SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

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ORAL HEALTH STATUS AMONG HEARING IMPAIRED STUDENTS AT STATE SCHOOL FOR THE DEAF, ASHAIMAN

BY

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DECLARATION

I hereby declare that excluding precise references which have been duly acknowledged, this submission is my own work towards my MPH dissertation and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the University or elsewhere.

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DEDICATION

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To God be the Glory.

This project is dedicated to my loving family for the support and sacrifices they made for me

on my journey in pursuing this degree.

ACKNOWLEDGEMENT

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ABBREVIATIONS

HI	Hearing Impairment
SN	Special Needs
OHS	Oral Health Status
OHK	Oral Health Knowledge
OHP	Oral Health Practices
DMFT	Decayed Missing Filled Teeth in Permanent teeth
dmft	decayed missing filled teeth in Primary teeth
CPI	Community Periodontal Index
FDI	International Dental Federation
UG	University of Ghana
UN	United Nations
WHO	World Health Organization
GHS	Ghana Health Service
GES	Ghana Education Service
GDA	Ghana Dental Association

DEFINITION OF TERMS

Dental caries   It is a result of a complex interaction of bacteria on the tooth surface covered by dental plaque or oral biofilm, fermentable carbohydrate to produce acids (lactic acid and acetic acid) which dissolve the protective hard tissues and acting on the teeth over time.

Periodontium   It holds the teeth in the mouth. Consists of all the tissues which surround and support the teeth – cementum, alveolar bone, periodontal ligament and gingiva.

Dental plaque   Is a soft adherent structured deposit which forms on the tooth surface. It consists of a mixed bacterial flora, sometimes epithelial cells and leukocytes.

Gingivitis   It is an inflammatory response of the gingivae without destruction of the supporting tissues.

Periodontitis   a group of inflammatory diseases that affect

all the periodontal structures. It results in

destruction of the attachment apparatus.

Periodontal pockets   Describes a gap along the sides of the tooth as

a result of destruction of the periodontal

ligaments and bones which surround and

support the tooth.

Community Periodontal Index   (CPI)   A periodontal status indicator that measures

gingival bleeding calculus, and periodontal

pockets

Posterior teeth   Consists of the premolars and molars

Anterior teeth: Consists of teeth at the front- the incisors and

canines

Buccal surfaces: The side of the tooth adjacent to the inner part

of the cheek

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Lingual surfaces: The surface of the tooth towards the tongue

Exfoliated tooth: natural loss of teeth more in children

especially with the primary teeth

ABSTRACT

Background: Oral health is key to the overall health status and quality of life. Dental caries and periodontal conditions are the most common oral health issues globally. Individuals with special needs, especially children, require extra care in daily activities as compared to individuals in the general population. These children will have to learn good oral health habits in order to pass it on to their colleagues and to their children. The aim of this study was to determine the oral health status and treatment needs of the hearing impaired students.

Methodology: This was a cross-sectional quantitative purposive study of hearing impaired students at a state school for the deaf at Adjei Kojo in Ashaiman. The study participants were selected based on the set exclusion and inclusion criteria. A total of 181 students participated in the study. Data collection included administration of questionnaires which were translated into sign language and videotaped. The video clips were then played to the students to assist them in filling out the questionnaire. Clinical assessments and recording were done for debris deposits, calculus, pocket depth and bleeding on probing. Teeth were also assessed for decayed, filled and missing. Data was entered and analyzed using Stata V14. Descriptive and inferential analysis were done which included chi-square tests, Fisher's exact and binary and ordered logistic regression analysis.

Results: There was unsatisfactory (90.61%) oral hygiene status of the students with 77.25% with unmet treatment need for the hearing impaired students. The dental caries prevalence rate was 24% with mean DMFT/dmft score of 0.45 (SD: 0.885) and 0.11(0.105) respectively. A significant association was identified between oral health knowledge and practices with oral health status.

Conclusion: This was a descriptive study to give baseline data for this special group of students. The study also aimed at filling the literature gap and to determine the influence of oral health knowledge and practices on oral health status in the students with hearing impairment. More effort is thus needed in oral health education to re-iterate the importance of oral health.

CHAPTER ONE

INTRODUCTION

1.0 Background to the study

The utmost burden of any disease has the greatest impact on the most disadvantaged and socially marginalized persons in our societies. Persons with disabilities, according to the United Nations (UN), are the most marginalized and disadvantaged in our societies (UN, 2006). Special Needs (SN) individuals refer to persons who cannot fully function physically, mentally and socially, as their peers would normally do. These individuals have lower educational status, less economic participation and a poorer health status than people without disabilities, according to the World Health Organization (WHO, 2011).

There are an estimated 650 million SN individuals in the world, with approximately 80% of them living in low- income countries and the number continues to rise (WHO, 2011). More than five percent of the world's population (360million people) have hearing loss. Thirty-two million of these are children and these numbers are increasing as world's population also rises (WHO, 2011).

Health is defined as the sum total of a person's physical, mental, and social well-being and not merely the absence of disease or infirmity (WHO, 2006).

Oral health related diseases are among the most prevalent non-communicable diseases and a key component of the global burden of diseases (WHO, 2013). With dental caries and periodontal conditions being the most common oral health issues. They are included in the

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seven oral health conditions and diseases prioritized in the African region by World Health Organization (WHO, 2015).

Oral health is a state of a healthy mouth, free from mouth and facial pain, oral cancers and infection, oral sores, decayed teeth, periodontal diseases, loss of teeth and any other condition or disease that decreases an individual's ability in chewing, smiling, biting, speaking and general psychosocial well-being (WHO, 2014). Oral health is key to the overall health status and quality of life of individuals. It is a basic need for all individuals but more in individuals with SN. Individuals with SN are at an increased risk for physical, developmental, behavioral, or emotional conditions and require greater demand for health and services as compared to those of the general population (McPherson, Arango, Fox, 1998).

Those with hearing impairment and other similar disabilities are often neglected due to fear, misconception, negative attitudes, stigma and plain ignorance (Jain et al., 2008). They will have challenges, therefore we must put special emphasis on them while striving to get equitable healthcare for all.

1.1 Problem Statement

There are 737,743 persons with disability in Ghana. Persons with hearing impairment form 15% (110,625) of this population (Ghana Statistical Service, 2013). In the Ashaiman municipality, persons with disability are slightly over two percent (2.3%) of the population of 190,721. Persons with hearing impairment constitute over seven percent (7.6%) of the persons with disability in the municipality (Ghana Statistical Service, 2014).

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Prevalence of dental caries amongst the general population have been documented but none focused on the oral health status in any of the special needs groups in Ghana (Addo-Yobo &Williams, 1991). There is a dearth of research on the hearing impaired population and even fewer studies determining their oral hygiene status.

A study conducted on children's oral health, indicates that, oral health care is the most common treatment need of children (Mouradian, 2001). A study in a special needs school in Johannesburg also found a high unmet treatment need in hearing impaired school children as compared to those with cerebral palsy, learning and mental disabilities. The same study found 100% unmet need for children with hearing impairment as compared to those with other disabilities (Nqcobo, Yengopal, Rudolph & Thekiso et al., 2012).

With an already disproportionate dentist to patient ratio of 1 to 75,000, it is very appropriate to plan effectively for oral care by the dentists, based on a national program and guidelines for oral care which should include the neglected minority group (Ghana Dental Association, 2017). Jain et al. (2008), reported that, identifying the specific health needs of marginalized groups is vital to ensure that adequate and appropriate strategies can be formulated to meet those needs precisely.

The objective of this study was to assess the oral health status among the hearing-impaired student population, where hardly any data exists and to determine their unmet treatment needs. It is anticipated that findings from this study would provide vital information for policy formulation and planning. That it will encourage similar studies on people with disabilities, especially disabled individuals with oral health issues. These will be beneficial for the development of the proposed National Oral Health Policy which remains largely unapproved and unimplemented (Addo, Batchelor, & Sheiham, 2006).

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1.2 Conceptual Framework of Oral Health Status
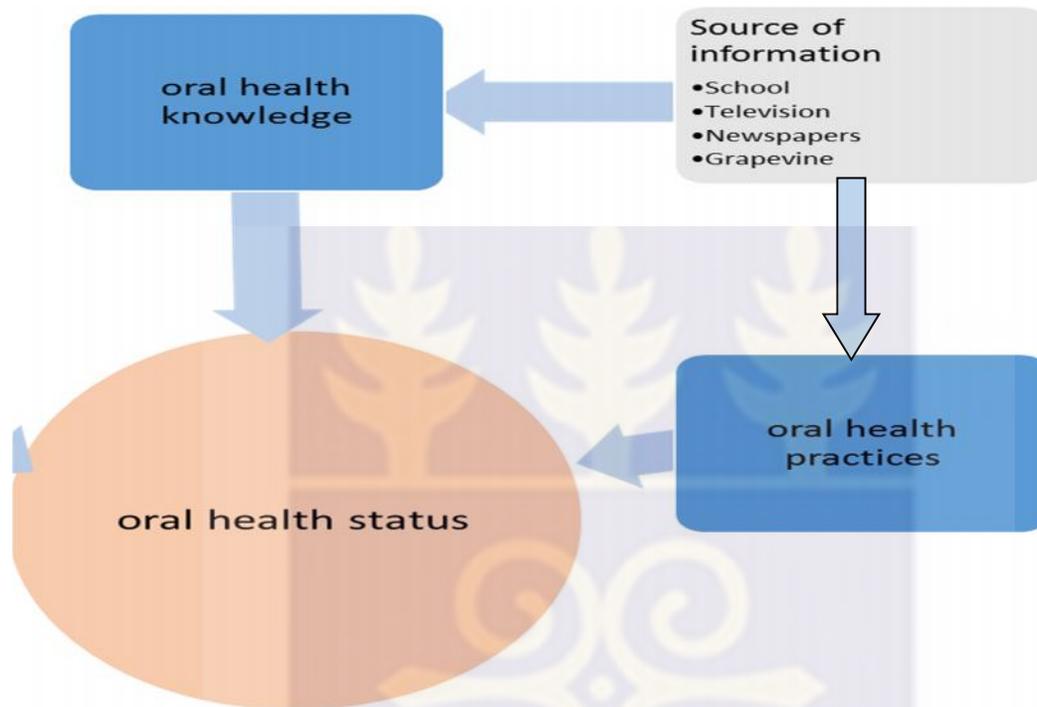
Fig 1. 1 Conceptual framework of oral health status

The figure above (fig 1.1) illustrates the factors that play a role in the oral health status of individuals. It indicates the possible sources of oral hygiene knowledge - school curriculum, television programs, and newspapers or through conversations with peers or other members of the society. The source of information builds up individuals knowledge and can influence perceptions of oral health treatments and allay or enhance fears and anxiety (FDI, 2015). Studies have associated various factors, including oral health knowledge and oral health practices with the status of oral health in individuals (Rustvold, 2012).

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The interplay of these factors particularly the oral health knowledge and oral health practices have a major influence on the oral health status of an individual.

1.3 Rationale/ Justification

This study is to provide data for oral health status and treatment needs of hearing-impaired individuals and also to serve as a baseline study. It will also contribute to the design of oral health education and to plan and implement appropriate Oral Health Programs for this group of marginalized individuals in the society.

The study is also to determine the association of Oral Health Status (OHS) of students with hearing impairment with their Oral Health Knowledge (OHK) and Oral Health Practices (OHP).

1.4 Objectives

The objectives of the study were divided into general and specific as stated below.

General Objectives

To determine the oral health status and treatment needs of hearing impaired students at the Adjei Kojo State School for the Deaf at Ashaiman.

Specific Objectives:

1. To determine the oral health status of the hearing impaired students at the State School for the Deaf at Ashaiman

2. To determine the treatment needs of the Hearing-Impaired students.

3. To assess the level of influence of oral hygiene knowledge of Hearing-Impaired students on their oral health status

4. To assess the influence of oral health practices of the Hearing Impaired students on their oral health status.

1.5 Research Questions

This proposed study will answer the research question: What is the oral health status and treatment needs of hearing impaired children at the Adjei Kojo State School for the Deaf at Ashaiman?

