

**SCHOOL OF PUBLIC HEALTH  
COLLEGE OF HEALTH SCIENCES  
UNIVERSITY OF GHANA, LEGON**

**PREVALENCE OF DENTAL CARIES IN PATIENTS ATTENDING THE  
DENTAL CLINIC OF THE TEMA GENERAL HOSPITAL**

**BY**

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**THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF  
GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR  
THE AWARD OF MASTER OF PUBLIC HEALTH DEGREE**

**JULY 2016**

### DECLARATION

I declare that all information produced from this project is a result of my own research. Other works cited have been duly acknowledged by means of referencing. No part of this research has been presented elsewhere for another degree.

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Date.....



## **DEDICATION**

This dissertation is dedicated first to God Almighty and to my lovely parents, Mr. Andrew Carl Quist and Mrs. Esther Quist for the maximum care and support given me throughout the course of this programme



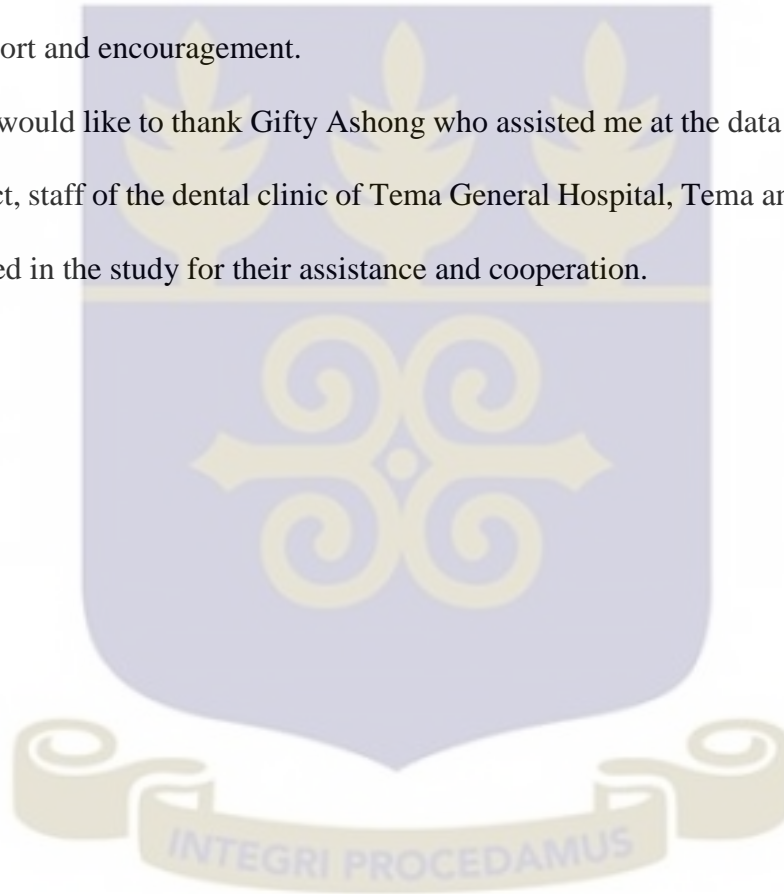
## AKNOWLEDGEMENT

This dissertation was made successful through the contribution of many.

I express my sincere gratitude to Dr. Priscillia Nortey for your guidance and supervision throughout this project. Special thanks goes to Dr S.O Sackey and all staff of the Department of Epidemiology of School of Public Health for your assistance.

I would like to express my sincere gratitude to my Husband and children for their love, care, support and encouragement.

Finally, I would like to thank Gifty Ashong who assisted me at the data collection stage of this project, staff of the dental clinic of Tema General Hospital, Tema and the patients who participated in the study for their assistance and cooperation.



## ABSTRACT

**Introduction:** Dental caries is one of the most important global health problems characterized by breakdown of normal tooth tissue by bacteria in the presence of food substrate (sugar-containing food) and over a period of time. It is highly prevalent as it affects about 60% - 90% of school-aged children and a large number of adults (WHO, 2012). It has a negative impact on the quality of life and economic productivity of a nation.

Epidemiological studies have confirmed some relationship between economic, demographic and behavioral factors. However, there is very little evidence of the relationship between dental caries and these social factors especially in Ghana. Significant economic productivity lost yearly due to absenteeism in school and work as a result of untreated dental caries remains a challenge. Therefore the aim of this study was to determine the prevalence and social factors that affect or have influence on dental caries

**Objective:** To determine the prevalence and social factors related to dental caries among patients aged 3 years and above attending the dental unit of Tema General Hospital, Tema

**Methods:** Cross-sectional design was used in this study. Purposive sampling and a sample size of 160 was used for this study. Data was collected from 160 patients attending the dental unit of the Tema General Hospital, Tema, to determine the social factors and distribution of dental caries amongst these patients.

**Results:** The prevalence of dental caries among patients attending the dental unit of Tema General Hospital was found to be 81.3% and 92.3% of these patients had complete destruction of the tooth. The mean age of patients with dental caries was  $31 \pm 16.9$  years. Strong association was observed between socio-demographic and behavioral factors.

**Conclusion:** The prevalence of dental caries in this study is high. Therefore, there should be reinforcement of public oral health education with emphasis on regular dental check-up. This will help in early diagnosis and treatment.

