel/Dentine fracture	0	3	1.00
Caries			
No	65	155	0.62
Yes	19	61	
Bleeding gum			
No	30	92	0.53
Yes	54	124	

There was no significant association between the way a pupil felt about the appearance of the teeth and the oral health status.

CHAPTER FIVE

5 DISCUSSION

5.1 Introduction

Human dentition is very important. Its primary function is efficient chewing. Nutritious diet is obtained effectively through the use of healthy teeth to masticate and break down food. Untreated diseases of the mouth cause dysfunction and eventual tooth loss. The school pupils sampled were a realistic representation of basic school pupils in the Lower Manya Krobo Municipality. Good quality data was obtained due to adequate preparation and standardization of examiners.

5.2 Oral Diseases

The main conditions identified included dental caries, bleeding gums, fluorosis, dental trauma and oral mucosal lesions.

5.2.1 Dental Caries

Dental caries is a public health menace in many high-income countries (Prasai Dixit *et al.*, 2013a) especially among the poor and marginalized (World Health Organisation, 2017). In developing countries and countries of low socio economic status, dental caries is not as prevalent (Adeniyi and Odusanya, 2017).

The study showed a DMFT of 1.05 which significantly exceeds the WHO target of DMFT of below 3 for 12 year olds (‘WHO | Oral health information systems’, 2010). This means that pupils in Lower Manya Krobo Municipality have very low caries incidence, better than what is

expected by WHO. This could be attributed to the relatively lower sugar intake by the school pupils. Majority of these children had never taken in jam. Consistent with this finding, a study conducted in the Ho Municipality, a district in Ghana with similar characteristics also had low caries prevalence (Tuosie Beni, 2009).

The 4-9-year-old group had more frequent caries than the other groups, Figure 4-3. They represented 67% of all pupils with caries experience. This is a matter of concern because they are the children with mixed dentition and are more likely to have negative effect on both their primary teeth and the permanent teeth.

Gender, location and type of school, whether public or private, did not have any association with the prevalence of caries, with p values of 0.36, 0.60 and 0.11 at a significant level of $p<0.05$. Age group, however, showed a strong association with $p < 0.001$. This varies from the Nigerian study which showed a significant association between dental caries and the type of school, $p = 0.014$ (Adeniyi and Odusanya, 2017)

Pupils with caries showed a strong association with suffering from toothache within the last 12 months, $p = 0.042$ ($p < 0.05$). This is similar to results from a survey conducted in Nigeria where 8 to 12 year olds self-reported dental pain which was significantly associated with dental caries with $p = 0.04$ (Adeniyi and Odusanya, 2017)

It is important to advocate for early intervention to prevent pain and discomfort and to protect permanent teeth from caries experience. The introduction of atraumatic restorative technique (ART) will be of benefit to these children as shown in the 5 year study of children in the South African province of Gauteng (Mickenautsch and Frencken, 2009).

5.2.2 Periodontal Disease

Gingival bleeding occurred in 59% of all pupils. Teeth cleaning and periodontal disease was found to be statistically significant with age group p – value 0.003. This may be because older pupils are expected to possess better dexterity than younger pupils thus clean their teeth better. About 60% of children who brushed their teeth once a day had bleeding gums compared to 59% of children who brushed twice daily. The frequency of tooth brushing alone, is inadequate in preventing periodontal disease because the skill to clean well is also very important. It should however be noted that in this study, the caregivers involvement in the cleaning of the pupil's teeth did not have a significant effect on the prevalence and severity of bleeding gums, p> 0.504. Meta-analysis done has proven that for improved oral hygiene, there is a need to brush twice daily for a minimum of two minutes to achieve adequate levels (Chapple *et al.*, 2015).

Periodontal disease is of marked importance due to its association with cardiovascular disease, respiratory disease and diabetes mellitus and also with systemic disease (Oberoi *et al.*, 2016 ;Nazir, 2017).

Perodontal disease is expected to increase, hence policy makers need to be proactive in planning towards its prevention. This is because the world population is growing and people are keeping their teeth longer (Kassebaum *et al.*, 2014).

5.2.3 Fluorosis

Prevalence of dental fluorosis was 11 % among the school pupils. A large majority of the children with fluorosis, 23 out of 33, constituting 69.7% were from Oborpa, a rural community with bore hole as their source of water. Dissolved chemicals such as fluoride can be found in

underground water, which when ingested accumulate in hard tissues such as the teeth and bones and causes fluorosis. Government needs to ensure the safety of ground water to prevent adverse effects of fluoride(Yousefi *et al.*, 2019).