1.5.1 Sub-Questions:

1. What is the oral health status of the students with hearing impairment at State School for the Deaf in Ashaiman?

2. What are the unmet treatment needs of the students with hearing impairment at the State School for the Deaf in Ashaiman?

3. What is the influence of oral hygiene knowledge on oral health status among the hearing-impaired students at state School for the Deaf in Ashaiman?

4. What is the influence of oral health practices on the oral health status among the hearing-impaired children at State school for the Deaf in Ashaiman.

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CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The purpose of this study is to determine the oral health status and treatment needs of students with hearing impairment in a special needs school. It also investigates the oral health knowledge and practices of these children. While various studies on oral health status are available for the general population, there is a scarcity of literature for this vulnerable group. Individuals with SN are vulnerable as they are at an increased risk for physical, developmental, behavioral, or emotional conditions and require greater demand for health and services as compared to those of the general population (McPherson, Arango & Fox, 1998). Literature for the hearing impaired is unavailable in the country and thus this study aims to add to the literature available on oral health issues in the country, focusing on a target group of SN individuals.

Review of literature for the study was done with general internet searches with key terms as hearing impaired, special needs, dental status in hearing impaired, oral health in hearing impaired, oral health knowledge and oral health practices.

Most scholarly sources were the University of Ghana library online off campus access, Pubmed and Medline for electronic journals and e-books. Hard copies of journals such as the Ghana Dental Association journals were accessed together with thesis on oral health issues at the School of Public Health Library.

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In addition, consultations were held with specialist periodontologist and senior lecturers of the University of Ghana, Legon.

This review focuses on literature of dental caries and periodontal status of students in the state school for the deaf at Adjei Kojo in Ashaiman. Literature addressing dental caries, periodontal status and oral hygiene practices and knowledge, were examined.

This chapter is in seven parts covering: The relevance of oral health; The commonest oral health conditions; Dental caries; Periodontal diseases; Burden of oral diseases on countries and globally as a whole; Special needs and hearing impaired individual; Oral health knowledge and practices.

2.1 Relevance of Oral Health

The World Health Organization (WHO) defines oral health as a state of being free from chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal (gum) disease, tooth decay and tooth loss, and other diseases and disorders that affect the oral cavity, (WHO, 2014)

The relevance of oral health status has been undermined over the years. Oral health is usually treated as a separate entity from general health. A large number of medical conditions which includes life-threatening diseases and conditions usually show their first signs in the mouth and this can be detected early by the dentist (WHO, 2014). The mouth is the body's first point of defense in fighting diseases and providing immunity. It is the entry point for nutrition and thus any disease or injury to the oral cavity and its tissues greatly affects general health. The mouth reflects signs of systemic diseases. The mouth can reveal nutritional deficiencies and unhealthy

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social habits including smoking and other tobacco use and also gives indications of eating disorders.

It has been well recognized that the mouth is often the first place to see signs of HIV infections (FDI, 2015). Untreated tooth decay was the most prevalent out of the 291 conditions studied between 1990-2010 and reported by the Global Burden of Disease (FDI, 2015). Oral diseases negatively affect quality of life, self-esteem, one's confidence and social interactions. They can cause children to miss school and can lead to social isolation (WHO, 2014). It is therefore important to have healthy and well-functioning dentition in all stages of one's life. The teeth together with the facial bones help give the basic shape and form of an individual's face. The dentition supports speaking, smiling, eating and socializing (FDI, 2015).

2.2 Commonest Oral Health Conditions

Oral diseases occur in many forms and present with varying signs and symptoms but only a few cause the greatest burden on the population. Seven oral conditions and diseases have been prioritized in the African region by World Health Organization(WHO Regional Office for Africa, 2016). These oral conditions and diseases include dental caries, periodontal diseases, noma, oral cancers, oral manifestations of HIV and AIDS, oro-facial trauma from road traffic accidents and violence and cleft lip and palate. These are common in the African region and most of them are preventable or treatable at the early stages. Two of these conditions have been discussed further.

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2.2.1 Dental caries

Dental caries is the most common childhood disease. It is estimated that dental caries for example, affects 60%-90% of schoolchildren and a majority of adults of the general population and globally, an estimated 30% middle-aged individuals (35-44 years) are with no natural teeth (WHO, 2015). Untreated tooth decay in the permanent teeth ranks first among the 291 commonest conditions while untreated tooth decay in the primary teeth ranks tenth (FDI, 2015). Dental caries manifests as a result of a complex interaction between sugars (carbohydrates), susceptible tooth surface, bacteria over a period of time which produces acid to dissolve tooth enamel and dentine. With time and with no intervention, the infection spreads to the pulp, which is the internal part of the tooth with the nerve endings and blood vessels causing excruciating pain. There can also be a spread of the infection to the jawbones causing an abscess, which may be small or large enough to compress air-ways and other complications. Dental caries is the most widespread chronic disease in the world (WHO, 2015).

In India, it is known that a high prevalence of dental caries (65%) and unmet treatment needs (91.7%) are common in children with hearing impairment (Sandeep, Kumar, Vinay, Chandrasekhar, & Jyostna, 2016). In South Africa, it was reported that there was a high unmet need of all hearing impaired children compared to those of mental and physical disabilities in the same environment. There was an increase in the prevalence of dental caries with increasing age with a reported, 27.55% prevalence of dental caries for primary dentition as compared to 35.56% in permanent dentitions (Nqcobo et al., 2012).

Another study in India on the oral health status and treatment needs among institutionalized hearing impaired and blind children concluded that overall health status was poor amongst the hearing impaired as compared to the blind (Jain et al., 2013). Decayed teeth (D), missing (M)

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and filled (F) teeth resulting from dental caries have a DMFT mean score which vary greatly in the African region, with that of Ghana and Guinea Bissau having the lowest score of less than one whiles that of Gabon and Mauritius is more than four (Thorpe, 2006).

2.2.2 Periodontal diseases

Gingivitis is a chronic inflammation of the gingival tissues. Gingivitis is common in childhood and this may progress to Periodontitis if untreated. Bacteria, which is the main cause of Gingivitis, gets trapped in dental plaque, deposited on the surfaces of the teeth. Dental plaque that is not cleaned gets hardened with time to form calculus (Sayegh, Dini, Holt, & Bedi, 2005).

Periodontal diseases have been identified as the main cause of loss of teeth for people between the ages of 65 and 74 years, about 30% lose all their teeth (FDI, 2015). Prevention is the main target for managing gingivitis and hence periodontal diseases (WHO, 2015). Periodontal diseases are usually reported late when the disease is at the advanced stage.

A study conducted on Periodontal disease in primary and mixed dentition, recommended the need for periodontal examinations in children for early detection and prevention of Periodontal diseases to maintain dentition (Nobre, Fernandes-Costa, de Melo Soares & Pugliesi, 2016).

2.3 The Burden of Oral Diseases

Oral health related issues are a component of the non-communicable and preventable diseases in the world. There is currently a shift in focus from communicable to non-communicable diseases (NCD) and it is estimated that deaths from NCD's in Africa will be the major cause of mortality if this trend is not reversed by 2030 (WHO, 2015).

An estimated 15 million Disability Adjusted Life Years (DALY) can be attributed to a combination of all oral conditions. The DALY is defined as the number of years lost as a result of ill health, disability or early death. A notable increase of 20.8% was observed in DALY as a result of oral conditions from 1990 - 2010 with Eastern Africa having the largest of 51.7% and central Sub-Saharan Africa 50.5% (WHO, 2 015). Globally, oral conditions accounted for 15 million Disability Adjusted Life Years in 2010, which was an average health loss of 224 years per 100,000 people (FDI, 2015).

With urbanization and socio-economic change, the pattern of disease on the African continent is changing and the same can be said for oral diseases (Thorpe, 2006).

There is an increase in oral disease in the low and middle-income countries with the burden being more amongst those in the poor and marginalized population (WHO, 2011).

Public health expenditure for management of oral health diseases in the high-income countries accounts for 5-10%. However dental public health care in low and middle income countries are rare (WHO, 2012).Oral conditions affected 3.9 billion people worldwide in 2010, with untreated tooth decay being the most prevalent and severe periodontitis being the sixth most prevalent of all 291 conditions studied. Oral health related conditions impact on the wellbeing of people and societies and is evident at different stages across the life course. Evidence from different countries demonstrates that, considerable absenteeism from school and work is related to oral health conditions. Furthermore, dental status affects diet and nutrition, particularly in children and older people, while oral conditions and tooth loss have a significant negative impact on peoples quality of life, not only affecting them functionally, but psychologically and socially. Historically, approaches to oral care have focused on individual curative care rather than on population-based preventive interventions. However, the financial

and human resource costs of this approach are unaffordable for many countries, and unsustainable on a global scale. Most oral diseases can largely be prevented through simple cost-effective measures that involve reducing exposure to recognized risks and strengthening healthy behaviors. Prevention and oral health promotion are highly cost-effective strategies to address the global burden of oral diseases.

2.4 Special Needs and Hearing Impaired Individuals

A special needs child is one who cannot function fully physically, mentally and socially as a child of same age can. There is an estimated 150 million disabled children most of whom live in areas where healthcare accessibility is limited.

Persons with some form of disability constitute 737,743 in Ghana. Persons with hearing impairment form 15% of this population (110,625) with an ever increasing number (Ghana Statistical Service, 2013). WHO defines hearing loss in adults as hearing greater than 40 decibels (dB) in the better hearing ear and a hearing of greater than 30dB in the better hearing ear in children. The highest number of people with hearing loss live in low and middle-income countries. Hearing impairment, has been proven to delay speech, reduce cognitive skills and stalls academic progress in school, thereby affecting the total maturation and development of the child (Davis & Hind, 1999).

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2.5 Oral Health Knowledge and Practices

Basic oral hygiene practices are key for achieving good dental and gingival health (Azodo & Agbor, 2015). The importance of teaching oral hygiene for prevention of gingivitis was demonstrated in a clinical study where significant improvement in plaque removal followed good brushing instructions, regardless of type of toothbrush being used (Scheidegger N, 2005).

Poor oral hygiene knowledge, oral hygiene practices and utilization of preventive oral health care services were found to have contributed to dental conditions in a pilot study of oral health status and treatment needs in Chad (Natto & Petersen, 2014).

Studies of oral health knowledge and practices also enable us to determine the prevalence of risk factors for oral diseases and aid in formulating behavior modification strategies and dissemination of information.

2.6 Health Promotion Theoretical Models

Various models have been used to explain behavior modification in oral health practices. The most common however, being the health behavior model and the social cognitive therapy model.

The health behavior model explains the motivation that drives individuals in performing an activity (DiClemente, Salazar, & Crosby, 2013). It explains that actions or practices are performed when benefits or rewards are known to be awarded at the end or that failure to act results in consequences of which the cost outweighs the action. People will perform the necessary actions against disease or any condition that threatens their good health if they are made aware of the consequences of not responding. (Glanz, Rimer, Viswanath, & Orleans, 2008). Hollister and Anema, 2004 stated that the basic principle of the health belief model is

that the right information enables individuals to make better decisions. There were six main key concepts identified by Glanz, et al, 2008, of the health belief model. Namely, Perceived susceptibility: perceived severity: perceived benefits: perceived barriers: cues to action and self-efficacy.

Perceived susceptibility: The belief that one is at risk of getting a disease. In the context of this study, it is the individual's belief that he/she is at risk of infection causing dental caries or periodontal disease.

Perceived severity: how an individual beliefs the seriousness of a disease and its consequence. It examines how the sequelae of dental caries or periodontal diseases are well understood by the individual.

Perceived benefits: how an individual's belief in the benefits of an action that prevents or decreases the danger of developing periodontal diseases and dental caries.

Perceived barriers: how an individual's belief is linked to the cost, psychological and tangible, of taking the necessary actions to maintaining good oral hygiene.