**Key words:** dental caries, socioeconomic, demographic, socio-behavioral factors



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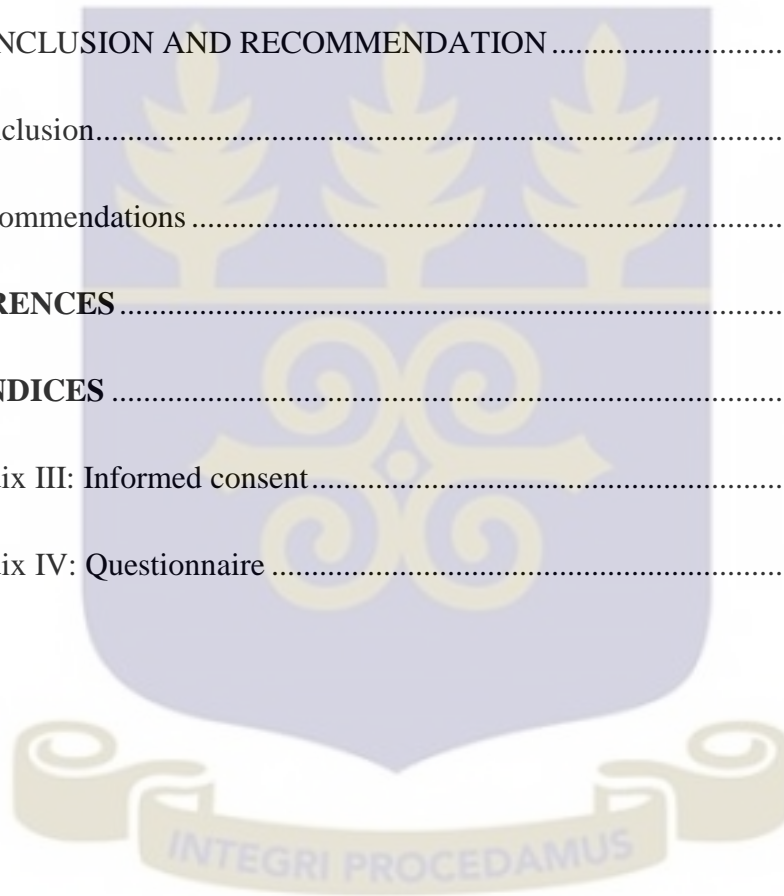
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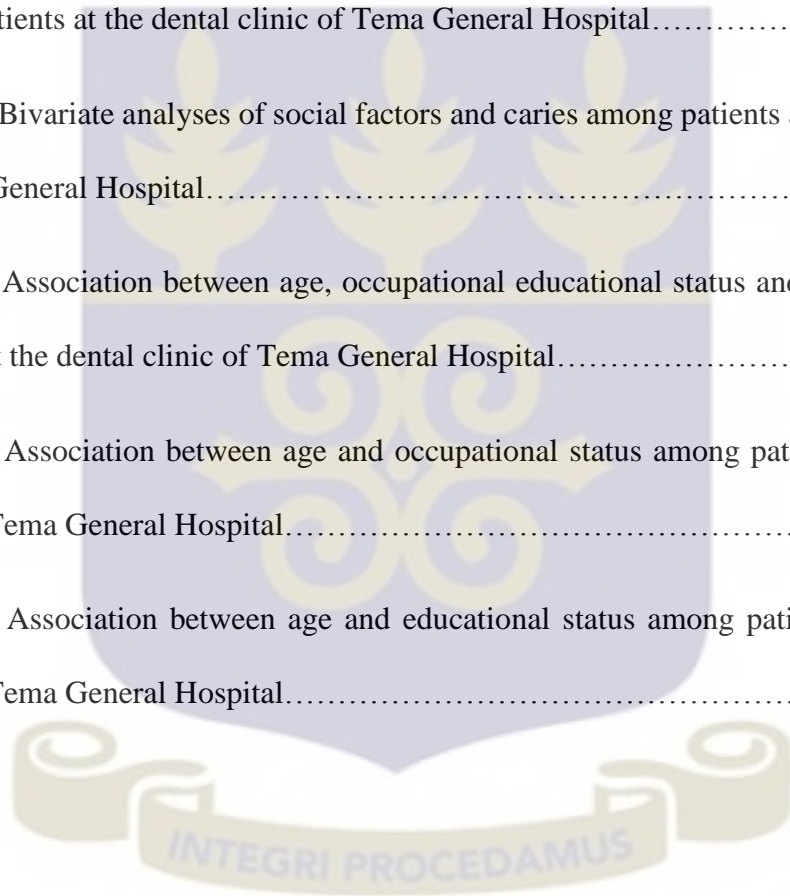
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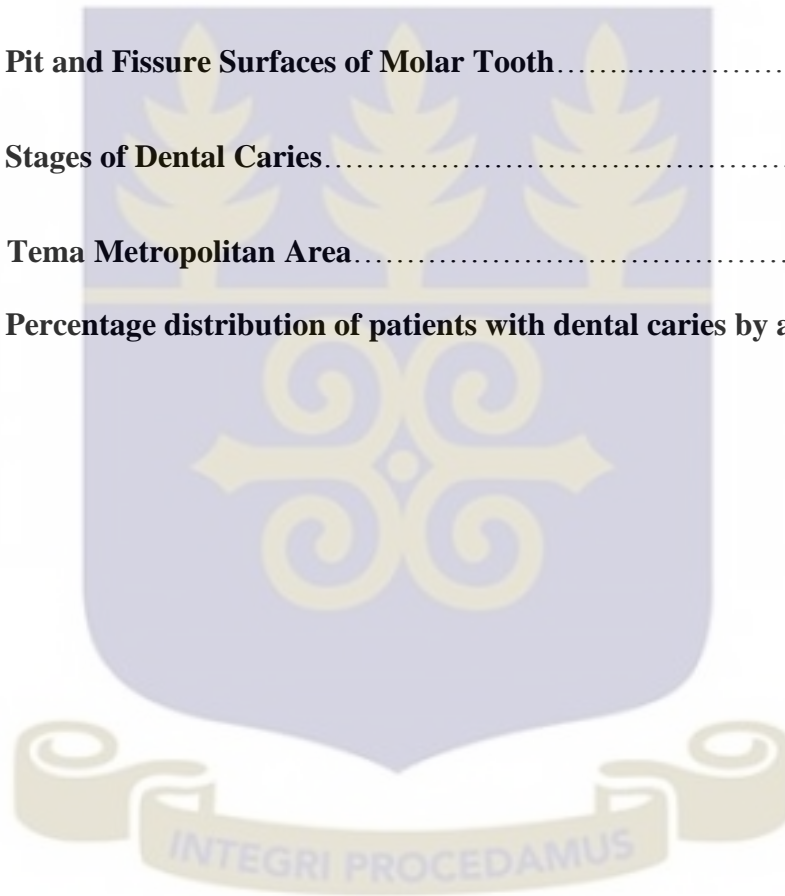
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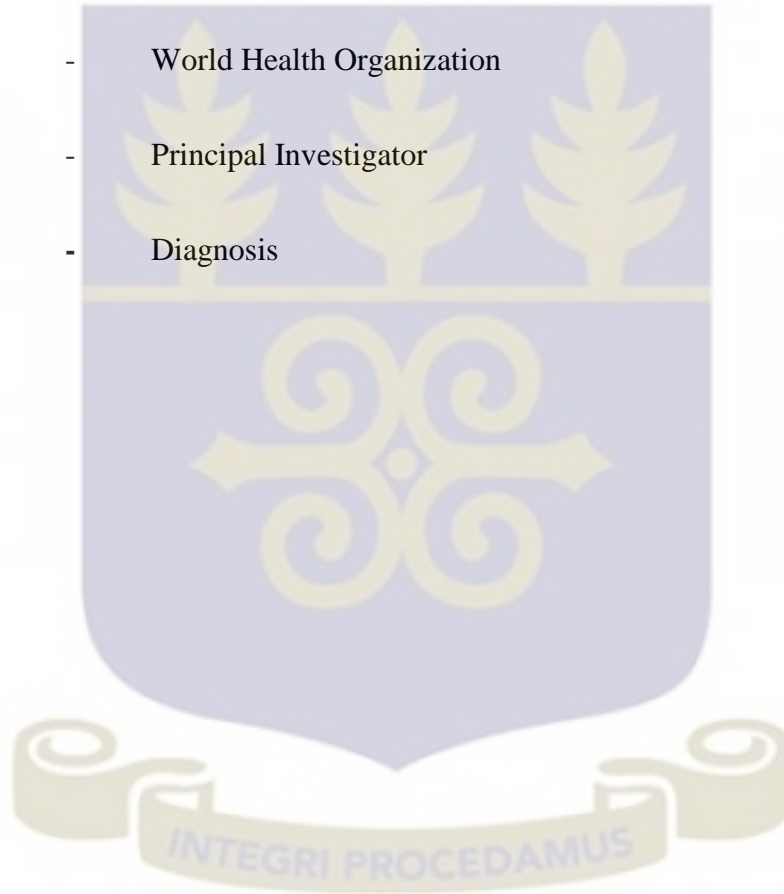
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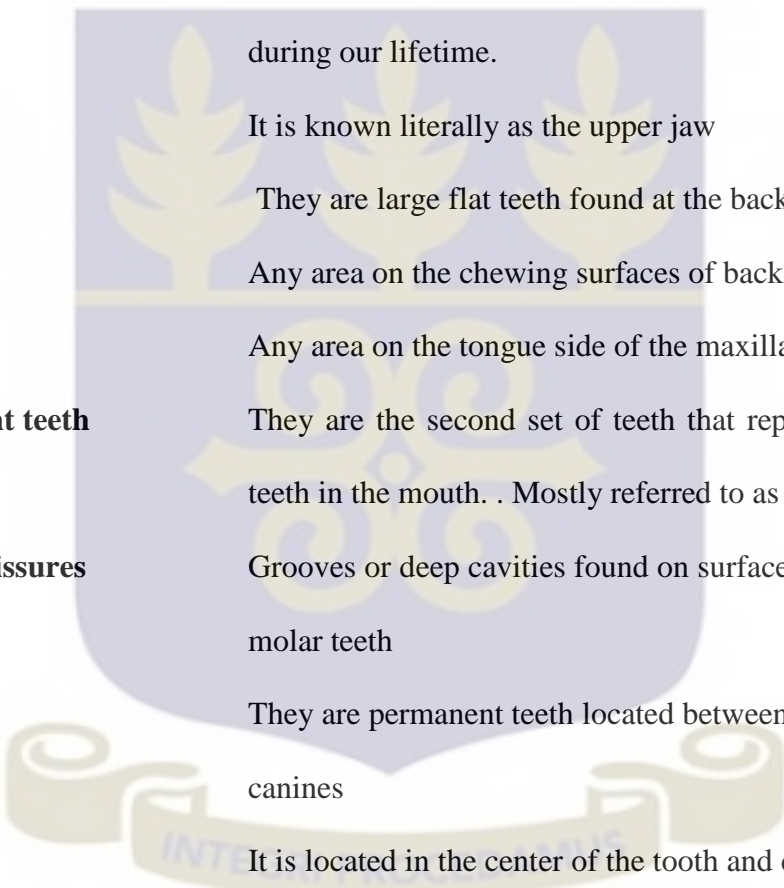
<b>DMF</b>	-	Decayed missing filled
<b>DMFT</b>	-	Decayed missing filled teeth
<b>ERCRIHS</b>	-	Ethical Review Committee involving Human Subjects
<b>OPD</b>	-	Out Patient Department
<b>WHO</b>	-	World Health Organization
<b>PI</b>	-	Principal Investigator
<b>D1-D3</b>	-	Diagnosis



## DEFINITION OF TERMS

<b>Anterior</b>	Towards the front of the mouth Mesial – Towards the midline of the mouth
<b>Avulsion</b>	Is the complete displacement of a tooth from its socket in alveolar bone owing to trauma
<b>Buccal</b>	It is an area found on the cheek side of the teeth
<b>Canine</b>	It is found between the lateral incisor and First premolar. It has a triangular shape with a pointed tip.
<b>Cemento-enamel junction</b>	It is a location where the enamel, covering the anatomical crown of a tooth, and the cementum, covering the anatomical root of a tooth, meet
<b>Cariogenic Bacteria</b>	A bacteria that produces or promotes the development of tooth decay
<b>Congenital</b>	Having a particular trait from birth or by firmly established habit. Hereditary
<b>Crown</b>	Refers to the anatomical area of tooth, usually covered by enamel. The crown is usually visible in the mouth after developing below the gingiva and then erupting into place
<b>Demineralization</b>	It is the opposite process of mineralization, a process to reduce the content of mineral substances in tissue or organism or of tooth.

<b>Dental Caries</b>	Dental caries is defined as the demineralization of normal tooth tissue by acids produced as a by-product of the metabolism of dietary carbohydrate by plaque bacteria over a period of time.
<b>Dental Cavitation</b>	It is a hole in the tooth caused by infection
<b>Dental explorer</b>	It is a dental instrument used to investigate tooth surfaces to detect caries or other defects
<b>Dentin</b>	The yellowish tissue that makes up the bulk of all teeth. It is harder than bone but softer than enamel. Second layer of tooth structure.
<b>Dentinal tubules</b>	Is the portal through which stimuli gain access to the pulp
<b>Dentition</b>	It refers to the development of teeth and their arrangement in the mouth. In particular, it is the characteristic arrangement, kind and number of teeth present at a given age
<b>Distal</b>	Away from the midline of the mouth
<b>Enamel</b>	Semi-clear, hard, outer layer protects teeth from the daily wear and tear of biting and chewing, as well as temperature extremes from hot or cold foods and drinks. Enamel also guards against acids and chemicals that can damage teeth.
<b>Facial</b>	It is an area usually on the lip side of the teeth. It is in the anterior portion of the mouth
<b>Incisor</b>	Tooth found in the anterior part of the mouth.
<b>Incisal</b>	Any area on the biting surfaces of the front teeth.



<b>Lesion</b>	A region in an organ or tissue which has suffered damage through injury or disease, such as a wound, ulcer, abscess.
<b>Lingual surfaces</b>	Any area on the tongue side of the mandibular teeth
<b>Mandible</b>	The lower jaw is called the mandible. Mandibular Teeth – The teeth located in the mandible are referred to as mandibular teeth. As humans, we have two sets of teeth during our lifetime.
<b>Maxillae</b>	It is known literally as the upper jaw
<b>Molar</b>	They are large flat teeth found at the back of the mouth
<b>Occlusal</b>	Any area on the chewing surfaces of back teeth.
<b>Palatal</b>	Any area on the tongue side of the maxillary teeth
<b>Permanent teeth</b>	They are the second set of teeth that replaces the primary teeth in the mouth. . Mostly referred to as the adult teeth.
<b>Pits and fissures</b>	Grooves or deep cavities found on surfaces of premolar and molar teeth
<b>Premolar</b>	They are permanent teeth located between the molars and canines
<b>Pulp</b>	It is located in the center of the tooth and consists of nerves, blood vessels and connective tissue.
<b>Plaque</b>	Is a biofilm bacteria that grows on the surfaces of teeth. It is usually white or pale yellow "slime layer", commonly found between the teeth and along the cervical margins.
<b>Posterior</b>	Towards the back of the mouth.

<b>Primary Dentition</b>	The first set of teeth. Most often referred to as baby teeth. There are 20 teeth in the primary dentition.
<b>Remineralization</b>	It is a process in which certain minerals are returned to the molecular structure of the tooth.
<b>Root</b>	The lower two-thirds of a tooth often embedded in the tooth socket
<b>Supernumerary</b>	Tooth that appear in addition to the regular number of teeth



## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background

Good oral health is essential for the general health or wellbeing of an individual. Dental caries, an infectious disease, is one of the most important oral health problems globally. It is common among the underprivileged groups in both developing and developed countries. It affects about 60 -90% of school children and nearly 100% of adults. (Peterson et al., 2005) (WHO, 2012)

Dental Caries is also known as tooth decay, a sugar- dependent infectious disease. It is a dynamic process characterized by episodic demineralization and remineralization which occurs only when these 4 factors are present; tooth, micro-organisms, food substrate and time (Laura and David A. Mitchell, 2007). Dental caries starts as small whitish spot lesion on the surface of the tooth, progressively changes to yellowish then brownish where an initial spot lesion progresses into a frank cavitation and later destroying the crown completely. However, if dental caries is left untreated the infection progresses down the nerve root and spreads to the underlying structures causing facial swellings, difficulty in chewing and swallowing, limited mouth opening, distress in breathing and in some cases leads to death. The early onset and recurrent clinical progression of the disease makes it a public health problem for both children and adults. It therefore affects their activities at school and at work causing several hours to be lost each year. This in effect leads to poor quality of life and low economic productivity.