There was a significant association between a pupil having fluorosis and being teased by peers $p < 0.03$. It is worth noting that fluorosis was not significantly associated with the use of fluoride containing toothpaste, teeth cleaning frequency or satisfaction with appearance of the teeth. It can therefore be deduced that, the fluorosis observed in these pupils is not due to the use of fluoride toothpaste.

5.2.4 Dental Trauma

Dental trauma was rare, occurring in only 4 pupils. Though the numbers are few, dental trauma is of significance because of its impact on the sufferer. It affects quality of life of the individual (Lam, 2016). It forms a significant portion of trauma occurring globally (Petti et al., 2018). Aetiology of dental trauma is varied and wide and include factors related to the mouth and environment (Ulf, 2009).

5.2.5 Oral mucosal Lesions

Oral mucosal lesions were also uncommon. Two pupils had oral abscesses which needed immediate attention whilst 4 had other mucosal abnormalities. Global prevalence of oral mucosal lesions is much higher with leukoplakia varying from 0.1% to 10.6% depending on geographical distribution (Petersen, 2003). Some of the presentation of lesions include dry mouth, discolouration, periodontitis and poor oral hygiene. Among the global goals for oral

health 2020, oral mucosal lesions have been targeted for early diagnosis by increasing the number of health care providers (Hobdell *et al.*, 2003).

5.2.6 Dental Erosion

Changes in diet and lifestyle is associated with the emergence of diseases such as dental erosion, diabetes, obesity and hypertension ((Petersen, 2003). Alcohol consumption, an integral part of many cultures, is also associated with dental erosion (Allen CCamisa, 2015). During the study, only 2 pupils were found to be having erosion of the teeth, though majority of the pupils drink fizzy drinks several times a week.

5.3 Prevalence of Oral Diseases

Oral disease is the most prevalent non-communicable disease affecting people throughout their lifetime. It can cause pain and discomfort and sometimes lead to disfigurement and death. The Global Burden of Disease Study (2016), estimated that oral diseases affect about half of the world's population, a staggering 3.8 billion people. Periodontitis, characterized by gum bleeding was found to be the 11^{th} most common disease in the world (Garcia, 2012).

It was therefore not surprising that almost all pupils examined had at least one oral disease condition present with only 4.7% of them not needing intervention.

5.4 Access to Dental Services

Universal barriers to dental health services such as financial, geographic and cultural exist. Barriers to preventive dental care can also be due to individual, social or cultural reasons. Access to dental health services in low-income countries are limited compared to industrialized countries.

Access to professional dental services is a prerequisite to obtaining optimum oral health (Alade *et al.*, 2016). In Africa and South America, lack of proper access has been identified as a serious challenge in the pursuit of optimum health (Jin *et al.*, 2016).

Data obtained from this research setting showed that only 9.67% of pupils and 27.67% of caregivers had visited the dentist before. Of those who had visited the dentist, 52% went because of pain. This contrasts sharply the findings of a study done in Jordanian adults where 93% of all participants had visited a dentist (Obeidat et al., 2014).

Though NHIS covers dental services, only 31% of those interviewed were aware of this. Thirty-four caregivers considered a visit to the dentist not to be important because of high cost. Sixteen caregivers also claimed that it was because of difficulty of access, whilst four attributed it to fear and ten others gave no specific reason.

These statistics can be improved by introducing cost effective remedies which are accessible in their local communities. A 5 year study showed that improving access through the introduction of ART services in the South African province of Gauteng significantly increased the rate of retention of teeth as opposed to dental extractions (Mickenautsch and Frencken, 2009).

5.5 Knowledge, Attitude and Behaviour of Pupils and Caregivers towards Oral Health

Majority of caregivers had good knowledge of oral health, 66.52%, and a few had excellent knowledge, 10.57%. Attitude towards oral health was mostly good, 78.22%, and behaviour was mostly average. This is similar to work done in New Delhi, where the awareness of parents and attitudes exhibited regarding their children's oral health were relatively good. Similarly, there was a need for professional dental intervention, which was not commensurate with the findings

on knowledge, attitude and behaviour, which were good. This buttresses the fact that knowledge alone is not sufficient if attention is not paid to changing caregivers' behaviour and attitudes (Kumar *et al*., 2019). Thus, there is a need to focus on the promotion of healthy behaviour.