Cues to action: these relate to the external, environmental or social factors that motivates an individual to take the required actions to avoid poor oral hygiene.

Self-efficacy: an individual's self-confidence in taking the necessary actions to avoid periodontal diseases and dental caries.

Oral health behaviors have been found to be complex and diverse (DiClemente, Salazar, & Crosby, 2013). Most common theories associated with oral health behavior are sense of coherence: stages of change: theory of reasoned action: Trans theoretical model and locus of control (Hollister, & Anema, 2004).

A qualitative study on dental attitudes reported that dental attitudes and behaviors are influenced by emotional extents, supportive, childhood experiences and cognitive knowledge (Syrjälä, 2001). Studies done by Levin and Shenkman (2004); Ogawa et al (2003); Ogundele and Ogunsile (2008); Zhu et al (2005) with different age groups all indicated that poor oral health practices, attitudes and oral health knowledge correlated with an increased level of dental diseases.

Thus the study assesses the influence of the oral health knowledge and practices in the students with hearing impairment to enable the areas and channels which can be targeted to educate and plan preventive oral health programs for this group of special needs individuals.

Summary

The chapter introduced oral health and its importance in special needs individuals. It also brought to forth the scarcity of literature on oral health status in the hearing impaired or any of the special needs groups in the country. There is a gap in literature connecting the association of oral health knowledge and practices to oral health status. Thus data from the study may help fill the gap that could aid in the formulation of health programs for this marginalized group. The next chapter seeks to describe the importance of oral health and its burden on individuals and countries as a whole. It also describes special needs individuals, oral health knowledge and practices.

CHAPTER THREE

METHODOLOGY

Introduction

This study aims to determine the oral health status and treatment needs of hearing impaired

students in a state school for the deaf. It also seeks to determine the association of oral health

knowledge and practices with oral health status of the students. Chapter 3 is in 9 sub-sections.

These sections describe the study area, study population and the variables to be measured. It

also describes the exclusion and inclusion criteria applied in the selection of the participants.

The questionnaire design and its administration and clinical examination procedures that were

used. Threats to validity were also listed and described while applying them to the study. Data

analysis using and the various statistical tests are also described in the chapter.

3.1 Study Area

The Ashaiman constituency is located in the Tema Municipal District of the Greater Accra

Region of Ghana. It is about 4km North of Tema and about 30km from Accra, the capital of

Ghana. Ashaiman falls within Latitude 5°42' North and Longitude 0° 01 west. It shares

boundaries to the North and East with Kpone-Katamanso District and to the South and West

with Tema Metropolis. The Municipality spreads over a total land area of about forty-five (45)

square kilometers (Ghana Statistical Service, 2014).

Ashaiman has a population of 190,721. The highest population is seen in the age group 0-14

years representing 12.3% and age group 80-84 years with the least population of 0.2% thus

exhibiting a broad base population pyramid. Ashaiman is a peri-urban settlement, parts of

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which exhibit characteristics of a slum. Its proximity to Tema and Accra gives the members of the community a reasonably high-level of social infrastructure and social facilities. It has about 17 health facilities with only one public health facility and referrals are usually made to the Tema General Hospital, about 30 minutes' drive away from the community. Thus, physical access to health care delivery cannot be considered a major problem for the community. There are 37 public schools in the Ashaiman Municipality made up of 18-primary, 18-JHS and 1-SHS- the Ashaiman Senior High School and 29 private schools (Ghana Statistical Service, 2014).

Ashaiman is composed largely of Ghanaians with 2.3 percent of the population being foreigners. The predominant occupation in the Municipality is the service and sales industry with the distribution amongst the wholesale and retail, repair of motor vehicles and motorcycles. The majority of the members are employed in the private formal and private informal sector (Ghana Statistical Service, 2014).

Fig 3.1 Aerial map of Ashaiman

3.2 Study Design

The study design was cross sectional quantitative. Literature indicates that a cross sectional study design is the most ideal for determining the prevalence and possible associations.

These associations can then be studied into detail in a cohort or randomized controlled study (Mann, 2003). Cross sectional study design, is also useful for advising health planning and understanding disease etiology. It has also been stated that findings from cross sectional designs can be used as a basis for generation of a hypotheses (Levin, 2006).

3.3 Sampling Procedure/Technique

Out of 231 students, 50 students were excluded based on the inclusion and exclusion criteria.

Data collection spanned over a week for both questionnaire administration and clinical examinations.

3.4 Study Population

Participants comprised of all students attending Adjei Kojo State School for the Deaf, in the Ashaiman Municipality. The school had a population size of 231 day students, in that they only attend classes on Monday through to Friday. The students' ages ranged from 6years to 24 years, and these students were distributed among the classes from Crèche to Junior Secondary (JHS).

3.5 Inclusion and Exclusion Criteria

3.5.1 Inclusion criteria

Participation of children with overall good general health based on the American Society of Anesthesiologists criteria I and II (Mitchell and Mitchell, 2014) who could communicate in the sign language.

3.5.2 Exclusion criteria

Study excluded all those without consent forms. It also excluded all those with other forms of disabilities aside hearing impairment such as partial or complete blindness and intellectual disability.

3.6 Study Variables

The study variables included their sex, age, mother's educational level and father's educational level, mother's occupation and father's occupation. Other variables composed of their scores on oral health knowledge, oral health practices, DMFT/dmft scores and oral hygiene index (OHI-S) scores. Dependent variables consists of Oral health and DMFT/dmft scores.

Independent variables consists of Oral health knowledge (OHK), Oral health practices (OHP), socio-demographic characteristics and treatment needs of the hearing impaired students.

3.7 Data Collection Tools

3.7.1 Questionnaire Design

A closed ended structured questionnaire, captured data on the socio-demographic background, basic knowledge on oral health and oral health practices. The questionnaire was adopted from Rustvold (2012) and was subsequently used by Wendling (2016). The questionnaires were self-administered but with fixed responses. The three part questionnaire consisted of Part A on socio-demographic data for each participant, Part B was on oral health practices, with seven questions (7) each with four (4) possible answers with only one being the correct answer. Part C also had five (5) questions and four (4) possible answers with only one correct answer. (Appendix D).

3.7.2 Questionnaire administration

Various studies on the different types of instructions, audio-visual aids and self-educational manuals have proposed that, visual instructions give more clarity and are more convenient than the written instructions which are less effective (Sandeep, Vinay, Madhuri, Rao & Uloopi, 2014). Another study also indicated that, instructions for children should be more efficient in targeting their needs (Axelsson, 1993).

Therefore, with the above studies in mind, indirect instructions for the study took the form of a video clip. The video clip had a translator to translate the questionnaire to sign language and then another translator to translate the sign language answers to the investigator. Any corrections on the video clip translation of the questionnaire were then edited before administering to the study participants. The video clip included an introduction that summarized the assent form for the students, to re-emphasize that participation was by free

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will and that their teachers or school administration would not sanction them should they decline to participate. It also included explanation on the procedures to aid in allaying any anxieties they might harbor. The video clip was projected onto a screen for the students to give their answers to the questions on the socio-demographic, basic knowledge of oral health and their oral health practices. The questionnaires were administered within a day, a maximum of seven hours to all the qualified study participants based on the inclusion and exclusion criteria. In all eight groups with a maximum of 25 students per group, they had the questionnaires administered to them within a time frame of 40 minutes per group.

3.7.3 Clinical assessment

For the clinical assessment, a modified WHO basic method form, 2013 for the assessment for caries, gingival index, plaque score and periodontal pocket depth (Appendix E) was used.

Oral examination made use of the mouth mirror, explorer and CPI probe (0.5, 5.5, 8.5, 11.5 graduations) recommended by WHO (2013).

Clinical assessment was conducted in one of the classrooms. The classroom had lots of natural light filtering in through the doors and windows and in addition a hand held examination light source was used. Other items to aid data collection included hand gloves, facemask, soap and water or disinfectants, hand or paper towels, gauze, a computer and projector as well as a container for sterilized instruments and another for used instruments. Clinical examination was by one dental surgeon. Two (2) dental assistants recorded data, organized and coordinated the students. Two of the school's teachers assisted in organizing and coordinating the students.

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3.7.4 Clinical Examination Procedure

The objectives of the study were to determine the oral health status, determine the treatment needs and determine the level of oral hygiene knowledge and oral health practices of the hearing impaired students. It was also to determing the influence of oral health knowledge and practices on the oral health status of the students with hearing impairment. Thus, the two (2) main indices for assessing the oral health status in the study were Dentition status using the DMFT/dmft scores and Periodontal status that included scores for periodontal pocket depth, debris scores and calculus scores using the Greene and Vermillion, 1964 simplified oral hygiene index and bleeding on probing (Appendix F).

3.7.4.1 Oral Hygiene Assessment

Simplified oral hygiene index for oral hygiene assessment on debris and calculus deposit by Greene and Vermillion, 1964 was used. Periodontal status was assessed on periodontal pocket index based on a modified form of the WHO basic survey methods for assessment (WHO, 2013). Dentition assessed were a mixture of temporary and permanent dentition. The dentition were divided into six parts (sextants) with each part having an index tooth for assessment. Indexed teeth were the upper right first molar (16) or second molar (17), upper right central incisor (11), upper left first molar (26) or second molar (27), lower left first molar (36) or second molar (37), lower left central incisor (31) and lower right first molar (46). In the absence of any of the indexed anterior teeth, the tooth on the opposite side of the midline substituted, that is 21 substituted 11 and 41 substituted 31.

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Calculus and debris deposits were assessed using the index teeth. Deposits on the labial of the upper anterior teeth and of lower anterior teeth, and deposits on the buccal surfaces of the upper posterior teeth and the lingual of the lower posterior teeth were recorded. Calculus and debris index score of zero was recorded where there was no calculus or debris present. A score of one for supragingival debris and calculus covering not more than a third of the exposed teeth while a score of two for supraginigival debris and calculus covering more than one third but not more than two thirds. The highest score of three for supragingival debris and calculus covering more than two third of the exposed teeth.

3.7.4.2 Assessment of Periodontal Status

Periodontal status assessment was done for only students 15 years and above in accordance with WHO standards. The Community Periodontal Index probe (CPI), was gently inserted into each the gingival pocket of each indexed tooth and the depth read against the color-coded graduations for the tooth in accordance with WHO guidelines. Six readings per tooth recorded - Lingual (L), Mesio-Lingual (ML), Disto-Lingual (DL), Buccal (B), Mesio-Buccal (MB), and Disto-Buccal (DB) Fig 3.2. However only the highest reading was recorded for each tooth. The periodontal pocket depth for the student was the highest reading recorded in the mouth for the student.