Studies have shown that, some developed countries have a decline in dental caries due to a number of public health measures that have been put in place. These measures include improved self-care practices, use of fluorides and improved lifestyle (Peterson et al., 2005). Developing countries presently have an increase. The prevalence of dental caries was low until recent years but studies have shown its gradual increase. This may be due to increasing consumption of sugars, inadequate use of fluorides, and lack of education on preventive or restorative dental care (Peterson et al., 2005). This trend in epidemiological transition is true for a developing country like Ghana where dental caries is becoming a public health concern.

In Africa, the prevalence of dental caries was found to be 55.1% among 18 years olds and 74.4% in 34 years olds (Siddiqui et al., 2013). In Ghana, the 2013 Annual General Report for Korle-bu Teaching Hospital showed caries prevalence of 46.1% and found to be among the top 10 causes of dental O.P.D attendance. Several literature reviews have shown significant association between dental caries and demographic, economic and behavioral factors. Studies have shown that low educational level, low income, poor attitudes and perceptions amongst others have direct impact on the oral hygiene habits and the prevalence of dental caries. In India and the Republic of Lithuania, children who belong to the lower socio-economic class had the highest prevalence of dental caries of 41.5% and 36.7% (George & Mulamootil, 2015) and (Saldūnaitė et al., 2014) respectively. Children whose mothers have better knowledge of and positive attitudes towards oral health take better care of their teeth than those of poor knowledge and poor attitudes (Saied-Moallemi, Virtanen, Ghofranipour, & Murtomaa, 2008). This is similar to a study done in Burkina-

Faso (Varenne, Petersen, & Ouattara, 2006). Behavioral factors such as ethnicity, race, and gender have been shown to have an effect on dental caries (Krustrup & Petersen, 2007) (Calderon & Mallory, 2014).

DMFT is a tool used for measuring the prevalence of dental caries. The DMFT index is commonly accepted by the dental community for measuring caries prevalence. It is an index modified by WHO. The “D” component means decayed tooth, “M” component is the missing tooth, “F” component is the filled tooth and “T” is the tooth involved.

The World Health Organisation, in setting the average goal for determining dental caries suggested that there should not be more than 3 DMFT (decayed missing filled teeth ) at 12 years of age and not more than 14 DMFT for adults aged 35 to 44 years of age (Peterson et al., 2005) and (KHAN, 2011).

In this study the “D” component was used to determine the prevalence of dental caries.

Despite the high prevalence and the social factors that influence dental caries, very few studies have been conducted in Ghana, hence the need to determine the relationship between these social factors and dental caries.

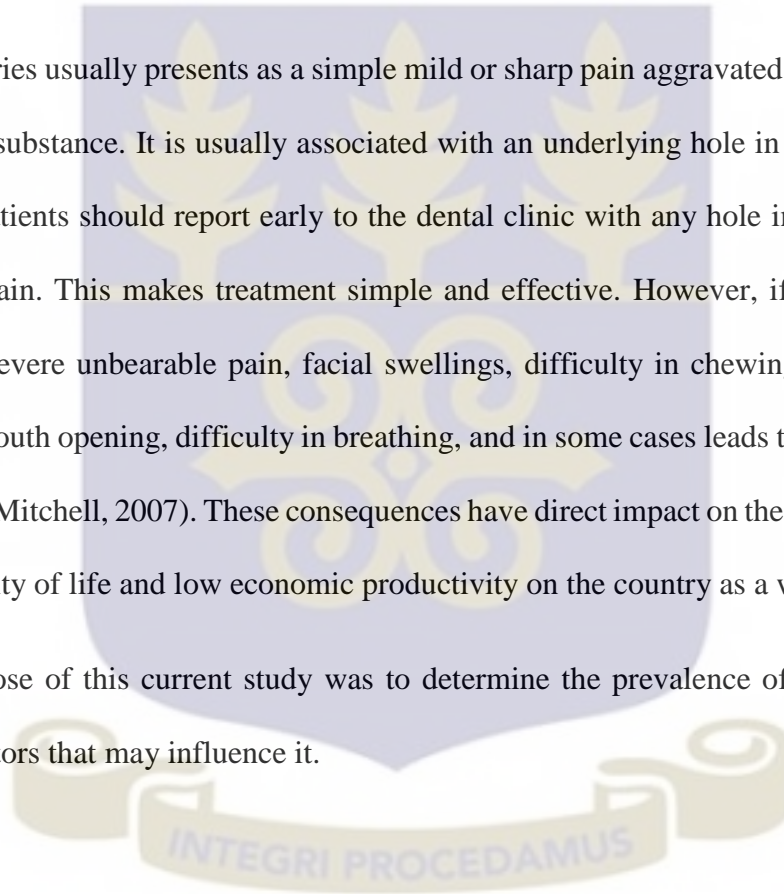
## **1.2 Statement of the problem**

Dental caries is a global public health concern. According to WHO, 60-90 % of school – aged children have dental caries whilst it affects a vast majority of adults (WHO, 2012). In

Ghana, the prevalence of dental caries recorded in the year 2013 at the Korle-bu Teaching Hospital, the nation's main referral and Teaching Hospital located in the capital was 46.1%. In this institution, dental caries was found to be one of the top 10 causes of dental O.P.D attendance (Annual Report, 2013). It was noted that, out of every 30 patients who report to the dental clinic, 14 of them were diagnosed with dental caries or one of its sequel. Very few patients report with other oral health diseases.

Dental caries usually presents as a simple mild or sharp pain aggravated whilst chewing on any food substance. It is usually associated with an underlying hole in the affected tooth. Hence, patients should report early to the dental clinic with any hole in the tooth with or without pain. This makes treatment simple and effective. However, if not treated early, leads to severe unbearable pain, facial swellings, difficulty in chewing and swallowing, limited mouth opening, difficulty in breathing, and in some cases leads to death (Laura and David A. Mitchell, 2007). These consequences have direct impact on the individual causing poor quality of life and low economic productivity on the country as a whole.

The purpose of this current study was to determine the prevalence of dental caries and social factors that may influence it.



### 1.3 Conceptual framework

Conceptual Framework for the relationship between social factors and Dental Caries

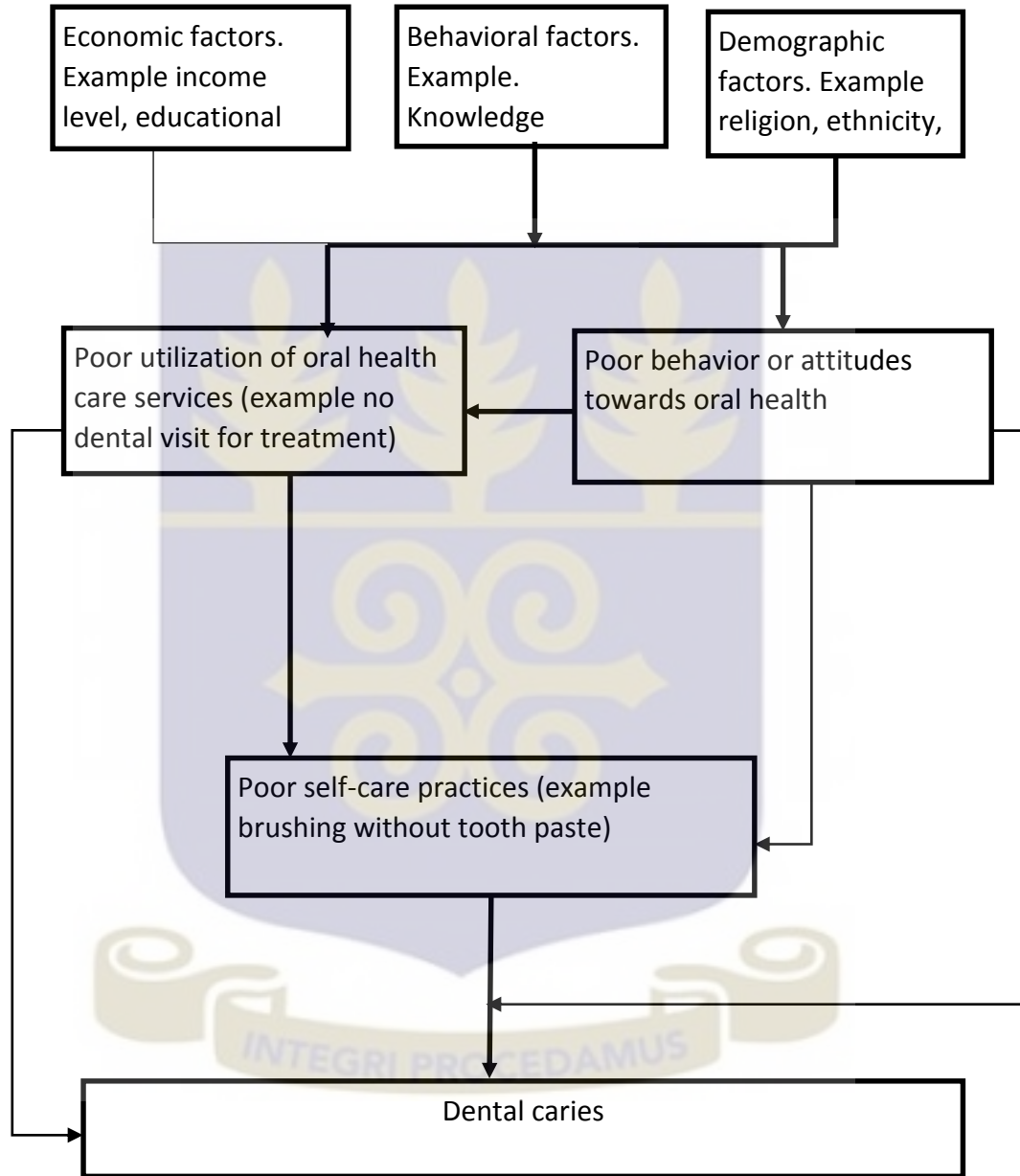


Figure 1: Conceptual Framework for the relationship between social factors and Dental Caries

The conceptual framework (Fig 1) shows the interrelationship between economic, behavioral, demographic factors and dental caries.