CHAPTER SIX

6 CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

Oral disease is the commonest non-communicable disease in the world. There exists a high burden of oral diseases among basic school pupils in Lower Manya Krobo Municipality. The need for professional intervention appears to be largely unmet. Though knowledge and attitude towards oral health of pupils by care givers can be considered as good, behaviour towards oral health is not commensurate and thus the above findings. The study showed high prevalence of periodontal disease characterised by bleeding gums. Mean DFMT was found to be of 1.05. No child had missing or filled teeth due to caries. There was a high concentration of fluorosis in children from rural schools. Oral mucosal lesions, dental erosions and dental trauma was found to be rare. Though NHIS caters for dental treatment, few parents were aware of this.

6.2 RECOMMENDATIONS

With reference to the findings of this study, the following recommendations and intervention measures have been proposed to address the unmet oral health needs of basic school pupils in the Lower Manya Krobo Municipality of the Eastern Region of Ghana:

1. Integration of healthy oral health behavior into primary health care programs such as antenatal and postnatal care to target mothers who form the majority of caregivers and health educators.
2. Sensitization of the public about the coverage of dental services under the National Health Insurance Scheme.

3. Introduction of community based Atraumatic Restorative Treatment (ART) services at the community level to improve dental care access.
4. Further studies need to be conducted to find out the causes of high incidence of fluorosis in rural communities within the Lower Manya Krobo Municipality.

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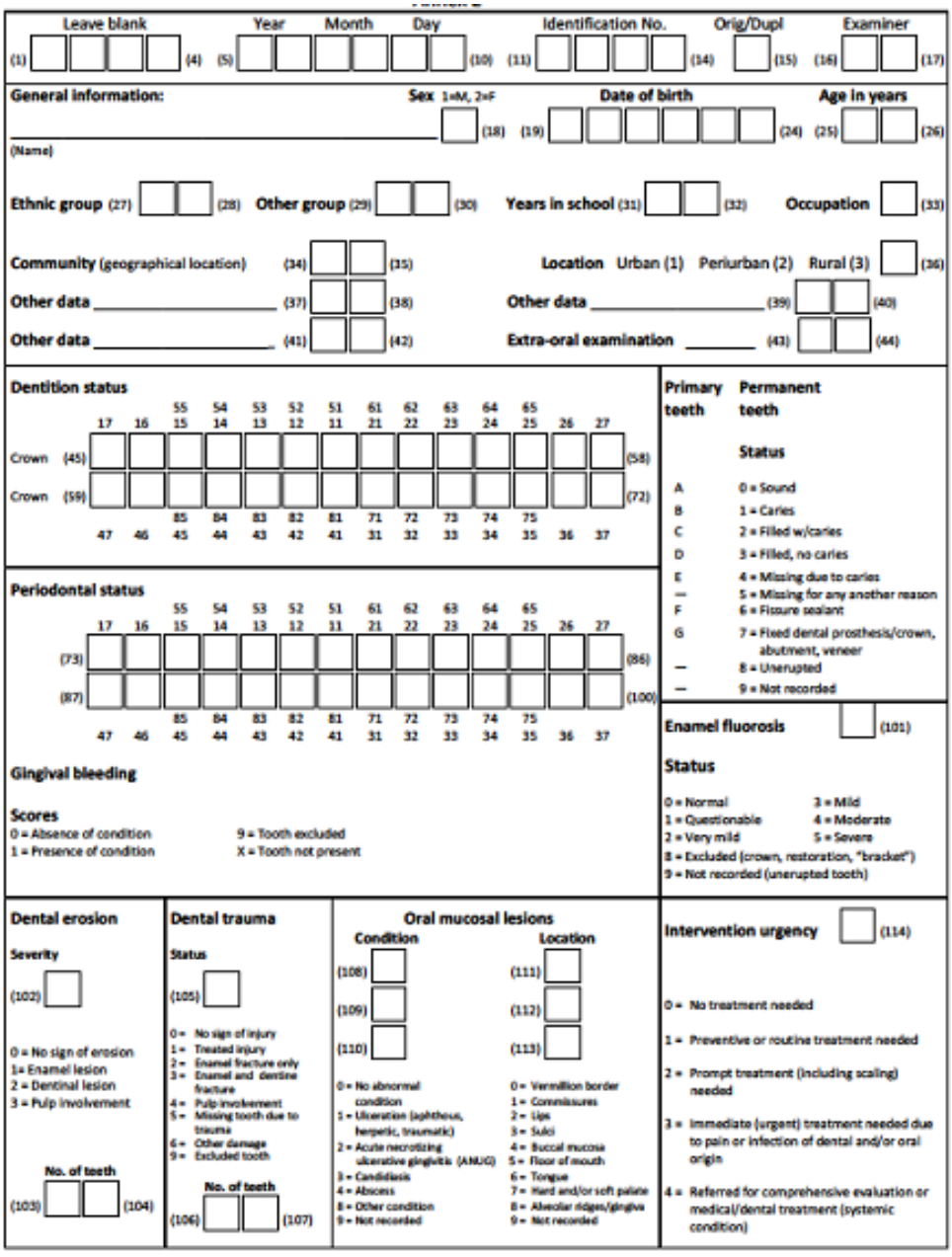
Appendix 1: Oral Health Examination Form