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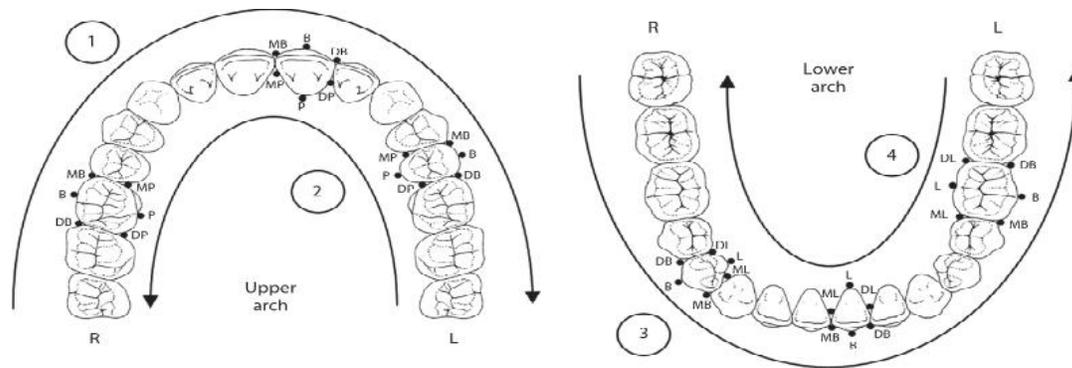
Fig 3. 1 Indexed teeth and areas for assessing pocket depth

Gingival health were assessed by bleeding on probing using World Health Organization diagnostic criteria. A score of zero for no sign of bleeding on the gingiva of the teeth on probing and a score of one for signs of bleeding on probing and x for a tooth that was excluded. Pocket depth scores were based on World Health Organization scoring. A score of zero for absence of pocket, one for pocket depth 4-5mm, two for pocket depth of 6mm and above. A score of nine for a tooth excluded and X for a missing indexed tooth.
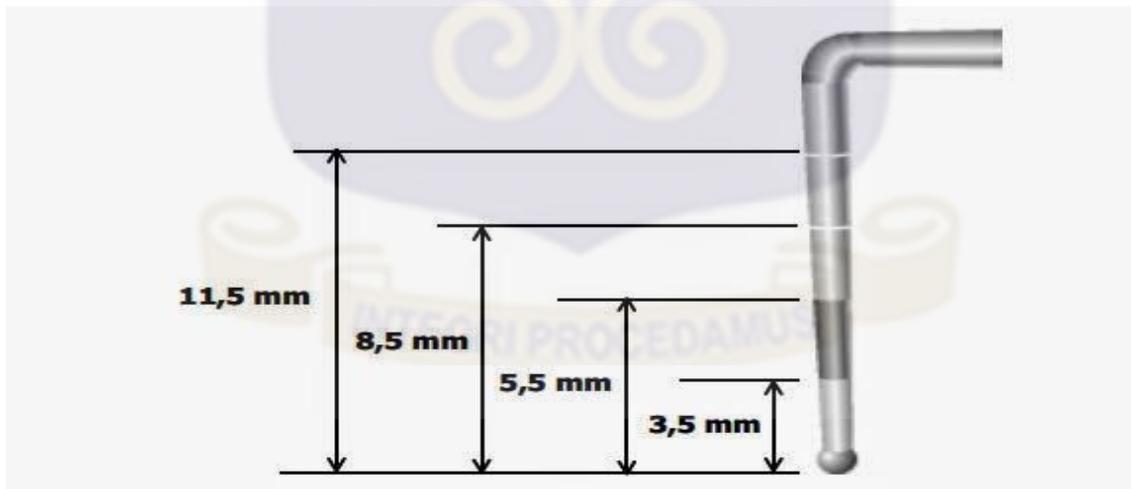
Fig 3. 2 WHO recommended Community Periodontal Index Probe (CPI) (WHO 2013).

3.7.4.3 Dentition Score

Dentition status was by scoring each tooth. Normally, each individual has 32 teeth, however, a maximum of 28 teeth were assessed for the older children as the wisdom teeth may not have erupted in some of the students.

The World Health Organization scoring criteria for decayed, missing and filled teeth (DMFT/dmft) were used to assess dental caries. According to the WHO diagnostic criteria, a D/d (decayed) is scored for a tooth with a lesion in the pit/fissure/smooth surface, undermined enamel, with a soft floor on probing and with a temporary filling with caries. Missing tooth (M/m) scored for any tooth extracted due to caries and not for unerupted or exfoliated tooth (natural loss of teeth more in children especially with the primary teeth) or tooth extracted due to trauma or another reason aside from caries. F/f (filled) scored for any tooth filled due to only caries. Table 1 shows the WHO codes and scores for dental caries diagnosis.

Table 3.1 Dentition Score

Code		Condition/status
Primary teeth	Permanent teeth	
A	0	Sound tooth
B	1	Caries
C	2	Filled, with caries
D	3	Filled, no caries
E	4 -	Missing due to caries
----	5	Missing: other reasons
F	6	Fissure sealant
G	7	Fixed prosthesis
	8	Unerupted crown or unexposed root
	9	Not recorded

Source: World Health Organization basic examination methods (WHO, 2013)

3.8 Threats to Validity

Validity can be defined as the best approximation to the truth of a given proposition, inference or conclusion, and can be divided into four main types- conclusion validity, internal validity, construct validity and external validity, with each of them having further subdivisions (Crocker & Algina, 1986).

3.8.1 Construct Validity

Construct validity is similar to conclusion or statistical validity except that as statistical validity generalizes data in the study to other people, places or time, constructs validity generalizes the measurements or outcomes to the concepts or the programs set out to measure (Trochim, 2006).

Threats to construct validity may include but not limited to pretest sensitization "practice effect" especially when pilot studies are done in the study population and language or cultural bias- if the participants do not understand the questionnaire.

A pilot study was conducted at a different sample location but with similar characteristics to the sample population- hearing impaired children.

3.8.2 Statistical/ Conclusion Validity

Conclusion validity describes the extent to which conclusions about the relationship in the study are reasonable (Trochim, 2006). It is vital for the study to have validity and to attain the set objectives. The statistical validity is hoped to be attained based on the appropriate selection of the statistical analysis.

3.8.3 Internal Validity

Internal validity in a descriptive study as this cross sectional study will have threats such as selection bias, measurement errors, and cause-effect. One dental surgeon took all the measurements on the study participants. An adequate sample size of 181 was taken to establish internal validity as much as possible.

3.8.4 External Validity

This cross sectional random sampling study can only be generalizable to the population with similar characteristics such as peri-urban setting, day pupils. It cannot be generalized to hearing impaired schoolchildren in a boarding setting as conditions there may not apply to the study population such as nutrition or diet, as the diet in boarding settings are monitored by the authorities. The schedule for the boarding activities are also different and that can influence oral health practices and attitudes that will influence oral health status.

3.9 Data Analysis

Data was entered and analyzed using Stata V14. Basic dental knowledge had five questions each with possible answers with only one correct answer and oral health practices had seven questions each with possible answers with only one correct answer. Total score was calculated by adding total number of correct answers by the student. Thus, dental knowledge score ranged from 0-5 and oral health practices score ranged from 0-7. The scores were categorized into poor oral health knowledge and good oral health knowledge. A total score of four or more for oral health practices indicates good oral health knowledge and a score of three or less for poor

oral health practices. Oral health knowledge was good if a student scored three or more on the oral health knowledge questions and poor if student scores two or less.

A Z-test was used for analysis of proportions of prevalence of caries, oral hygiene status and periodontal status. One-way analysis of variance for mean and standard deviations of dentition status according to age. In addition, Chi-square test for associations of oral health knowledge, practices on oral health hygiene, dentition status and periodontal status. Fischers exact test was applied by convention for cells that had less than a frequency of 5.

Oral hygiene index-S (OHI-S) was a sum of debris score and calculus score based on Greene and Vermillion's (1964), simplified oral hygiene index assessment. Using World Health Organization classifications, OHI-S was categorized into good, fair and poor. Dentition status was categorized into "absence"-those with no decayed, missing, filled teeth and "presence"-those with decayed, missing and filled teeth.

Mean and percentages of decayed (D/d) missing (M/m) and Filled (F/f) teeth calculated from the dentition status recorded and treatment needs adapted from a study in India on dental treatment needs of children with disabilities.(Ajami, Shabzendedar, Rezay, & Asgary, 2007)based on WHO treatment needs criteria was also recorded.

Periodontal status has two components: Gingival bleeding index and periodontal pocket depth. A zero for no bleeding when probed indicative of healthy or normal gingiva and one for gingivitis on the score for bleeding on probing. Oral hygiene index calculated by summing up plaque score and calculus score according to Greene and Vermillion (1964), simplified oral hygiene index. Oral hygiene index was categorized into good, fair and poor.

Good - score of 0-1.2   Fair - score of 1.3-2.9   Poor- score of 3.0 -6.0

Treatment needs were categorized based on the type of restorative or periodontal treatment required into none, mild, moderate and complex in table 3.2.

Table 3.2 Treatment needs criteria

Type of treatment required	Criteria
None	Oral hygiene instructions, improved oral hygiene practices
Mild	Preventive treatment –scaling and polishing, application of topical fluoride and fissure sealants
Moderate	1-3 teeth require surface restorations. Pocket depth >4-5mm
Complex	>4 teeth require restorations, extractions, endodontic treatments, stainless steel crowns, periodontal treatment (pocket depth >6mm).

3.9.1 Analysis for Research Questions Three and Four

Research questions three: which was to determine the influence of oral hygiene knowledge on oral health status among the hearing-impaired students at the school for the deaf at Ashaiman.

Research question four: which was also to determine the influence of oral hygiene practices on the oral health status of the hearing impaired at the school for the deaf at Ashaiman.

These questions were answered by applying logistic regression analysis. Presentation of results in frequency tables: the dental caries proportion or percentage, the proportion or percentage of the scores for the periodontal index, plaque scores and gingival index of the hearing impaired students with the different age categories,-6-9 years, 10-14 years, 15-19 years, 20-24 years and the overall total. The mean dmft/DMFT scores were also presented with their standard

deviations and the treatment needs presented as frequencies and percentages based on the

WHO criteria for treatment needs.

Table 3.3 Analysis for Research Questions 3 And 4

Research question, RQ	Hypothesis, $H_\circ$	Variables	Analysis
RQ3: Does OHK of the schoolchildren with HI influence their OHS?	The number of correct scores on OHK obtained by the adolescents with HI has no influence on their OHS	IV: OHK DV: DMFT scores and OHI-S scores Covariates; sex, age	Frequency table: proportion or percentage Cross tabulation: DV: high/low DMFT IV: Good/ Poor OHK Binary logistic regression analysis
RQ4: Does OHP of schoolchildren with HI influence their OHS?	The number of correct scores on OHP obtained by the adolescents with HI has no influence on their OHS	IV: OHP DV: DMFT/dmft scores and OHI-S scores Covariates; sex, age	Frequency table: proportion or percentage Cross tabulation: DV: high/low DMFT IV: Good/ Poor OHP Binary logistic regression analysis

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3.10 Ethical Considerations

Creswell (2007), stated that, participants taking part in research, research site and vulnerable populations should be respected by researchers. Lott (2005), also emphasized on the fact that vulnerable population- children, populations with disabilities or special needs who are attractive to researchers due to their vulnerability should come to no harm during the research. With the assistance of a sign language interpreter, the participants were informed about the nature of the study and assured of confidentiality of the data. They were also informed of their right to decline to participate in the study with no consequence whatsoever.

Informed consent was sought from their parents and ethical approval from the Ghana Health Service Ethical Review Committee.

In order to make examinations easier on subsequent visits, questionnaires and clinical assessment forms had names on them. For security of the data, the hard copies will be kept safe under lock and key. Soft copies of the data will be stored on a password-protected file on a password-protected computer. The data collected and the analysis will only be accessed by me and the data destroyed not more than three years after this study was completed.

There are no anticipated risks in the conduction of this study. Parents, teachers and the students benefitted from the study as they stood to gain from an oral health talk on good oral health practices and the knowledge of the status of their oral health through the examination process and treatment options available for various dental conditions.

3.11 Conflict of interest

There is no conflict of interest. The study was self-financed in partial fulfilment of the Masters in Public Health Degree from the University of Ghana, Legon.

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3.12 Pilot Study

A pilot study was conducted at the Mampong School for the Deaf, where 10 participants were examined clinically for assessment of dental caries: decayed teeth, missing teeth and filled teeth. The video clip containing the questionnaire translated in sign language was played to the 10 students to fill out the questionnaire. Any corrections or modifications were applied before the main study.

Summary

The potential relationship between the oral health status and oral health knowledge and practices for the hearing impaired students at a school for the deaf at Ashaiman were investigated.

With the dearth of data on special needs individuals, a cross-sectional design was applied in the study to capture the prevalence of the oral health and the possible associations for future research. A purposive sampling of 181 hearing impaired students were assessed as random sampling was inconvenient due to the special or rare nature of the group under study. Survey questionnaire as well as the methods for the collection and analyzes of the data collected were described in chapter 3. The methods of questionnaire administration and clinical examination procedures were also described. In addition confidentiality and security of the information on the participants was enumerated and assurance given in this chapter,3.

Threats to validity of the study were listed and also discussed. Ethical consideration of the students were also discussed and how it was managed. The next chapter lists the findings of the study predominantly in a tabular format.