Utilization of dental services can be determined by all three factors; economic, behavioral and demographic. Having low income affects one's ability to utilize dental services due to the fact that one cannot afford it and therefore a small cavity or hole will progress into a severe form of dental caries. Having knowledge about oral health also plays important role in determining an individual's ability to utilize the dental service. Visiting the dental clinic regularly for treatment improves an individual's self-care practices such as method of brushing, number of times of brushing, type of toothbrush to be used. All these factors will determine one's ability to develop or prevent dental caries.

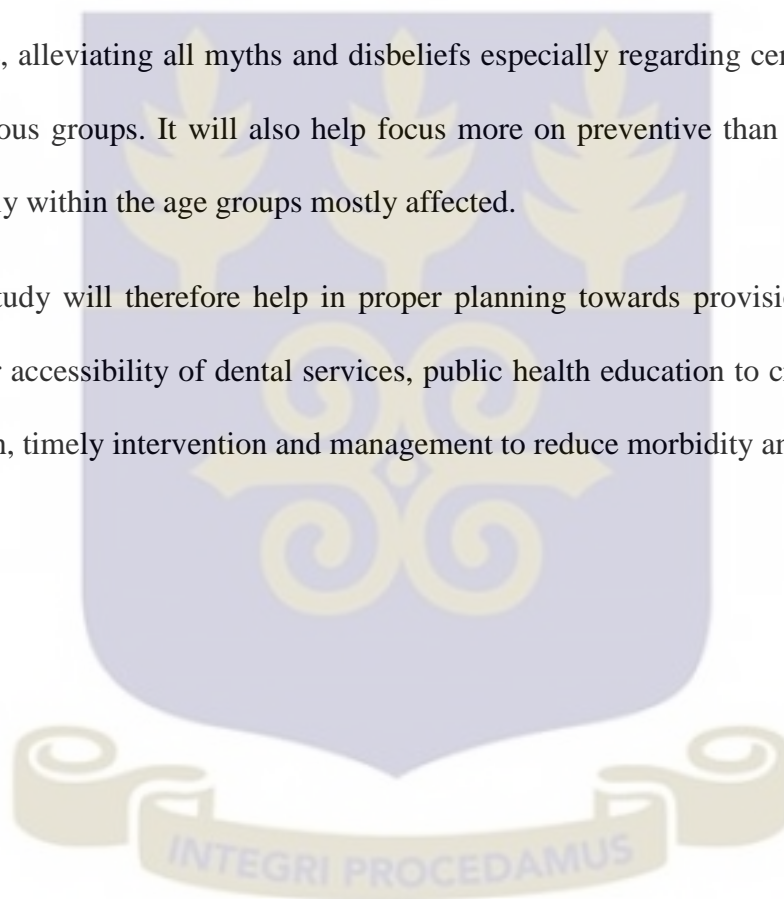
Attitude towards oral health is also influenced greatly by these three factors as they either negatively or positively change an individual's attitude or perception towards oral health. For example, having an initial carious lesion without pain may progress further into a severe form due to one's attitude or perception about dental treatment and this will lead to a severe form of dental caries.

Some demographic factors such as ethnicity and religion have certain myths and beliefs about pregnancy and dental caries as an example. It is believed that when pregnant it is advisable not to visit the dentist because taking the tooth out when decayed will affect the unborn child. These beliefs turn to affect an individual's attitude and thereby the use of dental care services which may also influence his or her self-care practices and eventually the ability to develop caries or not.

#### **1.4 Justification**

In Ghana, there is limited evidence on the relationship between economic productivity of a nation and dental caries. However, it is worthy to note that dental caries, an infectious disease condition is a great contributory factor in determining the economic productivity of a nation like Ghana. Having knowledge about the social factors influencing the prevalence of dental caries will help make dental services more affordable, easily accessible, alleviating all myths and disbeliefs especially regarding certain ethnic groups and religious groups. It will also help focus more on preventive than curative measures particularly within the age groups mostly affected.

Current study will therefore help in proper planning towards provision of more dental clinics for accessibility of dental services, public health education to create awareness of oral health, timely intervention and management to reduce morbidity and mortality.



## **1.5 Objectives**

### **1.5.1 General Objectives**

To determine the prevalence and social factors related to dental caries among patients aged 3 years and above attending the Dental Clinic of the Tema General Hospital, Tema

### **1.5.2 Specific Objectives**

1. To determine the prevalence of dental caries
2. To describe the demographic factors related to dental caries
3. To determine the economic factors related to dental caries
4. To determine the behavioral factors associated with dental caries

### **1.5.3 Research Questions**

The research questions for this study are as follows

1. What is the prevalence of dental caries
2. What are the demographic factors that have impact on dental caries
3. What are the economic factors that have an impact on dental caries
4. What are the behavioral factors that have an impact on dental caries

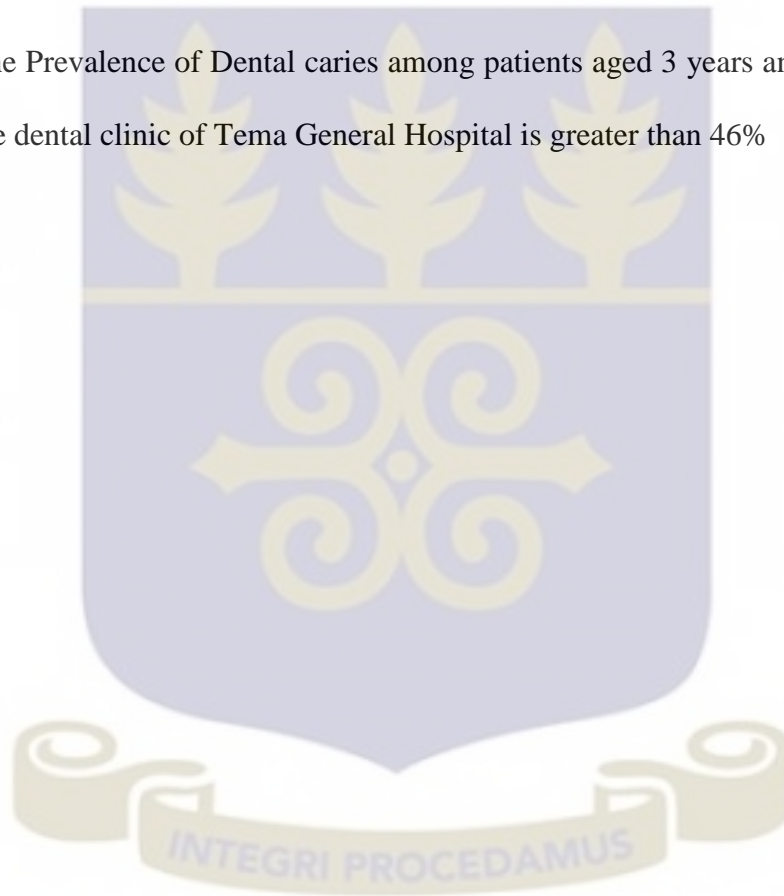
**Hypothesis**

**Null hypothesis**

The Prevalence of Dental caries among patients aged 3 years and above attending the dental clinic of Tema General Hospital is not 46%

**Alternate Hypothesis**

The Prevalence of Dental caries among patients aged 3 years and above attending the dental clinic of Tema General Hospital is greater than 46%



## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Oral Health: Definition and Significance

Good oral health is defined as a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal disease, tooth decay, tooth loss and other diseases and disorders that limit an individual's capacity in biting, chewing, smiling, speaking and psychosocial wellbeing (WHO, 2012)

According to the American Heart Association Studies have shown that, maintaining good oral health is very important since it prevents systemic disease such as infective endocarditis especially in patients who are at risk (Wilson et al., 2007).

Poor oral health can also affect an individual psychologically. It causes bad breath such that, more often than not leads to depression (Suzuki, Yoneda, Naito, Iwamoto, & Hirofuji, 2008). They suggested that, bad breath is caused by tongue coating and periodontal disease which is a poor condition of oral health and concluded that, there was strong association between bad breath and depression.

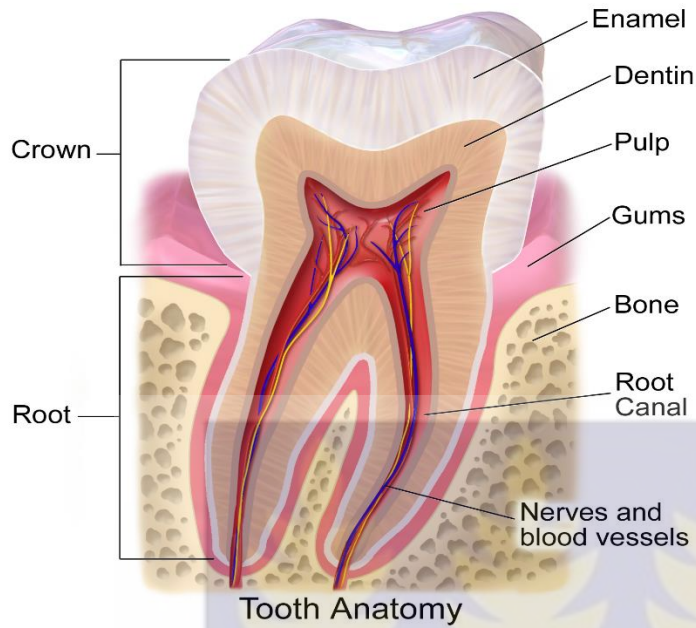
Having a good oral health enables an individual to have social confidence, higher self-esteem, communicate effectively and articulate well. Therefore it is imperative for one to aim at achieving good oral hygiene in order to maintain good healthy life.

## 2.2 Anatomy of Tooth

According to Wheeler's Dental Anatomy, Physiology and Occlusion, 10<sup>th</sup> edition (Stanley J. Nelson, 2009), the tooth consists of two parts; the crown and the root. The crown is the top part of the tooth that is mostly seen in the mouth whereas the root of the tooth is that part of the tooth embedded in the bone normally covered by the gum. However, the crown and the root are separated by a junction called the cemento-enamel junction. Within the tooth there are four major parts which are the enamel, dentin, pulp and cementum as shown in (Fig 2).

The Enamel forms the protective outer surface of the crown of the tooth usually seen as white or cream in color. The Dentin is the second layer within the tooth. It forms the majority of the inner surface of the tooth and can be seen by using dental x-rays. The Pulp is the third layer found within the tooth where the blood vessels and nerves are located. It is found in both the crown and the root of the tooth. The Cementum on the other hand, forms the outer surface of the root of the tooth. It is softer than the enamel (Stanley J. Nelson, 2009)

The Teeth are classified as incisors, canines, premolars and molars. Incisors and canines are usually the front teeth most often described as the anterior teeth. The premolars and molars often described as posterior teeth.