INTRODUCTION AND CONSENT

Hello. My name is **Mary Dsane**, I am a student of the Ensign College of Public Health. I am conducting a research to assess the unmet oral health needs of children in Lower Manya Krobo Municipality. The information I collect will help the Health Directorate to plan health services in your municipality. You have been selected for the survey. I would like to examine your mouth. This usually takes about 10 to 15 minutes. All of the observations made will be confidential and will not be shared with anyone other than members of my survey team. You don't have to be in the survey, but we hope you will agree to participate.

RESPONDENT AGREES Yes [ ] No [ ] Signature…….. Date…….


Leave blank
Year
Month
Day
Identification No.
Orig/Dupl
Examiner
General information:
Sex 1=M, 2=F
Date of birth
Age in years
(Name)
Ethnic group
Other group
Years in school
Occupation
Community (geographical location)
Location Urban (1) Periurban (2) Rural (3)
Other data
Other data
Other data
Extra-oral examination
Dentition status
Crown
Crown
Primary teeth
Permanent teeth
Status
A 0 = Sound
B 1 = Caries
C 2 = Filled w/caries
D 3 = Filled, no caries
E 4 = Missing due to caries
— 5 = Missing for any another reason
F 6 = Fissure sealant
G 7 = Fixed dental prosthesis/crown, abutment, veneer
— 8 = Unerupted
— 9 = Not recorded
Periodontal status
Enamel fluorosis
Status
0 = Normal
1 = Questionable
2 = Very mild
3 = Mild
4 = Moderate
5 = Severe
8 = Excluded (crown, restoration, "bracket")
9 = Not recorded (unerupted tooth)
Gingival bleeding
Scores
0 = Absence of condition
1 = Presence of condition
9 = Tooth excluded
X = Tooth not present
Dental erosion
Severity
0 = No sign of erosion
1= Enamel lesion
2 = Dentinal lesion
3 = Pulp involvement
No. of teeth
Dental trauma
Status
0 = No sign of injury
1 = Treated injury
2 = Enamel fracture only
3 = Enamel and dentine fracture
4 = Pulp involvement
5 = Missing tooth due to trauma
6 = Other damage
9 = Excluded tooth
No. of teeth
Oral mucosal lesions
Condition
Location
0 = No abnormal condition
1 = Ulceration (aphthous, herpetic, traumatic)
2 = Acute necrotizing ulcerative gingivitis (ANUG)
3 = Candidiasis
4 = Abscess
8 = Other condition
9 = Not recorded
0 = Vermillion border
1 = Commissures
2 = Lips
3 = Sulci
4 = Buccal mucosa
5 = Floor of mouth
6 = Tongue
7 = Hard and/or soft palate
8 = Alveolar ridges/gingiva
9 = Not recorded
Intervention urgency
0 = No treatment needed
1 = Preventive or routine treatment needed
2 = Prompt treatment (including scaling) needed
3 = Immediate (urgent) treatment needed due to pain or infection of dental and/or oral origin
4 = Referred for comprehensive evaluation or medical/dental treatment (systemic condition)

Appendix 2: Oral Health Questionnaire for Adults

ORAL HEALTH QUESTIONNAIRE FOR ADULTS

IDENTIFICATION NO. ☐

INTRODUCTION AND CONSENT

Hello. My name is **Mary Dsane**, I am a student of the Ensign College of Public Health. I am conducting a research to assess the unmet oral health needs of children in Lower Manya Krobo Municipality. The information I collect will help the Health Directorate to plan health services in your municipality. You have been selected for the survey. I would like to ask you some questions about your knowledge and attitude towards oral health. The questions usually take about 10 to 15 minutes. All of the answers you give will be confidential and will not be shared with anyone other than members of my survey team. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important.