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CHAPTER FOUR

RESULTS

Introduction

The study objectives were to determine the oral health status of the hearing impaired students at the state school for the deaf at Ashaiman and also determine their treatment needs. The study was also to determine the influence of the oral health knowledge on the oral health status of the students and to determine the influence of the oral health practices on the oral health status. This chapter reports the results obtained from the data collection and analysis. The analysis included frequency generation, mean with standard deviations, chi-square and Fischer's exact in some instances. It also employed logistic regression analysis to in the determination of the influence of oral health knowledge and practices on the oral health status of the hearing impaired students at the school for the deaf at Ashaiman.

4.0 Socio-Demographic Characteristics of Participants

Table 4.1 shows the socio-demographic characteristics of the student participants. Total sample for the study was 181, with more than half of the population being females 98 (54.14%). Majority of the population were between the ages of 10-19 years 165 (91.16%) being 85 (46.96%) for 10-14years age group and 80 (44.20%) for 15-19 years age group. Students were predominantly Christians 155 (85.64%) with Akan 57 (31.49 %) and Ewe 56 (30.94%) being the main ethnic groupings. Reported educational level for mothers obtained from study participants were mostly vocational 28.73 (52%) and that of father's educational level were

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mostly secondary 58 (32.04%). Parents were mostly self-employed, 124 (68.51%) and 146 (80.66%) for mother's occupation and father's occupation respectively.

Table 4.1 Socio-demographic characteristics of students

Description		Number	Percentage
Sex	Male	83	45.86
	Female	98	54.14
Mean age (± SD)	15 ±3.143		
Age	6-9 years	3	1.66
	10-14 years	85	46.96
	15-19years	80	44.20
	20-24years	13	7.18
Ethnicity	Akan	57	31.49
	Northerner	21	11.60
	Ewe	56	30.94
	Ga	47	25.97
Religion	Christian	155	85.64
	Muslim	25	13.81
	Traditioanlist	1	0.55

Description		Number	Percentage
Mother's educational level	None	50	27.62
	Primary	41	22.65
	Vocational	52	28.73
	Secondary	22	12.15
	Tertiary	16	8.84
Mother's occupation			
	Housewife	42	23.20
	Self-employed	124	68.51
	Other	15	8.29
Father's educational level	None	18	9.94
	Primary	42	23.20
	Vocational	28	15.47
	Secondary	58	32.04
	Tertiary	35	19.34
Father's occupation			
	Unemployed	25	13.81
	Self-employed	146	80.66
	Other	10	5.52

4.1 Oral Health Status

4.1.1 Dental caries and oral health hygiene by sex

Table 4.2 shows majority 137 (75.69%) of the students were caries free. The overall oral hygiene status was unsatisfactory (a combination of fair and poor), 91.84% for females versus 89.15% for the male students. Unsatisfactory oral health status was worse in the female students.

Table 4.2: Distribution of dental caries and oral health hygiene by sex

	Dental caries		Oral hygiene status			
	Caries free	**Caries present**	**Good**	**Fair**	**Poor**	**Total**
Male	67 (80.72)	16 (19.28)	9 (10.48)	30 (36.14)	44 (53.01)	83
Female	70 (71.43)	28 (28.57)	8 (8.16)	38 (38.78)	52 (53.06)	98
Total	137 (75.69)	44 (24.31)	17 (9.39)	68 (37.57)	96 (53.04)	181

4.1.2 DMFT/dmft scores of students by age

Table 3 shows that the mean score of DMFT was 0.45 (SD: 0.885) and dmft was 4.5 (SD: 4.949). Decayed (D/d) were the main components for the DMFT/dmft 1.81 (SD: 0.764) and 4.5 (SD: 4.949) respectively.

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Table 4.3: Distribution of students by age according to dentition status-mean (±sd)

	Decayed (D)	Missing (M)	Filled (F)	DMFT	decayed (d)	missing (m)	filled (f)	Dmft
6-9years Mean(sd)	1 (0)	0	0	0.33 (0.577)	0	0	0	0
10-14years Mean(±sd)	1.64 (0.643)	0	0	0.27 (0.662)	4.5 (4.949)	0	0	4.5 (4.949)
15-19years Mean(±sd)	1.96 (0.824)	1.33 (0.577)	0	0.69 (1.07)	0	0	0	0
20-24years Mean(±sd)	1.5 (0.707)	0	0	0.23 (.599)	0	0	0	0
Total	1.81 (0.764)	0	0	0.45 (0.885)	4.5 (4.949)	0	0	4.5 (4.949)

4.2 Periodontal status and periodontal treatment needs

Oral hygiene status and gingival index was poor in the study participants, which were 53.04% and 66.85% respectively. Periodontal treatment needs ranging from oral hygiene instructions and prophylaxis to scaling were required by 66.85% of the students.

Periodontal pocket depth of 4-5mm was observed in 18% of the students (Table 4.4).

Table 4.4 Distribution of the students according to periodontal status and treatment needs

		6-9yrs	10-14yrs	15-19yrs	20-24yrs	Total
Debris score	Good	1 (33.33)	11 (12.94)	9 (11.25)	0 (0)	21 (11.60)
	Fair	2 (66.67)	67 (78.82)	63 (78.75)	13 (100)	145 (80.11)
	Poor	0 (0)	7 (8.24)	8 (10.00)	0 (0)	15 (8.29)
Calculus score	Good	1 (33.33)	22 (25.88)	18 (22.50)	1 (7.69)	42 (23.20)
	Fair	2 (66.67)	60 (70.59)	59 (73.75)	11 (84.62)	132 (72.95)
	Poor	0 (0)	3 (3.53)	3 (3.75)	1 (7.69)	7 (3.87)
Oral hygiene	Good	1 (33.33)	9 (10.59)	7 (8.75)	0 (0)	17 (9.39)
	Fair	2 (66.67)	38 (44.71)	24 (30)	4 (30.77)	68 (37.57)
	Poor	0 (0)	38 (44.71)	49 (61.25)	9 (69.23)	96 (53.04)
Periodontal status :						
Gingival status	Good	2 (66.67)	32 (37.65)	24 (30.00)	2 (15.38)	60 (33.15)
	Poor	1 (33.33)	53 (62.35)	56 (70.00)	11 (84.62)	121 (66.85)
Pocket depth	Absence of	3 (100)	85 (100)	52 (65.00)	7 (53.85)	147 (81.22)
	Presence of	0 (0)	0 (0)	28 (35.00)	6 (46.15)	34 (18.78)
Periodontal						
	None-OHI	2 (66.67)	32 (37.65)	24 (30.00)	2 (15.38)	60 (33.15)
	OHI+Prophylaxi	1 (33.33)	53 (62.35)	56 (70.00)	11 (84.62)	121 (66.85)

4.3 Oral health practices.

Table 4.5 shows that a majority (66.85%) of the students brushed once a day with 58.56% responded they had never visited a dentist. About eighteen percent (18.78%) of the students responded the main reasons for dental visits were due to toothache or pain in the gums. Sixty-seven percent (67.40%) spend 30sec to 1 minute to brush their teeth and less than half (40.33%) reported to change their toothbrushes every 3 months. Only 16.57% indicated that type of toothbrush used for brushing does not matter and 33.15% reported to use a soft bristle toothbrush. Water was the predominant beverage intake for the students in a week (81.77%).
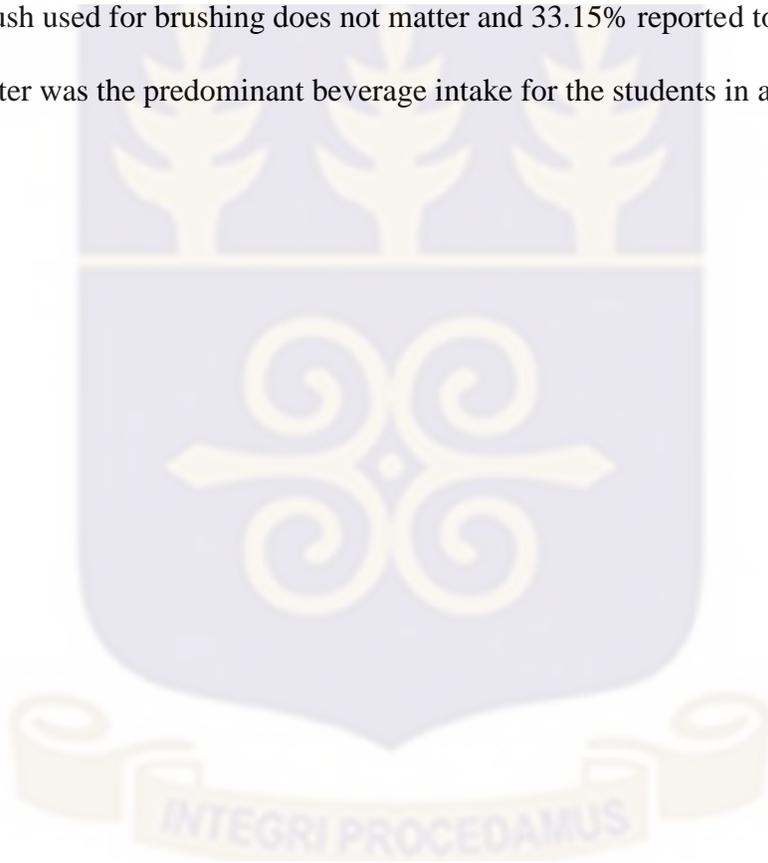
Table 4.5 Oral health practices scores (OHP)

N =181

	Number	Percentage (%)
How often do you brush your teeth in a day		
Once	121	66.85
More than thrice	1	0.55
Thrice	3	1.66
Twice	56	30.94
How often do you visit a dentist		
Once a year	9	4.97
Only when in pain	34	18.78
Twice a year	11	6.07
Never	128	70.72
How long do you spend brushing your teeth		
30sec-1min	122	67.40
2mins	56	30.94
3-4mins	3	1.66
How often do you replace your toothbrush		
Every 3 months	73	40.33
Every 6-9months	59	32.60
Once a year	7	3.87
When the bristles are off	42	23.20
What type of toothbrush bristles do you use?		
Hard	44	24.31
Medium	47	25.97
Soft	60	33.15
It does not matter	30	16.57
What beverage do you drink in a week		
Water	148	81.77
Fruit juice	10	5.52
Tea,milo,cocoa	13	7.18
Soft drink-cola,Fanta,Miranda	10	5.52
Reasons for last dental visit		
Toothache/pain in gum	34	18.78
Regular check up	11	6.08
Trauma	8	4.42
Never	128	70.72

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4.4 Oral health knowledge

Table 9 below shows good overall oral health knowledge. Majority (58.56%) of the students were aware that fluoride in toothpaste decreases the development of caries. Only 15.47% knew that the best time to eat sweets was along with a meal. Sixty percent (60.77%) were aware of the importance of visiting your dentist regularly to prevent tooth decay and gum diseases. Knowledge about oral health issues were taught either in school (33.70%) or through advertisement, educational programs on television (29.28%).