(Tooth anatomy  
Wikipedia, 2016)

Figure 2: Longitudinal view of the Anatomy of the tooth

### **2.3 Dentition (Primary and Permanent teeth Arrangement)**

Dentition is defined as the development of teeth and their normal arrangement in the mouth. It also describes the arrangement of the upper and lower teeth in both primary and permanent dentition as shown in (Fig 3). Clinically there are three dentitions; primary, mixed and permanent dentition. (Stanley J. Nelson, 2009)

The primary dentition consists of 20 teeth; 10 teeth for the upper jaw and ten for the lower jaw. Primary teeth is also called 'baby' teeth, deciduous or 'milk' teeth. It starts to appear in the mouth at age six months and it is completely replaced by ages 12 and 13 years.

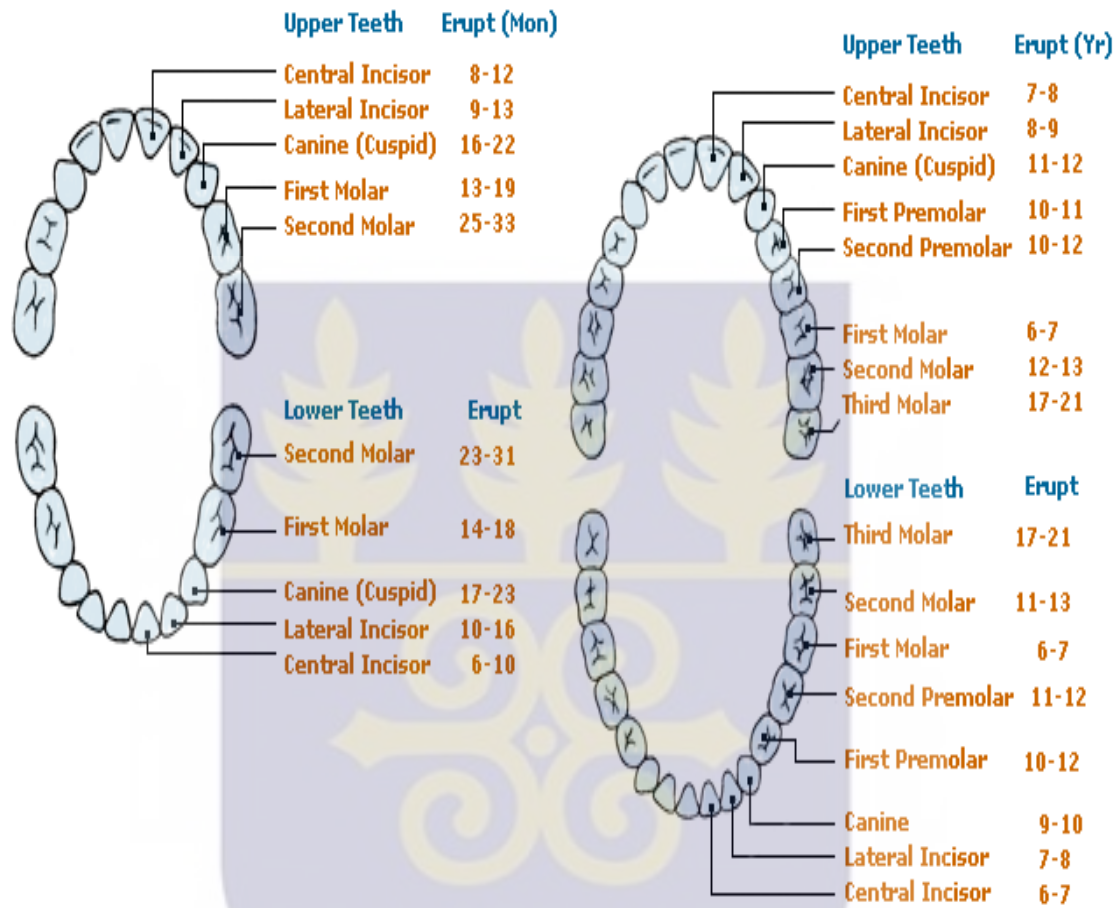
The mixed dentition is made up of both primary and permanent teeth. It starts with the eruption of the first permanent teeth which occurs around age six years and ends with the

loss of the last of the primary teeth which occurs around the ages of 12-13 years (Stanley J. Nelson, 2009).

The permanent dentition consists of 32 teeth in all with 16 for the upper jaw and 16 for the lower jaw. As an individual grows, all the primary teeth are gradually replaced by the permanent teeth at about age 18 -20 years where ideally all the permanent teeth would be present in the mouth (Stanley J. Nelson, 2009).



## Primary vs. Permanent Teeth Eruption



(Dr Chetan, 2015)

Figure 3: Normal arrangement of teeth in the oral cavity for both permanent and primary teeth

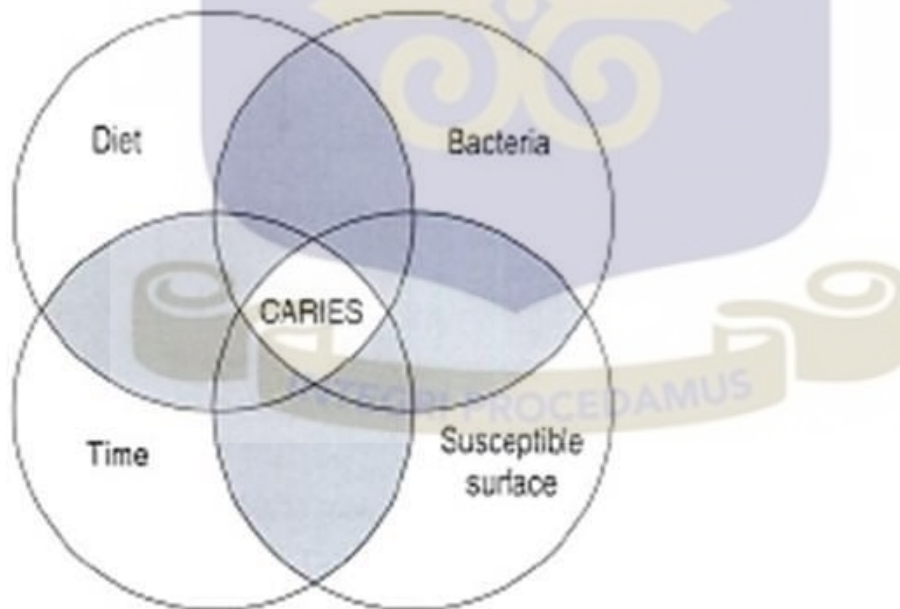
## 2.4 Dental Caries (Etiology, Caries Susceptible Tooth Surfaces, Clinical Presentation, Diagnosis, Risk factors)

### 2.4.1 Etiology

Dental caries also known as Tooth decay is one of the most important oral health burden globally.

According to the Oxford Handbook of clinical dentistry, 4<sup>th</sup> edition (Laura and David A. Mitchell, 2007) dental caries is defined as the demineralization of normal tooth tissue by acids produced as a by-product of the metabolism of dietary carbohydrate by plaque bacteria over a period of time.

For dental caries to occur, as shown in (Fig 4), the main etiological factors are Bacteria (micro-organisms), diet (sugar-containing foods), a susceptible tooth surface and time.



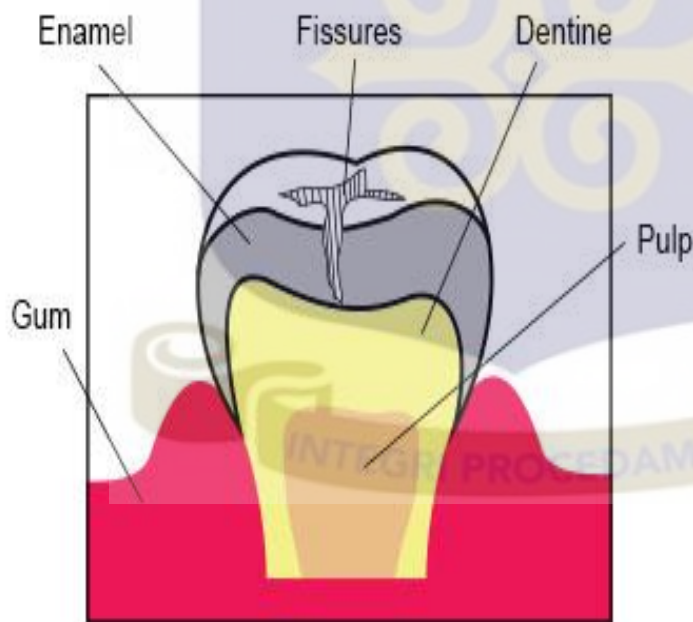
(By Levkiv M.O, 2006).

Figure 4 Etiological factors causing dental caries.

Once these players are present dental caries will certainly occur. Cariogenic bacteria is from plaque usually found on the surface of the tooth as a thin biofilm which starts every 2 to 3 seconds after brushing of teeth. Fermentable carbohydrate is obtained from ordinary sugar-containing foods.

#### 2.4.2 Caries Susceptible Tooth Surface

The susceptibility of different tooth surfaces to dental caries varies markedly. The pit and fissure surfaces of teeth are more susceptible to tooth caries than are the smooth surfaces (labial and lingual). In other words, the rear molar and premolar teeth that have pits and fissure surfaces (Fig 5) are more susceptible to caries than the front teeth (central incisor, lateral incisor and canine) which has smooth surfaces (Laura and David A. Mitchell, 2007)



(Dentessential, 2014)

Figure 5: Pits and fissure surface of a molar tooth

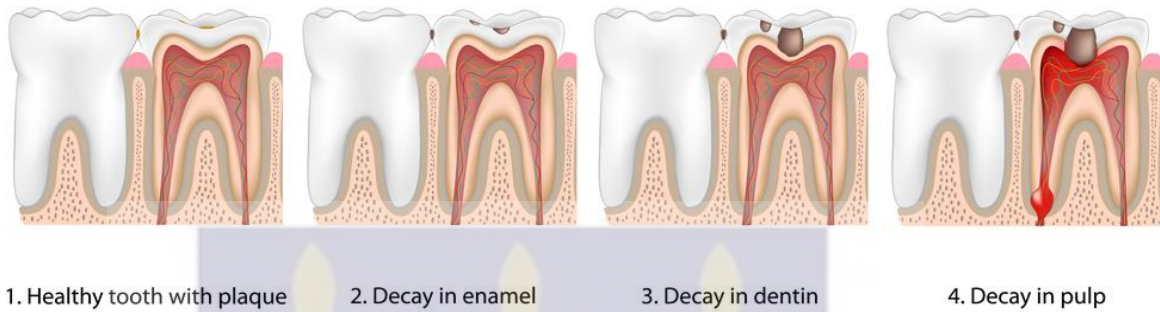
#### 2.4.3 Diagnosis of Dental Caries

##### Clinical Presentation (Symptoms)

The presence of a hole in a tooth does not usually result in any pain initially and therefore one may not be aware of it. Stages of dental caries (Fig 6) shows that, dental caries presents initially as a chalky white spot on the surface of the tooth, thereby indicating an area of demineralization of enamel of the tooth. It then progresses to brown. However at this stage the process is reversible but eventually turns into a cavitation as the lesion continues and once the cavity is formed the lost tooth structure cannot be regenerated. (Laura and David A. Mitchell, 2007). An active dental caries presents as lighter color and dull in appearance whilst an arrested one appears dark brown and shiny most appears as a stain. As the lesion progresses, the enamel and dentin of the tooth are destroyed and the cavity becomes more obvious. The affected tooth then changes color and become soft to touch. As the infection progresses inwards, beyond the enamel, it spreads faster through the dentinal tubules and to the nerve of the tooth. At this stage, the tooth become exposed, resulting in pain whereby the pain becomes severe on exposure to heat, cold, or sweet foods and drinks. The pain can become constant when the infection overwhelms the tooth tissues (Laura and David A. Mitchell, 2007)

When no treatment is done at this stage, the infection continuously progresses down into the underlying and surrounding soft tissues, leading to the complications such as apical periodontitis, Dento-alveolar abscess, and Ludwig's angina. These complications present as difficulty in chewing and swallowing, facial swellings, respiratory distress and even death respectively. (Laura and David A. Mitchell, 2007)

## The stages of tooth decay



(Prestonwooddental, 2012)

Figure 6: Stages of dental caries (tooth decay)

### **Clinical presentation (diagnosis of dental caries on tooth surface)**

Diagnosis of dental caries on tooth surface (Fejerskov, Ole & Kidd, 2009) can be done either by using the Dichotomous scale (dental caries present or absent) or D1 to D3 scale (stages of dental caries).