RESPONDENT AGREES Yes [ ] No [ ] SIGNATURE…… DATE: ……

PART ONE: SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. Gender A) Male ☐ B) Female ☐

2. Age ☐ ☐ years

3. Marital status A) Single ☐ B) Married ☐ C) Co-habiting ☐ D) Widow ☐ E) Divorced ☐

4. Ethnicity A) Ga-Adangme ☐ B) Akan ☐ C) Ewe ☐ D) Other ☐

5. Occupation: …….

6. What is your highest level of education? A) No Formal Education ☐ B) Primary ☐ C) Junior High ☐ D) Senior High ☐ E) Tertiary ☐ F) Other ☐

7. What is your relationship with the child? A) Mother ☐ B) Father ☐ C) Guardian ☐

D) Other (please specify) ……

8. What is the age of the child at last birthday? Answer: …….

PART TWO: KNOWLEDGE OF ORAL HEALTH/HYGIENE

9. How many sets of teeth does a person have in life from childhood to adulthood?
   i) 1
   ii) 2
   iii) 3
   iv) Don't know

10. How many baby teeth and how many permanent teeth does each person grow

   i) 5 and 24
   ii) 20 and 32
   iii) 32 and 32
   iv) Don't know

11. Do you think that primary teeth are important? A) Yes ☐ B) No ☐

12. Do you think that the problems of primary teeth can affect the permanent teeth?

   A) Yes ☐ B) No ☐

13. Why do we brush our teeth? Choose one

   i) To make our teeth cleaner and brighter
   ii) To prevent tooth decay and gum disease
   iii) To give fresh breath
   iv) Don't know

14. Does frequent exposure to sweet or sticky food affect dental health?

   A) Yes ☐ B) No ☐

15. What happens when you chew sweet or sticky foods and they get stuck on the teeth? Choose only one

   i) It leads to formation of holes in the teeth
   ii) It can cause calcium deficiency

iii) It can cause bleeding gums
iv) Don't know

16. Does prolonged and frequent bottle feeding affect dental health? A) Yes ☐ B) No ☐

17. Do you think that fluoride is important for good dental health? A) Yes ☐ B) No ☐

18. What does fluoride do to the teeth? Choose one

i) It can prevent gum disease
ii) It can prevent tooth decay
iii) It makes the teeth very clean

19. Can a parent transmit cavity causing germs to their children? A) Yes ☐ B) No ☐

20. Does the state of a child's oral health affect general body health? A) Yes ☐ B) No ☐

21. When should a child visit the dentist for the first time? Choose one

i) When the teeth start erupting
ii) When the permanent teeth appear
iii) Don't know

22. What is dental plaque? Choose one

i) Discoloured teeth
ii) Soft deposits on our teeth
iii) Holes in teeth
iv) Don't know

23. Why do our gums bleed? Choose one

i) Due to inflammation of gums
ii) Due to infection of the tooth
iii) Due to calcium deficiency
iv) Don't know

24. Which of these can cause cancer in the mouth? Choose one

i) Lack of calcium in the body
ii) Chewing of tobacco
iii) Lack of vitamin C
iv) Don't know

25. Can crooked teeth be straightened? A) Yes ☐ B) No ☐

26. What causes dental caries? Choose one
i) Lack of calcium in the body
ii) Bacteria
iii) Lack of vitamin C
iv) Don't know

27. NHIS caters for dental services. A) Yes ☐ B) No ☐ C) Don't know ☐

PART THREE: ASSESSMENT OF ATTITUDE TOWARDS ORAL HEALTH

28. Is it important to visit the dentist frequently? A) Yes ☐ B) No ☐

29. If No, why do you not send your child to the dentist frequently?
i) Fear ☐
ii) High cost ☐
iii) Difficulty in accessing dental healthcare ☐
iv) Lack of time ☐
v) Cultural belief ☐
vi) No specific reason ☐

vii) Other reason ……..