Table 4.6 Oral health knowledge scores (OHK)

	Number	Percentage (%)
Is fluoride in toothpaste healthy for your teeth		
Yes, it decreases the development of cavities	106	58.56
No, it does not make any difference to teeth	30	16.57
Paste w/without fluoride protects teeth	21	11.60
I do not know	24	13.26
What is the tooth-friendly time to eat sweets		
As a snack on its own	39	21.55
Anytime	88	48.62
Along with a meal	28	15.47
Last thing for desert	26	14.36
How did you know about dental issues?		
Was taught in school	61	33.70
Advertisement, educational programs on TVs	53	29.28
Through discussion with friends	41	22.65
Don't know about dental issues	26	14.36
Is it important to visit your dentist regularly?		
No, unless you have a toothache	71	39.23
Yes, to prevent tooth decay and gum diseases	110	60.77
What causes tooth decay and gum diseases?		
Nothing, it's a natural ageing process	17	9.39
It's a hereditary disease	38	20.99
It's a combination of sugar and gum	71	39.23
I do not know	55	30.39

4.5 Association between oral health knowledge (OHK), oral health practices (OHP),

DMFT/dmft, and oral hygiene index (OHI-S)

There was significant association between oral health practices (OHP), the oral hygiene status

(OHI-S) and gingival status of the students (p-value 0.001). The study also recorded a

moderate association between oral health practices and dental caries status, DMFT/dmft

(0.032)

There was also significant association between oral health knowledge and oral hygiene status

(0.020). See table 4.7 below

Table 4.7 Association between oral health knowledge (OHK), practices (OHP), DMFT/dmft and oral hygiene index (OHI-S)

	OHP			OHK		
	Good	**Poor**	**p-value**	**Good**	**Poor**	**p-value**
OHI-S						
Good	13 (18.57)	4 (3.60)	**0.001**	12 (11.32)	5 (6.67)	**0.020**
Fair	33 (47.14)	35 (31.35)		47 (44.34)	21 (28.00)	
Poor	24 (34.29)	72 (64.86)		47 (44.34)	49 (65.33)	
DMFT						
Absence	59 (84.29)	78 (70.27)	**0.032**	78 (73.58)	59 (78.67)	0.432
Presence	11 (15.71)	33 (29.73)		28 (26.42)	16 (21.33)	
Gingival						
Absence	36 (51.43)	24 (21.62)	**0.001**	41 (38.68)	19 (25.33)	0.060
Presence	34 (48.57)	87 (78.38)		65 (61.32)	56 (74.67)	

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4.6 Logistic regression analysis of influence of oral health knowledge (OHK), oral health practices (OHP) on oral health status.

Table 4.8 below show the influence of poor oral health practices on dental caries.

The proportional odds of poor dental caries status is 0.35 times lower in students with good

oral health practices as compared with those with poor oral health practices. (aOR: 0.35.; CI:

0.16 - 0.79: p=0.012).

Table 4.8 Binary logistic regression analysis of influence of OHK and OHP on dental caries- DMFT by age and sex.

Variables	Unadjusted			*Adjusted		
	OR	95%CI	p-value	OR	95%CI	p-value
OHK						
Poor **RC**	1			1		
Good	1.32	[0.66, 2.67]	0.433	2.09	[0.97, 4.49]	0.058
OHP						
Poor	1			1		
Good	0.44	[0.21, 0.94]	**0.035**	0.35	[0.16, 0.79]	**0.012**
Age						
6-9yrs **RC**	1			1		
10-14yrs	0.39	[0.03, 4.65]	0.460	0.62	[0.05, 8.21]	0.720
15-19yrs	1.02	[0.09, 11.75]	0.988	1.90	[0.15, 24.95]	0.624
20-24yrs	0.36	[0.21, 6.19]	0.484	0.75	[0.04, 14.71]	0.850
Sex						
Male **RC**	1			1		
Female	1.68	[0.83, 3.37]	0.148	1.94	[0.92, 4.10]	0.083

OR= Odds Ratio; CI=Confidence Interval; RC= Reference Category: OHP=oral hygiene practices: OHK=oral hygiene knowledge.
adjusted OR= all other covariates are adjusted for each variable

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Table 4.9 shows that students with good oral hygiene practices had a 23% decreased odds of

having poor oral hygiene status (aOR:0.23; 0.12 - 0.44; p= 0.001).

The odds of having combined fair and poor oral hygiene practices was 11.97 times higher for

children in the age group of 10-14 years as compared to those in 6-9 years age group

(aOR:11.97;CI:1.41 -101.41; p=0.023) Compared to the 6-9 years age group, the odds of

having poor oral hygiene was 21.78 times higher in the 15-19 years (aOR:21.78;CI: 2.45 -

190.89; p= 0.005) and 51.16 times in the 20-24 year age group. (aOR: 51.16; CI: 4.23 - 618.58;

p= 0.002).

Table 4.9 Ordered logistic regression analysis of influence of OHK and OHP on oral hygiene status, OHI-S by age and sex.

Variables		Unadjusted			*Adjusted	
	OR	95%CI	p-value	OR	95%CI	p-value
OHK						
Poor **RC**	1			1		
Good	0.44	[0.24, 0.79]	**0.007**	0.65	[0.34, 1.26]	0.204
OHP						
Poor **RC**	1			1		
Good	0.26	[0.14, 0.48]	**0.001**	0.23	[0.12, 0.44]	**0.001**
Age						
6-9yrs **RC**	1			1		
10-14yrs	5.58	[0.71, 44.00]	0.103	11.97	[1.41, 101.41]	**0.023**
15-19yrs	10.26	[1.28, 82.31]	**0.028**	21.78	[2.45, 190.89]	**0.005**
20-24yrs	16.17	[1.55, 168.40]	**0.020**	51.16	[4.23, 618.58]	**0.002**
Sex						
Male **RC**	1			1		
Female	1.05	[0.59, 1.85]	0.865	1.12	[0.611, 2.07]	0.702

OR= Odds Ratio; CI=Confidence Interval; RC= Reference Category: OHP= oral hygiene practices: OHK=oral hygiene knowledge.
*adjusted OR= all other covariates are adjusted for each variable

4.7 General Periodontal and Restorative Treatment Needs

Mild periodontal and restorative treatment needs involves treatment of oral hygiene instructions and scaling. Table 4.10 shows that 59.12% of the students required mild periodontal and restorative treatment needs. Moderate periodontal and restorative treatment needs, which involves oral hygiene instructions, restorations of one to three teeth, scaling and fissure sealants was recorded mostly (46.96%) in the 10-14 years age group followed by 44.20% in the 15-19 years age group. Only 1.66% of the student needed more advanced periodontal and restorative treatments that comprises of oral hygiene instructions, root canal therapy, crowns, bridges and root scaling.

Table 4.10 General Periodontal and Restorative treatment needs for the students

Description Preventive and/or restorative treatment need	6-9yrs N (%)	10- 14yrs N (%)	15-19yrs N (%)	20-24yrs N (%)	Total N (%)
None	1 (4.55)	11 (12.94)	10 (12.50)	0 (0.00)	22 (12.15)
Mild	1 (0.93)	57 (67.06)	39 (48.75)	10 (76.92)	107 (59.12)
Moderate	1 (2.04)	16 (18.82)	29 (36.25)	3 (23.08)	49 (27.07)
Complex	0 (0.00)	1 (1.18)	2 (2.50)	0 (0.00)	3 (1.66)
Total	3 (1.66)	84 (46.96)	80 (44.20)	13 (7.18)	181 (100)

Summary

The study was to determine the oral health status and treatment needs of the hearing impaired students at a state school for the deaf. The influence of oral health knowledge and practices on oral health status for the students were also explored. The chapter Descriptive and inferential statistics were employed to aid in answering the research questions. Fischer's exact was used in analyzing data with frequency less than 5 per the rule of thumb. The chapter also reported findings from binary and ordered logistics analysis which were also employed in answering research questions three and four of the influence of the oral health knowledge and practices on the oral health status.

The findings reported in this chapter have been discussed in the following, chapter 5 in correspondence to the objectives set for the study and in comparison with literature.
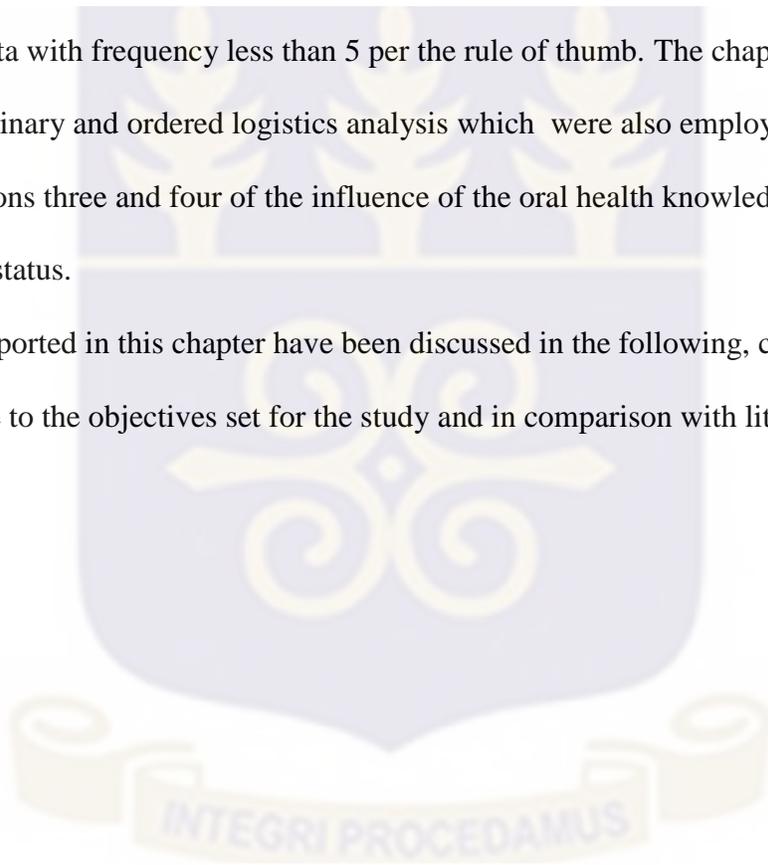
CHAPTER FIVE

DISCUSSION

5.0 Discussion of the results

Introduction

The study was to determine the oral health status and treatment needs of the hearing impaired students at a state school for the deaf. It also explored the influence of oral health knowledge and practices on oral health status for the students. The major findings reported in chapter 4 were a predominantly high percentage of female students to males in the school, 54.14%. The major age range between 10-19years. Overall, unsatisfactory oral hygiene status higher in the females, 91.84% as compared to the males 89.15%. Treatment needs required by more than half of the students, 66.85%. The influence of the oral health knowledge and practices to oral health status were found to be significant. This chapter interprets the results reported and link to similar studies in the literature.

5.1 Oral Health Status

5.1.1 Dentition status: Caries

There is neither data on oral health status of the hearing impaired nor any other special needs groups in the country to the best of the researcher's knowledge at the time of study. This thus, provides a baseline for oral health status, knowledge and practices of one group of the special

needs individuals. The study found the prevalence of caries among the hearing impaired to be 24%. This was higher than the 17.4% prevalence of caries that was found in a study of 9-15 year olds school children in Accra (Ndanu, Aryeetey, Sackeyfio, Otoo, & Lartey, 2015). There are wide variations in the prevalence of caries in various studies on hearing impaired pupils. A study by Al-Qahtani and Wyne (2004), reported 91% prevalence of caries in 6-7 year olds and 95% in 11-12 year old hearing-impaired children in Saudi Arabia. Another study by Rao, et al (2001), reported 65.1% in the prevalence of caries and Suma 42% prevalence of dental caries. The main component of the dental caries in these studies as was in this study was decayed untreated teeth.

Other studies reported mean DMFT scores of 7.35 (SD: 3.51) in 6-7 year old and 5.12 (SD: 3.45) in 11-12 year old hearing-impaired children. (Al-Qahtani & Wyne, 2004) Jain et al, 2008 reported a mean DMFT score of 2.17 (SD: 1.98) in 5-8 year old and 1.76 (SD: 1.74) in 9-12 years old hearing-impaired children. A mean DMFT score of 3.86 (SD: 2.176) and dmft of 0.58 (SD: 0.231) was reported in a study in India by Sanjay et al, (2013). The mean DMFT and dmft recorded in this study were 0.45 (SD: 0.885) and 4.5 (SD: 4.949) respectively.

This is lower than most DMFT/dmft reported in other studies. The mean DMFT recorded for the children with hearing impairment is lower than that reported for the general population, 2002) (0.63) in a study conducted by Onuoha (2002), in the Ga district. Another study reported a mean DMFT score of 1.11 (SD: 0.07) and 0.30 (SD: 0.06) in 7-9 year olds and 13-16 year olds in peri-urban schoolchildren in Accra (Bruce, Addo, & Ndanu, 2002). There has been a steady decrease in the reported DMFT scores for children in the country. The mean DMFT score reported in 1964, 1981 and 1989 were 1.37, 1.30 and 0.69 respectively(Onuoha,

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2002). Perhaps there is increased awareness promoted through the efforts of the limited number of the dental profession

 Due to the wide variations of the age groups used in the various studies, comparison across these studies is challenging. However, the figures all indicate a high prevalence of dental caries in the hearing-impaired children.