#### **Dichotomous scale**

The dichotomous scale is used for diagnosing dental caries at the dentinal (second layer of tooth) lesion stage only. For a tooth to be diagnosed with dental caries, pits and fissures (grooves) on the occlusal (upper surface of tooth), buccal (tooth surface facing the cheek or lip) and lingual (tooth surface facing the tongue) are carious when the explorer (dental instrument) catches after insertion with moderate to firm pressure.

### **D1 to D3 scale**

This scale is used for diagnosing through the full range of dental caries. The full range are as follows

**0 (Sound tooth)** - This implies surface of tooth sound with no evidence of treated or untreated clinical dental caries

**D1 (Initial caries)** - there is no clinically detectable loss of substance for pits and fissures. There may be significant discoloration or rough spot in the enamel (whitish outer layer of tooth) that do not catch the explorer but no demonstrable loss of tooth substance (Fig 6, diagram 2)

**D2 (Enamel caries)** - there is demonstrable loss of tooth substance in pits and fissures (Fig 6, diagram 3) or in smooth surfaces but no softened undermined enamel. The texture of the material within the cavity may be chalky but there is no evidence that the cavitation (hole) has penetrated the dentin.

**D3 (Caries of Dentin and Pulp involvement)** – there is detectable softened undermined enamel and deep cavity with probable pulpal (Third layer of tooth substance) involvement as shown in Fig 6, diagram 4).

Pulpal involvement is usually classified as D4 but included during data analysis.

#### **2.4.5 Risk Factors Associated with Dental Caries**

Dental caries are associated with a number of risk factors. Some of which are frequent snacking, inadequate saliva flow, anatomy of the tooth, medications that cause dry mouth, psychological conditions such as bulimia and anorexia.

Frequent snacking- frequent eating of sugars and refined carbohydrates usual produces an acid environment conducive for bacteria to act effectively.

Inadequate saliva flow- it provides a more conducive acidic medium for bacteria to work better since there is no adequate saliva to neutralize the acids.

Anatomy of tooth-the pits and fissures on the surface of a tooth is determined by the genetic make-up of an individual. The deeper they are, the more likely it is difficult to remove stuck food particles on its surface hence possibility of caries.

Medications that cause dry mouth- there are some drugs for other medications which causes production of low saliva. This therefore increases risk of dental caries.

Bulimia and anorexia- these are psychological conditions which turns to increase the acidic conditions in the mouth thereby increasing the risk of dental caries.

#### **2.5 DMFT Index**

DMFT index is used to measure the prevalence of dental caries. The index measures the average number of permanent teeth per person which are decayed, missing or filled. It is a quantitative expression of caries experience of permanent teeth. The DMFT index was introduced by Henry T. Klein, Carole E. Palmer & Knutson J.W. in 1938 and modified by WHO.

The components are, “D” component is used to describe decayed tooth which include carious tooth, filled tooth with recurrent decay, only tooth root left, defect filling with caries, temporary filling and filled tooth surface with other surface decayed.

“M” component Used to describe missing teeth due to caries. Other cases should be excluded these are; un-erupted teeth, congenitally missing and avulsion teeth due to trauma or accident.

“F” component is used to describe a filled tooth due to caries. The excluded teeth in the DMF index is the supernumerary teeth.

The rules and principles used in recoding DMFT are, a single tooth may have several restorations but it is counted as one tooth, F, a tooth may have restoration on one surface and caries on the other, it should be counted as decayed (D), no tooth must be counted more than once.

Calculation of DMFT

For individual  $DMF = D + M + F$

For the population, mean DMF =  $\frac{\text{Total DMF}}{\text{Total number of subjects examined}}$

Maximum score is DMFT = 32 and Minimum score is 0

The same calculation is used for primary teeth index where the maximum scores dmft is 20 and Minimum score dmft= 0

For a mixed dentition, each child is given a separate index, one for primary teeth and the other for permanent teeth if present.

For measurement of prevalence of dental caries, the formula below is used

$$\text{Prevalence of caries} = \frac{\text{number of persons with dental caries}}{\text{Total amount of examined patients}} * 100\%$$

## **2.6 Dental caries (Oral Health Burden)**

Dental caries is known to be one of the most important oral health care burden globally. According to WHO (Petersen et al., 2005), dental caries affects 60-90% of school aged children and nearly 100% adults. It is common among the underprivileged groups in both developing and developed countries (WHO, 2012)

The standard age category currently used to determine the prevalence of dental caries in adults is between 35 to 44 year olds whilst 12 year olds represent children. (Petersen et al., 2005). “The World Health Organization recommends epidemiological studies on 35-44 years due to their relevance in describing and analyzing the cumulative damage of caries on people's oral health over the years” (Olabisi et al., 2015).

Most developed countries had high DMFT scores in the 1980's This was mainly due to the high sugar intake until recent years, there has been a gradual decline due to the public health interventions and changing lifestyles (Peterson et al., 2005). Most developing countries such as Africa and Asia on the other hand recorded a decline during the era when

the developed countries were recording an increase in dental caries. However, studies have shown that some developing countries are now recording a gradual increase. This can be attributed to the lack of availability or inaccessibility of dental services where most often dental services are offered at the regional or central hospitals of urban centers and lack of oral health education on preventive measures (Peterson et al., 2005). Another reason may be due to the shortage of dentists meeting the needs of large population. The dentist to population ratio is 1 to 150,000 in Africa (Peterson et al., 2005).

Literature reviews have shown a high prevalence of dental caries in some developed countries such as the Americas where children aged 12 years have a DMFT score of 3 higher than the WHO criteria (DMFT less than 3) for children aged 12 years. However, the DMFT scores for 12 year olds in Baghdad, Iraq was 1.7 lower than expected (Ahmed, Åstrøm, Skaug, & Petersen, 2007). In Russia, the prevalence of dental caries among 35 - 44 year olds was 99% and the mean DMFT value was 13.93 (Kuzmina, 2010). This was relatively no different for the same aged group in Brazil where the caries prevalence was 68.5% and mean DMFT of  $16.6 \pm 6.973$  (Costa, Vasconcelos, Haddad, & Abreu, 2012)..

Some African countries recorded lower DMFT of 1.7 (Petersen et al., 2005). In Burkina Faso, DMFT score for children aged 12 years was 0.7 which showed a much lower DMFT score as compared to that reported for most African countries (Varenne, Petersen, & Ouattara, 2004). In Ghana, the caries prevalence among school aged children between the ages of 9 to 15 years was 17.4%, females (19.3%) and males (15.1%) with a mean DMFT score of  $1.138 \pm 0.476$  (Ndanu et al, 2014) This is relatively higher than that recorded in Burkina Faso. Korle-Bu annual report for 2013 recorded a prevalence of 46.1%. Very little

or no study has been done to determine the prevalence of dental caries among adults, though extensive study has been done among school-aged children.

## **2.7 Related Social Factors**

### **2.7.1 Socio-Economic factors and dental caries**

Many studies have shown the correlation between dental caries prevalence and socio-economic. The relationship between dental caries and socio-economic factors can be viewed in two ways, since it can affect it both positively and negatively.

Literature has shown that, some high income earners purchase more sweets and sugar containing foods for their children. Based on this, their children turn to have high caries experience. Adolescents whose parents had a high monthly income turn to have high caries prevalence with a high DMFT score (Pakpour et al., 2011). Similar study done in Brazil revealed that children whose parents had low monthly income had the highest caries experience of 50.6% due to the inability to afford dental services hence had most of their dental caries untreated (Borges et al., 2012) and (Saldūnaitė et al., 2014)

From the review this shows that parents play a major role in determining the incidence of dental caries in their children.

### **2.7.2 Socio-Behavioral Factors**

Normally it is assumed that people with high level of education have better knowledge about oral health care, have good dental practice and visit the dentist regularly for dental check-ups.

Among Iranian adolescents (Pakpour et al., 2011) proved that indeed those whose parents had low level of knowledge about oral health had the highest prevalence of dental caries. Those who had never visited a dentist had a mean DMFT approximately 3x that of those who had seen a dentist in the last 12 months. They then concluded that, Iranian adolescents had poor brushing habits as only 18% brushed their teeth twice daily. For those who brushed their teeth less frequently had a higher incidence of dental caries.

Similar studies done in Brazil and Lithuania found that, the highest caries experience of 64.6% was recorded amongst children whose parents had low educational levels and 59.9% for those with poor dental practice (Borges et al., 2012) and (Saldūnaitė et al., 2014)

### **2.7.3 Socio-demographic factors**

Socio-demographic factors have also been found to significant association with dental caries.

A study done among Iranian adolescents concluded that Boys had significantly higher DMFT scores than girls (Pakpour et al., 2011). This may be due to the fact girls are more conscious of their oral health than boys and therefore take better care of them or have regular dental check-ups

A Similar study done in England revealed that Ethnicity have some level of influence on oral health status of an individual whereby Asians, Pakistani and Bangladesh children living in England have poor oral health hence high prevalence or incidence of dental caries.

The study also showed that people living in deprived areas have poor oral attitudes towards oral health ( $p < 0.002$ ) compared with those who lived in non deprived areas (Williams, Whittle, & Gatrell, 2002)

In Ghana, very few studies have been done to determine the relationship between all three social factors related to dental caries as well as prevalence of dental caries among adults. Therefore current study will help disclose all the factors and provide possible ways to correct these factors in improving the oral health of both children and adults.