Answer Yes/No to Questions **30** To **35**

		YES	**NO**
30.	Visiting the dentist regularly is a waste of time and money		
31.	Chewing tobacco is not good for our teeth/mouth		
32.	Smoking is not good for our health		
33.	Hard bristle toothbrushes are not good for the teeth		
34.	It is good to replace missing teeth as soon as possible		
35.	It is important to see the dentist for treatment and not for prevention		

PART FOUR: ASSESSMENT OF ORAL HEALTH BEHAVIOUR

36. What oral hygiene aid do you use for your ward?

		YES	NO
i)	Tooth brush		
ii)	Tooth paste		
iii)	Chewing stick		
iv)	Chewing sponge		
v)	Mouth wash		
vi)	Dental Floss		
vii)	Other		

37. How often does your child/ward clean the mouth in a day?

FREQUENCY		YES	NO
i)	Once		
ii)	Twice		
iii)	More than two times		
iv)	Occasionally		

38. What is your role in the cleaning of the child's mouth? Choose one
    i) I observe and guide my child/ward
    ii) I advise but do not monitor
    iii) I am not involved

39. Do you smoke/chew tobacco? A) Yes ☐ B) No ☐

40. Have you visited the dentist before? A) Yes ☐ B) No ☐

41. Why did you visit the dentist?
    i) For treatment
    ii) For checkup
    iii) Other reason ……..

42. How often does your ward visit the dentist?
    i) Regularly
    ii) When there is pain or other problems in the mouth
    iii) Never

43. Has your child visited the dentist in the last one month? A) Yes ☐ B) No ☐

44. If yes in **Question 43** above, what was the reason for the last visit?

i) Tooth decay
ii) Pain
iii) Swelling
iv) Deposits and bad odour
v) Regular checkup
vi) Other ……

45. Are there other people who influence the dental care decisions taken for your child/ward?

A) Yes ☐ B) No ☐

46. If yes to **Question 45** above, what people influence your decision

i) Spouse
ii) Family/friends
iii) Healthcare provider
iv) Other …….

47. How did you learn how to take care of the mouth?

a. At home b. From school c. Other

Thanks again for your time and willingness to participate in the project.

Appendix 3: Oral Health Questionnaire for Pupils

ORAL HEALTH QUESTIONNAIRE FOR PUPILS

IDENTIFICATION NO. ……..

INTRODUCTION AND CONSENT

Hello. My name is **Mary Dsane**, I am a student of the Ensign College of Public Health. I am conducting a research to assess the unmet oral health needs of children in Lower Manya Krobo Municipality. The information I collect will help the Health Directorate to plan health services in your municipality. You have been selected for the survey. I would like to ask you some questions about your knowledge and attitude towards oral health. The questions usually take about 10 to 15 minutes. All of the answers you give will be confidential and will not be shared with anyone other than members of my survey team. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important.

RESPONDENT AGREES Yes [ ] No [ ]

SIGNATURE OF INTERVIEWEE: …… DATE: ……

First, we would like you to answer some questions concerning yourself and your teeth

Identification number **Sex** **Location**

1. ☐☐☐☐ Boy ☐ 1 Girl ☐ 2 Urban ☐ 1 Periurban ☐ 2 Rural ☐ 3

2. **How old are you today?** _____
(Years)

3. **How would you describe the health of your teeth and gums?**

(Read each item)

Teeth Gums

Excellent.....

Very good.....2

Good.....

Average .....

Poor .....

Very poor .....

Don't know.....

4. **How often during the past 12 months did you have toothache or feel discomfort due to your teeth?**

Often.....

Occasionally.....2

Rarely .....

Never .....

Don't know.....

Now please answer some questions about the care of your teeth

5. **How often did you go to the dentist during the past 12 months?**
(Put a tick/cross in one only)

Once .....

Twice.....

Three times.....

Four times.....

More than four times.....

I had no visit to dentist during the past 12 months .....

I have never received dental care/visited a dentist.....

I don't know/don't remember .....

If you did not see a dentist during the last 12 months, go on to question 7

6. **What was the reason for your last visit to the dentist?**
(Put a tick/cross in one box only)

Pain or trouble with teeth, gums or mouth.....

Treatment/follow-up treatment .....

Routine check-up of teeth/treatment .....