Periodic utilization of oral health services as recommended by the dental professions is an assurance for preventive oral care. The high prevalence of the decayed component of the DMFT is indicative of the low utilization of the dental health services, as a higher proportion (70.72%) had never visited the dentist. Subsequently, 60.77% agreed on the importance to visit the dentist regularly to prevent tooth decay and gum diseases. Perhaps, a qualitative study will help to delve into the reasons for the poor utilization of the dental health services as the nearest major Government dental health service facility is 30 minutes away from the students.

5.1.2 Periodontal status: Gingivitis
Gingivitis is inflammation of the gingiva and it is reversible with good oral health practices Failure to arrest gingivitis, in some instance progresses to periodontitis that is an irreversible state whereby there is loss of bone and subsequently loss of teeth. Out of the 181 students, only 9.39% had good oral health status. The rest of the students (90.61%) had fair to poor oral health status. More than half of the students (66.85%) required periodontal treatment. This is lower to that reported in the study conducted on dental treatment needs of children with disabilities with their periodontal treatment needs as high as 74% in Iran perhaps different cultural practices influencing diet. (Ajami et al, 2007). More than half of the students (66.85%) had some form of gingivitis that could be resolved with good oral health practices.

Brushing of the teeth helps removes debris, thus preventing gingival inflammations and dental conditions. There was an association between brushing once a day and an increase in prevalence of gingivitis in the students (p-value 0.041).

There was an increase in poor oral health status with age increase. Students between the ages of 15-19 years had the highest score of poor oral health status and a low score in oral health practices. The odds of having poor oral hygiene status was noted to be increasing with increasing age. The odds of having unsatisfactory (combined fair and poor) oral hygiene practices were found to be 11.97 times higher for children in the age group of 10-14 years, 21.78 times higher in the 15-19 years (p-value 0.005) and 51.16 times in the 20-24 year age group (p-value 0.002).

 Perhaps supervision by parents and guardians wanes as the children age and thus contributing to this effect. These young children will possibly become parents in the near future and therefore it is imperative to impress on them the importance of good oral hygiene.

5.2 Influence of Oral Health Practices and Knowledge on Oral Health Status

In spite of poor oral health knowledge, females recorded good oral health practices. However, their overall oral hygiene status was poor. Studies have shown that good oral hygiene status and oral hygiene practices were better in females than in males in the general population in Nigeria. (Agbelusi & Jeboda, 2006; Kolawole, Oziegbe, & Bamise, 2011). Similar to a study by Folayan et al (2014), which reported better oral self-care amongst the males, the logical explanation for this observation is unknown.

Despite poor oral health practices, the students were found to have good oral health knowledge. Oral health information aside that from advertisement and educational programs on television was largely from teachers in school. Thus, regular education on oral health to the teachers can further enhance their knowledge and encourage good oral health practices amongst their students. The media can further more be a motivational and educative channel to facilitate a change in attitude for better oral health practices. Motivational materials in the form of video clips and poster can help to increase and improve on oral health practices. A study found positive effects of the use of motivational materials in boosting oral health practices and subsequently improve oral hygiene most notably in children with special needs was in India (Sandeep, Vinay, Madhuri, Rao & Uloopi, 2014). Several studies have confirmed an association between oral health knowledge and oral health status ((Gao et al., 2014; (Miller et al, 2010).

Evaluation of oral health practices for assessment of possible contribution to dental caries (p-value 0.012); oral health status (p-value 0.001) and gingival health (p-value 0.001) confirmed the influence of oral health practices. There by indicating the importance of good oral hygiene to remove deposits that harbor organisms that cause dental diseases. Poor oral hygiene status is indicative of high prevalence of dental caries and poor gingival status. However, the prevalence of dental caries is not that high. The most common beverage intake to be water 81.77% by the students may be a contributory factor. Dental caries is multifactorial with the main substrate of carbohydrate (sugar) converted to acid that then demineralizes the protective layer of the tooth structure- the enamel. The low intake of sugary snacks may be the possible explanation for the low prevalence of dental caries.

5.3 Treatment Needs of Hearing Impaired Students

The study findings depicted unmet preventive and restorative treatment needs for 77.85% of the students with hearing impairment. These unmet needs ranged from mild (59.12%) which comprised of general oral hygiene instructions, prophylaxis, fissure sealants and application of topical fluoride to complex procedures (1.66%), which include extractions, restorations, root planning and endodontic therapies. Contributory factors may include inadequate dental personnel to handle general population dental needs or lack of utilization of the dental health services. Present population of dental surgeons in the country estimated to be around 360 for the population of 27 million Ghanaians (1:75,000) (GDA, 2017). Perhaps, factors such as but not limited to the lack of training of dental surgeons in handling individuals with special needs who require special communication, special care and financial capacity of these individual with special needs may be contributory to the high unmet treatment needs.
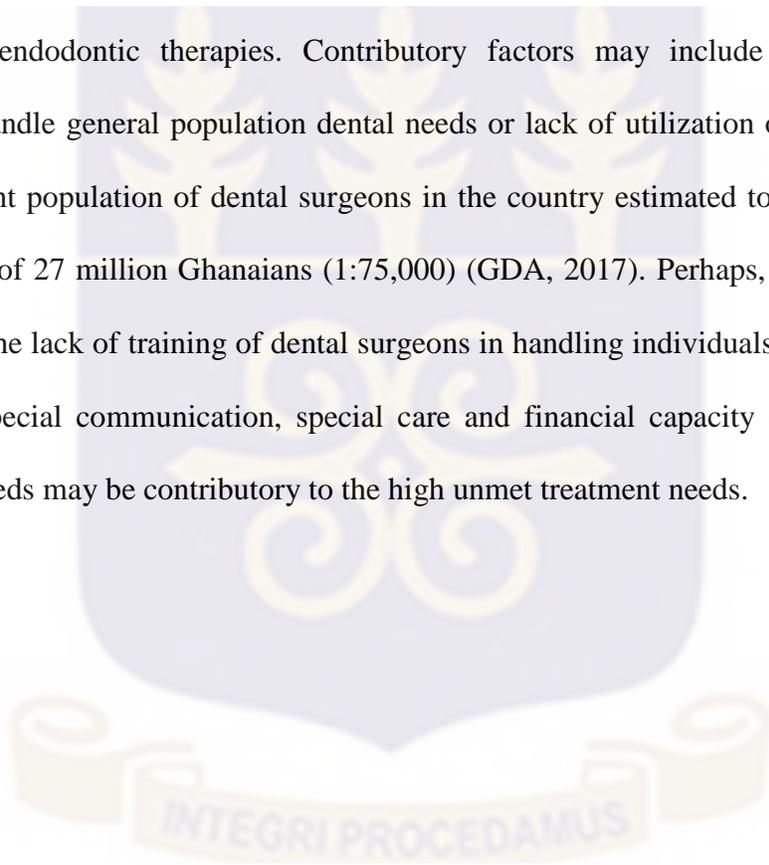
CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

Introduction

This was a descriptive study to determine the oral health status and treatment needs of the students with hearing impairment. It has also contributed to baseline literature on oral health knowledge and practices for this special group of students. The findings demonstrate unsatisfactory oral hygiene and extensive unmet treatment needs of the students with hearing impairment in the study. There was relatively good oral hygiene knowledge mostly from what was taught in school and from advertisement and educative programs on television. The study found significant association between oral health practices and poor oral health status. There was also a significant association between oral hygiene knowledge and oral hygiene status.

6.0 Conclusion

The study also aimed at filling the literature gap and to determine the influence of oral health knowledge and practices on oral health status in the students with hearing impairment. Descriptive and inferential together with binary and ordered logistic regression analysis to assess the associations between oral health knowledge and practices with oral health status and DFMT/dmft scores together with demographic data. The study reported an unsatisfactory oral hygiene status and a high treatment need for the hearing impaired students. It brings to forth

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the social implications as it provides important data which can be useful in planning oral health programs for this special group of the population.

6.1 Recommendations

The high unmet treatment need for this marginalized group is unacceptable. Thus, more effort in oral health education to re-iterate the importance of oral health is needed. The following recommendations are made for consideration by policy makers and practitioners.

1. This can be achieved by the Ghana Education service in collaboration with other stakeholders such as the dental professionals in providing regular oral health talks to such special needs groups.

2. The Ghana Dental Association will need to collaborate with the various education services to increase oral health education to these special needs individuals.

3. Ghana Health Service will need to collaborate with the Ghana Education Service and the dental professionals together with media houses to roll out educative and motivational programs on oral health practices.

4. The high-unmet treatment need for the children is unacceptable. A prevention based intervention program by the Ghana Health Service and the Dental professionals tailored to suit the population of hearing impairment to tackle these unmet needs to prevent progression of the state of the oral hygiene is necessary.

5. Future quantitative and qualitative research into the utilization and access of oral health care to help in formulation of oral health services tailored to these marginalized group.

6.2 Limitations of the study

Firstly, this was a non-probability study conducted in one institution. Secondly, it lacks a control group. The study findings cannot be generalized to all hearing impaired students as the sample size was not a representative of all hearing impaired students in the country. Secondly, there are state schools that have boarding facilities and therefore daily routine activities and diet may be different from that of the study participants. Thirdly, further studies possibly qualitative to explain the finding of better oral hygiene practices and oral hygiene status in males compared to the females. Fourthly, qualitative studies to enumerate reasons or the factors that contribute to the poor utilization of the dental health services by this marginalized group.

6.3 Strengths of the study

The questionnaires were self-administered therefore eliminating response bias that might have occurred with an interviewer administration. In addition the use of the video clip with questionnaire translated in the sign language eliminated any miscommunication that might have influenced the responses to the questionnaire

6.4 Future Research

This study was in a day state school, thus, future research may look into state schools with boarding facilities to have a comparison between the two. In addition further studies of oral health status in the other categories of special needs individuals may be beneficial in future research. These individuals comprise of the blind, cerebral palsy and deaf and dumb to aid in formulation of specific health programs for their needs.

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APPENDICES

Appendix A: Assent Form

I am Shirley Newman from School of Public Health, University of Ghana, Legon. I am doing a study to find out about hygiene in your mouth. We are hoping you will take part in the study because it will help us to recommend for planning of oral programs for you and members of your community.

For the research, we will ask you questions about what you know about your teeth and gums and how to keep them in good health. We will also check your mouth to see if you need any care for your gums and teeth problems in your mouth. Your answers will be kept private and it will not be shown to your teachers, your parents or your friends. Only people from the University working on the study will see them.

We do not think that you will have any problem if you take part in the research.

Taking part in the research will also help you know whether you are doing well with care for your mouth. We will also be able to give you some guidelines for future practice of good oral care. Taking part in the study will also help to plan for oral health programs for other children with hearing impairment.

Kindly note that:

1. You do not have to take part in the study if you do not want to. You won't get into trouble with your teachers if you say no.

2. You may stop being part of this study at any time.

3. Your parents/guardians were asked if it's OK for you to be part of the study but you can decide if you want to take part in it or not.

4. You can ask any questions you have.

5. You can contact me if you think of any questions later. My number is below.

Kindly sign the form if you:

1. Have understood what you will be doing for the study

2. Have had all your questions answered

3. Have talked to your parents/guardians about the study

4. Agree to take part in the study

Your name   Signature   Date

CONTACT

Dr Shirley Newman   0246569806   amanewman@yahoo.com

Dr Abdallah Ibrahim   0266450012   ibdallah4@gmail.com

Hannah Frimpong   0243235225   Hannah Frimpong@ghsmail.org

                             0507041223

Kindly contact any of the above at the University Of Ghana School Of Public Health and the Ghana Health Service Ethical Review Committee should you need further clarification concerning the study.