### **2.8 Individual and Economic Effect**

Dental caries is known worldwide according to WHO (Petersen et al., 2005) to have negative impact on both the individual and the economy of a country as a whole.

Untreated dental caries often lead to severe unbearable pain, difficulty in chewing and swallowing, limited mouth opening, facial swellings, distress in breathing and eventually death.

According to FDI world dental federation oral diseases including dental caries causes a loss of 2.4 million days of work and 1.6 million days at school in the united states of America. Some counties have shown that dental caires is a major cause of absenteeism in school especially among children. In the phillipine 97% of year olds absent themselves from school due to dental caries. in thailand 1900 school hours per 1000 children are lost due to dental problems (FDI World Dental Federation, 2014).

## **CHAPTER THREE**

### **3.0 METHODS**

#### **3.1 Study Design**

A cross sectional study was conducted amongst Male and female patients aged 3 years and above, diagnosed with dental caries who attended the out-patient department of the dental clinic of the Tema General Hospital.

#### **3.2. Study Area**

The study was conducted at the Dental Clinic of the Tema General Hospital.

##### **3.2.1 Profile of the Study Area**

The Tema Metropolis (fig 7) is one of the thirteen districts of the Greater Accra Region, located in the Southeastern part of Ghana. The Tema harbor which is the major seaport in Ghana is located in this metropolitan area. From the 2010 census, the estimated population of Tema is 371,220. Within the Tema Metropolitan area, there are four health centers, a polyclinic, Tema General Hospital and Eighty-four private health facilities which include hospitals, clinics and maternity homes. There are about 8 specialized dental clinics.

##### **3.2.2 The Tema General Hospital**

Tema General Hospital is the main Government Hospital serving the Tema Metropolis. Its catchment area is Tema Metropolis and Satellite towns and villages. It has 10 wards and a

294 bed capacity. It provides a 24- hour specialist and general services on both out-patient and in patient basis.



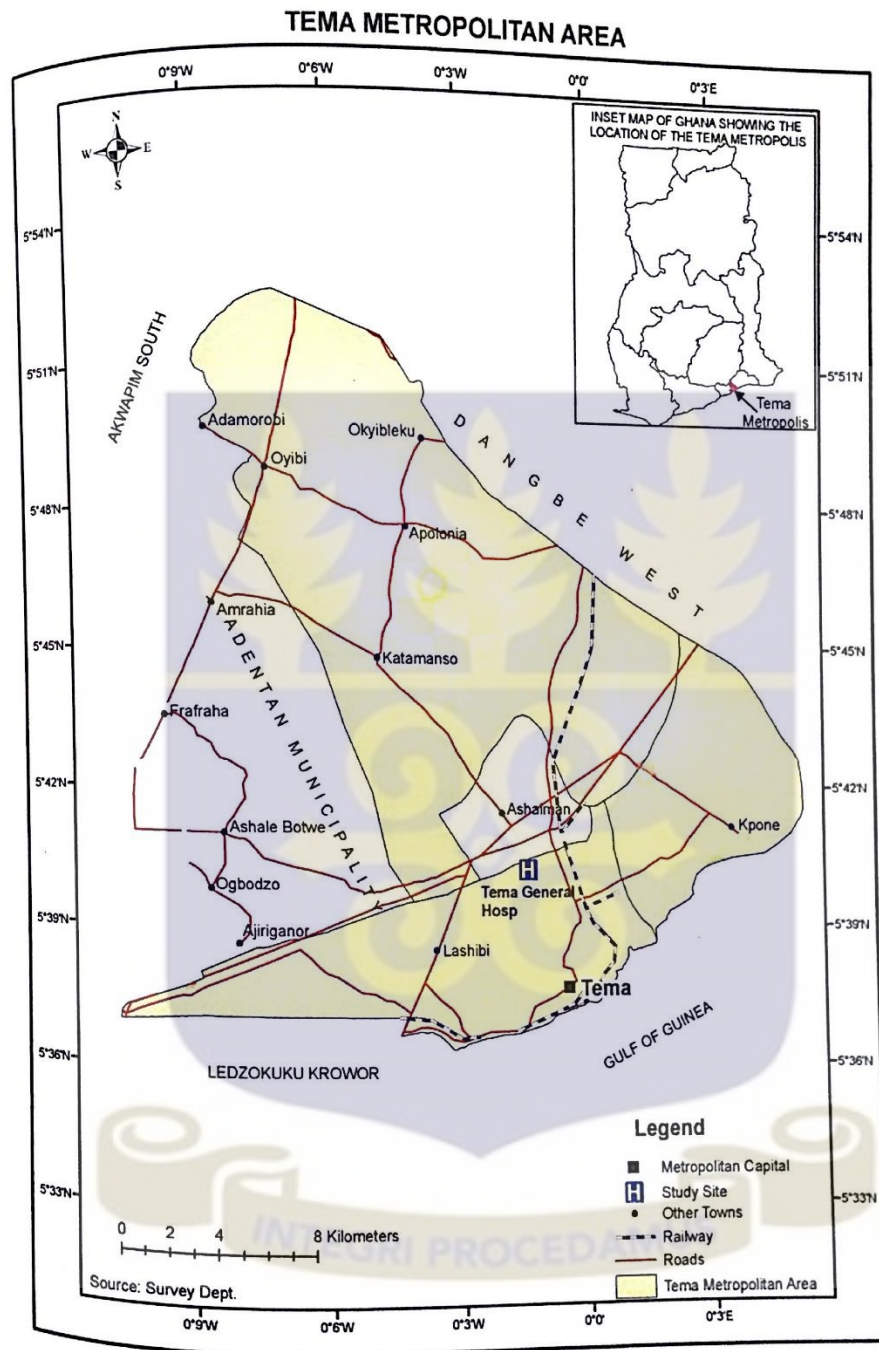


Figure 7 Map of Tema Metropolitan Area

Services provided include, Obstetrics and Gynecological care, Pediatrics, Medicine and General Surgery. Other specialized clinics are Dentistry, Dermatology and eye clinics including support services from laboratory, radiology and pharmacy.

### **3.2.3 Dental Clinic of the Tema General Hospital**

The dental clinic has 2 dental surgery units, dental surgeons, dental surgeon assistants, laboratory technician, records staff, accounts staff and cleaners. It also has an X-ray unit with dental radiographers. It attends to approximately 30 clients a day who present with various types of dental diseases.

## **3.3 Study Variables**

### **3.3.1 Dependent Variable:**

Dental caries

### **3.3.2 Independent Variables:**

Demographic factors: age, sex, religion, ethnicity

Economic factors: employment level

Behavioral factors: Knowledge, self-care practices

### 3.4 Study Population

Male and female patients aged 3 years and above diagnosed with dental caries who attend the dental clinic for Treatment.

### 3.5 Sample Size Determination

The prevalence of dental caries for the population is assumed to be 50 %. Using the estimated prevalence from Korle-bu teaching hospital and Tema General Hospital.

$$N = \frac{z^2 p (1-p)}{d^2}$$

Where N= sample size, z= statistic for a level of confidence, p= expected proportion,

d= precision

Where z = 1.96, p = 0.5, q = (1-p) = (1-0.5) = 0.5

Therefore, q = 0.5, d (precision) = 8% (0.08).

$$N = \frac{1.96^2 \times 0.5 \times 0.5}{0.08^2}$$

$$N = 150.06$$

For unresponsiveness and non-return of some of the questionnaires, 5% non-response rate was added to the sample size.

- 5% of 150.06= 7.50
- Sample size= 157.5 approximately 158
- New sample size=160

### **3.6 Sampling Method**

Non probability purposive sampling method was used in this study.

### **3.7 Sampling procedure**

The average number of patients who visited the dental clinic of the Tema General Hospital, Tema, was estimated to be 30 patients per day. Therefore the number of patients expected to visit the dental clinic over the period of data collection was estimated to be 300 patients. The patients recruited to participate in this study were first of all, registered by the receptionist at the unit. Their temperature, blood pressure and weight were recorded. After the registration, these patients were selected to participate in the study using the attendance book. Each patient who satisfy the eligibility and inclusion criteria and consent to participate in the study was interviewed daily. 10 patients were selected and interviewed each by the principal interviewer and research assistant. This procedure was repeated daily until the desired sample size of 160 was obtained.

### **Inclusion Criteria**

Patients aged 3 years and above who attended the dental clinic for treatment were included in this study. Reason for choosing patients 3 years as the lower limit was because, by this age all primary teeth will be present.

Patients who present with dental caries or sequel of dental caries.

### **Exclusion criteria**

Patients who came for review and are seriously ill were excluded from the study.

### **3.8 Data collection techniques**

Data was collected by the Principal Investigator and one research assistant each recruiting approximately 10 study patients daily, thus recruiting approximately 20 patients in a day.

The questionnaire (appendix 4) consisted of closed ended questions on the patient's demographic information, economic and behavioral factors. It included the distribution of the caries in the mouth, as well as the associated complication each patient presents with.

The questionnaires were administered at the out-patient department of the dental clinic of the Tema General Hospital every weekday between the hours of 8 am to 2 pm. For patients who are minor and those who cannot read and understand, questionnaires were filled by their parents or relatives.

In addition each patient was examined by the principal investigator using a mouth mirror and a dental explorer to check the status of the tooth. During the examination, each patient was asked to open the mouth gently. The mouth mirror was used to check all surfaces of the tooth for presence of any holes or cavities. Where there was cavity or hole, the dental explorer was inserted to check whether the floor of the cavity was softened. If the floor of the cavity was found to be softened then the tooth was said to be carious and recorded. Secondly, any tooth with discoloration or rough spots on the surface of the tooth with demonstrable loss of tooth substance was also considered as a carious tooth and recorded.

Data was collected by the interviewer who administered the structured questionnaires

### **3.8.1 Pre-data collection stage**

#### **Training of research assistants**

An individual with requisite background in dental health care and who could speak the two common local dialects (Twi and Ga) spoken in the study area was recruited to serve as research assistant for the study. The assistant was trained for two days. She was trained in the explanation and administration of the questionnaire and ethical issues such as the need to obtain informed consent before interviewing the study patients to ensure that she recruited and related with the patients in the appropriate manner.

#### **3.8.2 Pretesting of Questionnaire**

The questionnaire was pretested on patients who attended the dental unit of the Achimota Hospital, Accra. This was performed by the Principal Investigator and one trained research assistant. Attention was paid to the wording, ease of administering the questionnaire, skip patterns, omissions and other potential problems. The validity and reliability of the questionnaire was pretested. Any ambiguity and other difficulties that the patients may encounter in responding to the questions and the questionnaire were revised and restructured accordingly. The pretesting was done to assess the research assistant's administration of the questionnaires in order to prevent interviewer bias.