I don't know/don't remember .....

7. **How often do you clean your teeth?**

(Put a tick/cross in one box only)

Never .....

Several times a month (2–3 times).....

Once a week .....

Several times a week (2–6 times).....

Once a day.....

2 or more times a day .....

8. **Do you use any of the following to clean your teeth or gums?**

	Yes	No
Toothbrush		
Wooden toothpicks.....		
Plastic toothpicks.....		
Thread (dental floss).....		
Charcoal		
Chewstick		
Other.....		

Please specify_____

9.Do you use toothpaste to clean your teeth

Do you use toothpaste that contains fluoride?..

10. Because of the state of your teeth and mouth, have you experienced any of the following problems during the past year?

11. **How often do you eat or drink any of the following foods, even in small quantities?**

`	Several times a day	Every day	Several times a week	Once a week	Several times a month	Never
Fresh fruit .						
Biscuits cakes and cream cakes						
Lemonade, Coca Cola or other soft drinks						
Jam and Honey						
Chewing gum containing sugar						
Sweets/candy						
Milk with sugar .						
Tea with sugar						
Coffee with sugar						

12. **What level of education has your father completed (or your stepfather, guardian or other male adult living with you)?**

No formal schooling.....

Less than primary school .....

Primary school completed.....

Secondary school completed.....

High school completed .....

College/university completed .....

No male adult in household .....

Don't know .....

13. **What level of education has your mother completed?**

No formal schooling.....

Less than primary school .....

Primary school completed.....

Secondary school completed.....

High school completed .....

College/university completed .....

No female adult in household .....

Don’t know .....

That completes our questionnaire

Thank you very much for your cooperation!

Year Month Day

Appendix 4: Ethical Review

ENSIGN COLLEGE OF PUBLIC HEALTH - KPONG

OUR REF: ENSIGN/IRB/M4
YOUR REF:
Tel: +233 245762229
Email: irb@ensign.edu.gh
Website: www.ensign.edu.gh

P. O. Box AK 136
Akosombo
Ghana

Tuesday, 13 November 2018

INSTITUTIONAL REVIEW BOARD SECRETARIAT

Mary Dsane
Ensign College of Public Health

Dear Dr Dsane,

OUTCOME OF IRB REVIEW OF YOUR THESIS PROPOSAL

At a meeting of the INSTITUTIONAL REVIEW BOARD (IRB) of Ensign College of Public Health held on 1st November, 2018 your proposal entitled "**Unmet Oral Health Needs of Basic School Children in the Lower Manya Krobo District of the Eastern Region.**" was considered.

Your proposal has been approved for data collection in the following settings:

1. Thesis title should include name of the District and Region of study and consider change of topic to: "Assessing the unmet oral need…" Or: "Assessment of Knowledge, Attitudes and Practices of oral needs……"
2. Provide consent forms.
3. Review different questionnaires to suit the 5 year olds and 12 year olds.

We wish you all the best.

Sincerely,

Dr (Mrs) Acquaah-Arhin
(Chairperson)

Cc. President, ECOPH
Cc: Academic Registrar, ECOPH
Cc: Head of Academic Program, ECOPH

Appendix 5: Ethical Clearance from Ghana Education Service

GHANA EDUCATION SERVICE

In case of reply the number and date of this letter should be quoted
Email: lowermanyakrobo.edu@gmail.com

My Ref.No GES/ER/LMKM/B.33/VOL.11/05

MUNICIPAL EDUCATION OFFICE
P. O. BOX 49
ODUMASE-KROBO

14TH February, 2019.

REPUBLIC OF GHANA

Your Ref No .....

LETTER OF INTRODUCTION

Mrs. Mary Dsane (Student ID number 177100123) is a second year student of the Master Public Health (MPH) degree programme at the Ensign college of public Health Kpong.

She has been permitted to carry out Data Collection on Assessment of unmet Oral Health Needs of Basic School children in your School.

Please give her and the team the needed support required to carry out the exercise

Thank you.

.....
AGNES AKWELEY ATTIPOE (MRS.)
(DEPUTY DIRECTOR, FIN. & ADMIN.)

For AG. MUNICIPAL DIRECTOR OF EDUCATION
LOWER MANYA KROBO

DEPUTY DIRECTOR
FINANCE & ADMINISTRATION
GHANA EDUCATION SERVICE
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