Appendix B: Consent form from Parent/Guardian

Your child/ward has been invited to join the research on the Oral health status of students in her school. The decision to let your child/ward join is up to you. Taking part in the research will also help you to know whether your child is doing well with care for his/her mouth and gum. We will also be able to give him/her some guidelines for future practice of good oral care.

Your child will be asked to answer a few questions on oral hygiene and a clinical examination of her mouth done. All this will be at the school premises. This will take a few minutes and your child is at no risk from the examination and all records will be kept confidential with no link to your child's name.

Participation is voluntary. Your child has the right not to participate or leave the study at any time and this will not get her in trouble with the school authorities or the teachers.

Kindly sign the form if you have all your questions answered and agree to let your child/ward take part in the study.

I have read the information provided, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction.

I give consent voluntarily for my child/ward…………………………………………………. to participate as a participant in this research.

Name of Parent/Guardian_____

Date_____   thumb print

CONTACT

Dr Shirley Newman	0246569806	amanewman@yahoo.com
Dr Abdallah Ibrahim	0266450012	ibdallah4@gmail.com
Hannah Frimpong	0243235225	Hannah Frimpong@ghsmail.org
	0507041223	

Kindly contact any of the above at the University Of Ghana School Of Public Health and the Ghana Health Service Ethical Review Committee should you need further clarification concerning the study.

Appendix C: Statement from Researcher

I have accurately explained the research to the participant and to the best of my ability made sure that the participant understands that:

1. He/she is in no way obligated to take part in the study and that he/she can decline participation at any time

2. The particulars of the study will be kept private- teachers, parents/guardians will not have access to the information.

3. That the answers given in the study does not influence his/her academic continuous assessment

I confirm that the participant has not been coerced into giving assent, and that assent has been given freely and voluntarily.

A copy of the form has been given to the participant.

Name: Shirley Newman

Signature: ------------------------   Date: ----------------------------------
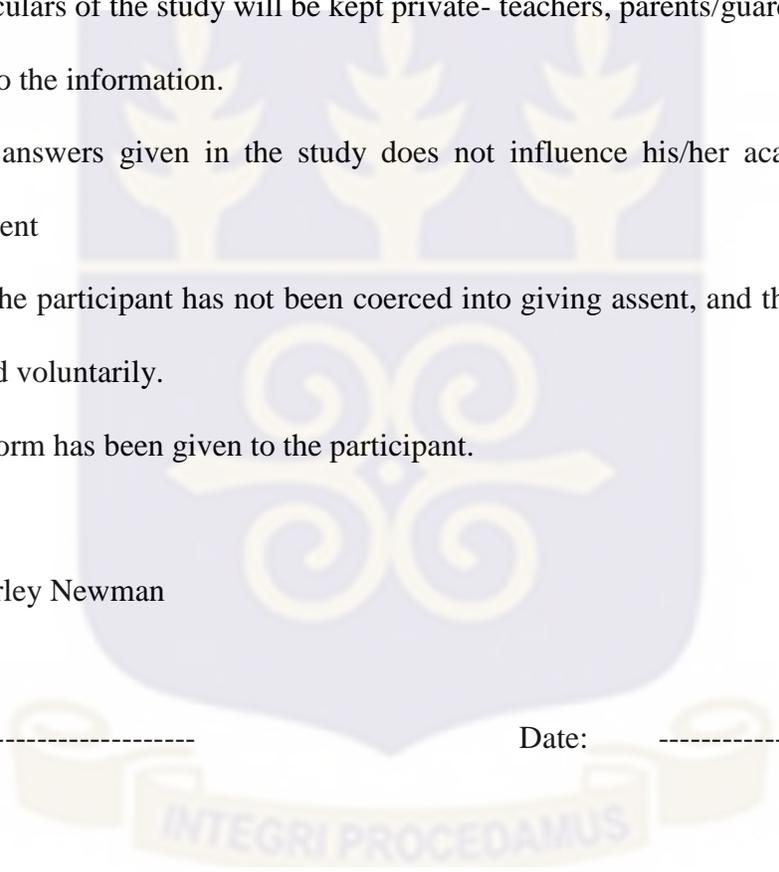
Appendix D: Questionnaire

Oral Health Status among hearing impaired students attending State School for the Deaf, Ashaiman.

A. SOCIO-DEMOGRAPHIC DATA

Date: ………………………………. ID #..............

Name…………………………….. Age today…………..

SEX   1-male   2-female ethnicity: ………….

RELIGION: 1 Christian   2. Muslim   3.Traditionalist   4. Other

Mother's occupation 1. Housewife   2. Self-employed   3. Other…………

Mother's educational level   1.None   2.primary 3. Vocational 4. Secondary 5. Tertiary

Father's occupation   1. Unemployed   2. Self-employed   3. Other………

Father's educational level   1Nnone   2.primary 3. Vocational 4. Secondary 5. Tertiary

66
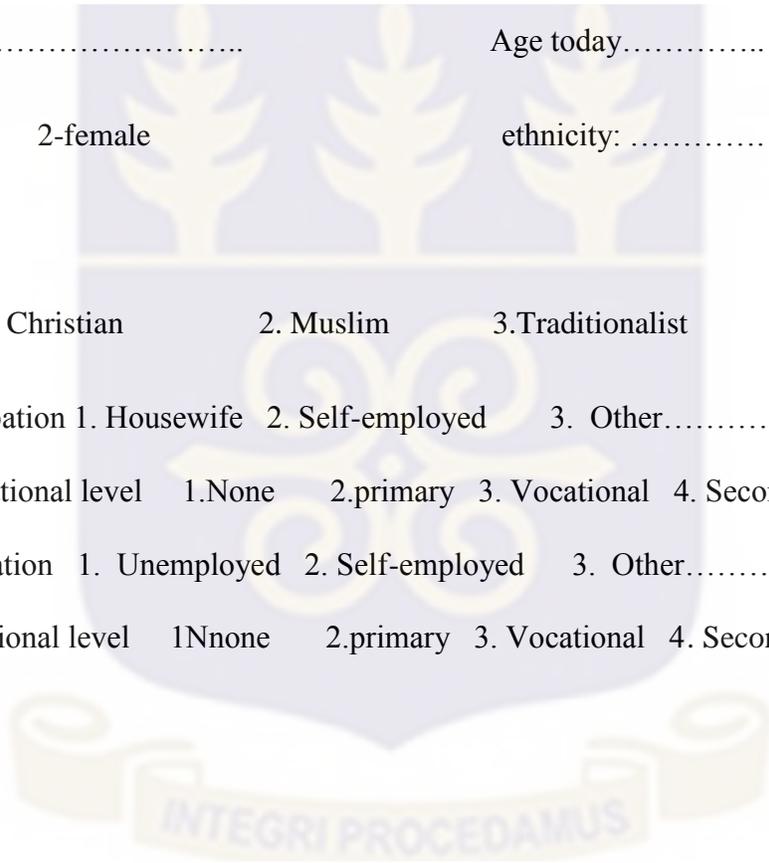
B. Oral Health Practices

A. How often do you brush your teeth?
1. Once a day
2. 3 or >times a day
3. 3 times a day
4. Twice a day

B. How often do you visit a dentist?
1. Once a year
2. Only when in pain
3. Twice a year
4. never

C. How long do you spend brushing your teeth?
1. 30 seconds-1 minute
2. 2 minutes
3. 3-4 minutes
4. 5 minutes

D. How often do you replace/change your toothbrush?
1. Every 3 months
2. Every 6 -9months
3. Once a year
4. When the bristles are off

E. What type of toothbrush bristles do you prefer?
1. Hard
2. Medium
3. Soft
4. It doesn't matter

F. What beverage do you drink the most in a week?
1. Water
2. Fruit juice
3. Tea, milo, cocoa
4. Soft drink-cola, Fanta, Miranda

G. Reasons for last dental visit
1. Toothache
2. Pain in the gum
3. Regular check up
4. Trauma

C. Oral Health Knowledge

A.   Is fluoride in toothpaste healthy for your teeth?
1.   Yes, it decreases the development of cavities
2.   No, it doesn't make any difference to the health of my teeth
3.   Toothpaste with or without fluoride protects teeth from cavities
4.   Don't know

B.   Is it important to visit your dentist regularly?
1.   No, you don't need to unless you have toothache
2.   Yes, to prevent any tooth decay and gum diseases

C.   What causes tooth decay and gum diseases?
1.   Nothing, it is a natural ageing process.
2.   It is a hereditary disease.
3.   It is a combination of sugar and germs.
4.   Don't know

D.   What is the best time to eat sweets?
1.   As a snack on its own
2.   Anytime
3.   Along with a meal
4.   Last thing at night for dessert
5.

E.   How did you know about dental issues?
1.   I was taught in school
2.   Through an advertisement, news and/or educational program on television
3.   Through a discussion with friends
4.   Read about it in the newspapers

Appendix E: WHO amended clinical assessment form

World Health Organization
Oral Health Assessment Form for Children, 2013
Amended

Appendix 3

Leave blank	Year	Month	Day	Identification No.	Orig/Dupl	Examiner
(1)	(4) (5)		(10) (11)		(14)	(15) (16)	(17)

General information: Sex 1=M, 2=F   Date of birth   Age in years

(18) (19)   (24) (25)   (26)

(Name)

Dentition status

| | 55 | 54 | 53 | 52 | 51 | 61 | 62 | 63 | 64 | 65 | | |
| | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |

Crown (45) .... (58)

Crown (50) .... (72)

| | 85 | 84 | 83 | 82 | 81 | 71 | 72 | 73 | 74 | 75 | | |
| | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |

Primary Permanent
teeth   **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

Periodontal status

| | 55 | 54 | 53 | 52 | 51 | 61 | 62 | 63 | 64 | 65 | | |
| | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |

(73) .... (86)

(87) .... (100)

| | 85 | 84 | 83 | 82 | 81 | 71 | 72 | 73 | 74 | 75 | | |
| | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 31 | 32 | 33 | 34 | 35 | 36 | 37 |

(101)

Gingival bleeding

Scores
0 = Absence of condition
1 = Presence of condition
9 = Tooth excluded
X = Tooth not present

Calculus Scores

0=no calculus present

1=Supragingival calculus covering not
more than 1/3 of exposed tooth

2=Supragingival calculus covering more
Than 1/3 but not more than 2/3 of
Exposed tooth surface or subgingival
Calculus around cervical portion or
Both

3= Supragingival calculus covering more
Than 2/3 or subgingival around
cervical portion or both

Plaque scores

0= no debris

1=soft debris covering not more than 1/3
of the tooth .Cervical 1/3

2= soft debris covering more than 1/3 and
not more than 2/3 of tooth surface

3= soft debris covering more than 2/3 of
tooth

Interventions

0=No treatment needed

1=simple: oral hygiene instruction

2=mild: Scaling, application of topical
fluoride, fissure sealants-Preventive

3=moderate: 1-3 teeth require
restorations
   Pocket depth >4.5mm

4=complex: >4teeth require
restorations, extractions,
endodontic treatments, stainless
steel crowns
   pocket depth >6mm

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Appendix F: Greene and Vermillion clinical assessment form

Id #: ……………

Name: ……………………………………   Age: …………………

Calculus scores

	Right Molar		Anterior		Left molar		Total	
	Buccal	Lingual	Labial	Labial	Buccal	Lingual	Buccal	Lingual
Upper								
Lower								

Calculus score = (The buccal-scores) **+** (The lingual-scores) **/** (Total number of surfaces examined).

=

Plaque scores

	Right Molar		Anterior		Left molar		Total	
	Buccal	Lingual	Labial	Labial	Buccal	Lingual	Buccal	Lingual
Upper								
Lower								

Plaque score = (The buccal-scores) **+** (The lingual-scores) **/** (Total number of surfaces examined).

=

Appendix G: Referral Form

The bearer …………………………………………………….received a dental screening

and was found to need some dental treatment/consultation.

We would be most grateful if you can assist.

Thank you