#### **3.8.3 Data Collection Tools**

A predesigned WHO questionnaire (Appendix 4) for determining the DMFT index score and a well-structured questionnaire to assess the demographic features such as age, sex, economic and behavioral factors was used.

The raw data imputed into Excel and STATA version 13 was used to analyze it.

### **3.8.4 Quality control**

The research assistant was selected on her exposure to the hospital environment and familiarity with dental diagnosis in order to make her comfortable with the subject area. To ensure the comfort of both interviewer and interviewees, the research assistant was fluent in the local dialects, Twi and Ga. Training was done in two days. The purpose of training was to educate the research assistant on ethical considerations particularly the informed consent procedure, questionnaire administration and response to queries on the research. The questions were thoroughly explained and discussed in Ga and Twi. Pre-testing was carried out immediately after training and the instrument edited to render it more valid and user friendly.

Records were checked for completeness daily. For data validation, double entry was done and the resulting two data sets matched for differences. The differences were cross checked using the questionnaire.

### **3.8.5 Data Processing and Analysis**

The pre-coded questionnaires was serialized during the time of entry and data entered into Microsoft Excel 2013 without identifiers after the principal researcher had checked for completeness of the information. Data cleaning was done by running all frequencies, identifying missing records and filling in missing detail. The data was cross checked for errors. The data was exported to STATA Version 13 for analysis using the chi-squared test and regression analysis. It was presented in tables.

### **3.9 Ethical Considerations**

#### **3.9.1 Ethical Clearance**

Ethical clearance was obtained from the Ghana Health service Ethical review committee on research involving human subjects (ERCRIHS) through the school of Public Health (University of Ghana, Legon).

#### **3.9.2 Consenting Process**

Once approval of the proposal was given by the ERCRIHS, permission was obtained from the Tema General Hospital Authorities to use the hospital as the study site and to obtain the necessary information from the study patients and records for the purposes of the study only.

Informed consent was obtained from patients after presenting the purpose, risks and benefits of the research. The patients were informed of the right to refuse to participate and right to opt out of the study. They were assured of anonymity and confidentiality of each patient's information. There was no financial compensation for participation.

Finally, once a patient has fully understood the issues relating to the study, his/her right as a participant, and has agreed to take part in the study, a written consent or thumbprint was required thereafter. Each patient was spoken to in a language that he or she understands very well and speaks fluently.

### **3.9.3 Risks and Benefits**

There were no anticipated risks involved in this study. However, there was some little discomfort during the examination of their mouth which required the use of wooden spatula and a mouth mirror. Sharp instruments or injections were not used or given during the oral examination section of this study.

There was no immediate and personal benefits of this work to patients. Those with immediate dental treatment were referred to the appropriate health facility (study site) for management.

### **3.9.4 Rights of Participants**

The rights of each patient was read to them before they consented to participate. Their rights include rights to decline, rights to voluntary participation and withdrawal, rights to anonymity and confidentiality, and rights to full explanation of risks and benefits

Patients were provided with the contact details of the principal investigator (PI) and a contact person at the Ethical Review Committee of the Ghana Health Service as stated in the consent form (Appendix III) for further information about the study.

### **3.9.5 Voluntary Withdrawal**

The agreement to participate was voluntary in this study. However, the research team showed appreciation by thanking patients who withdrew from the study at any point in time.

### **3.9.6 Anonymity and Confidentiality**

Information obtained from the patients were used only for the purpose of this study and were assured of confidentiality. The names of patients were not used in the study.

### **3.9.7 Data Storage and Usage**

Hard copies such as completed questionnaire and electronic data about the study were kept securely in a locked cabinet which was only assessed by the Principal Investigator.

Questionnaires were anonymised with serial numbers so that patients were identified by their questionnaires. Soft Copies of information of the data were placed on an external hard drive, pen drive, the PI's personal computer and password protected. This was assessed by the Principal Investigator. Data files were password protected.

### **3.9.8 Cost /Compensation**

There was no compensation for patients in this study. Patients incurred no costs for diagnosis or any other study procedure. They were not charged for the study, clinic visits or examinations related to this study.

### **3.9.9 Conflict of Interest**

The PI (Principal Investigator) had no personal conflict of interest that was interpreted to influence the results of this study.

### **3.10 Proposal & funding information**

This study was sponsored fully and solely by the PI. The PI was paying 100% of the study covering fieldwork, data entry and analyses.



## CHAPTER FOUR

### 4.0 RESULTS

#### 4.1 Sample Profile

This is a cross-sectional study to determine the prevalence of dental caries and related social factors. This cross-sectional study was conducted at the dental clinic of the Tema General Hospital.

A total of 160 patients were interviewed. Patients attending the clinic during this period were approached to take part in the study. All patients approached (100%) accepted to be part of the study.

Most of the patients (61.9%) were females (Table 1). The patients' ages were between 3-81 years with 57.5% within the age category of 20-39 years. More than half (58.1%) of the patients were single. The educational status showed 43.8% having at least secondary level of education. About (40.6%) of the patients in this study were unemployed. Greater than 60% reported daily tooth brushing and snacking (sugar-containing foods and drinks) habits. Among patients who had visited the dentist, 76.3% were first timers and 23.8% had visited the dentist within the last 12 months.



**Table 1: Background Characteristics of Patients**

Characteristics	Total=160	
	n	(%)
<b>Sex</b>		
Male	61	38.1
Female	99	61.9
<b>Age in years</b>		
<20	29	18.1
20-39	92	57.5
40-59	22	13.8
>60	17	10.6
<b>Ethnicity</b>		
Akan	47	29.4
Ga/Dangme	47	29.4
Ewe	49	30.6
Northerners	17	10.6
<b>Religion</b>		
Christian	139	86.9
Muslim	21	13.1
<b>Marital Status</b>		
Single	93	58.1
Married	59	36.9
Others <sup>a</sup>	8	5.0
<b>Educational Status</b>		
No Education	16	10.0
Primary	25	15.6
Middle/JHS <sup>b</sup>	49	30.6
At least secondary level	70	43.8

**Table 1: Background Characteristics of Patients**

Characteristics	Total=160	
	No.	(%)
<b>Occupation</b>		
Employed	40	25.0
Unemployed	65	40.6
Self employed	55	34.4
<b>Tooth brushing frequency</b>		
Twice a day	59	36.9
Once a day	101	63.1
<b>Snack<sup>c</sup></b>		
No snack	55	34.4
At least one snack a day	105	65.6
<b>Number of visit to dentist</b>		
First dental visit	122	76.3
Visit in the last 12 months	38	23.8

<sup>a</sup> others- include widows, divorced, separated

<sup>b</sup> JHS- Junior High school

<sup>c</sup> snack- sugar containing foods or drinks taken in between meals  
No. – number

#### 4.2 Dental Caries Experience

DMFT (decayed missing filled tooth) index is used to measure the prevalence of dental caries. The index measures the average number of teeth per person which are decayed, missing or filled. The “D” is used to determine the prevalence of dental caries and level of caries experience. Table 2 shows the distribution of patients by Dental caries experience. The prevalence of dental caries was 81.3%. Among those diagnosed with dental caries,

92.3% constituted the D3 level of caries experience. The mean age of patients who reported with dental caries was  $31 \pm 16.9$ .

**Table 2 Distribution of patients at the Dental clinic of Tema General Hospital by Dental caries Experience**

Dental caries experience	Total=160	
	No.	(%)
No Dental caries	30	18.8
Dental caries present	130	81.3
D1 <sup>2</sup> (Initial caries)	1	0.8
D2 <sup>b</sup> (Enamel caries)	9	6.9
D3 <sup>c</sup> (Caries of Dentin and Pulpal Involvement)	120	92.3

<sup>a, b, c</sup> D1-D3 scale – a scale used for diagnosing through the full range of dental caries experience

#### 4.3 Relationship between social factors and Dental Caries Experience

Logistic Regression analyses (Table 3) showed that, patients with primary level of education was strongly associated with dental caries experience when all possible confounders were adjusted for (OR=10.14, 95% CI: 1.02-100.42).

The OR (1.39) was increased among the age category (20-39) but the estimate was not statistically significant. Similar finding was observed between self-employment and dental caries experience (OR=1.72, 95% CI: 0.45-6.55)

Having adjusted for age, sex, religion, educational status, occupation and other possible confounders, the odds of married couples having dental caries is reduced by 81% compared to patients who are single.

The relationship between ethnicity and dental caries experience showed statistical significance. There was a strong association between the Ga/Dangme's, a tribe largely located in the Greater Accra region and dental caries experience (OR= 4.33, 95% CI: 1.09-17.16)

#### **4.3.1. Dental Caries experience and Demographic factors**

60.8% (Table 4) of females in this study presented with dental caries compared to males (39.2%) though not statistically significant. Among the various age categories, 61.5% of the patients within the age group 20-39 years (Fig. 8) reported the highest number of dental caries experienced. However, the estimate was marginally insignificant (p-value= 0.051). Strong association was apparent between marital status and dental caries experience (p-value <0.05). 62.3% of the patients who were single reported the highest number of dental caries present. 43.1% of patients with at least secondary level of education reported the highest number of caries recorded compared to those with low level of education; 17.7% (primary) and 8.5% (no education) respectively. However, this relationship was not statistically significant.

#### **4.3.2 Dental caries experience and Economic factors**

There was no significant association between occupational status and dental caries experience as shown in Table 4. 39.2% of patients unemployed reported with dental caries which was not significantly different compared to patient's self-employed (35.4%).

#### **4.3.3 Dental caries experience and Behavioral factors**

More than 60% of patients who take in at least one snack a day preferably sugar-containing foods or drinks in between meals reported the highest number of caries present compared to 36.2% who do not take any snack. This was similar to that recorded for patients who brush their teeth once daily compared to those who brush twice daily. There was no significant associations observed in both. (Table 4)



**Table 3: Logistic regression (adjusted and unadjusted) analyses of dental caries experience among patients at the dental clinic of Tema General Hospital**

<b>Social factors</b>	<b>OR (95%Confidence interval)</b>	<b><i>p-value</i></b>	<b>OR (95%Confidence interval)</b>	<b><i>p-value</i></b>
<b>Sex</b>				
Male	1		1	
Female	0.77 (0.34-1.79)	0.549	0.59 (0.22-1.60)	0.301
<b>Age in years</b>				
<20	1		1	
20-39	1.39 (0.44-4.34)	0.572	3.07 (0.63-14.97)	0.164
40-59	0.36 (0.10-1.33)	0.127	0.56 (0.08-3.73)	0.545
>60	0.5 (0.12-2.07)	0.339	0.89 (0.09-8.77)	0.917
<b>Ethnicity</b>				
Akan	1		1	
Ga/Dangme	3.21 (1.04-9.90)	0.042*	4.33 (1.09-17.16)	0.037*
Ewe	1.70 (0.65-4.46)	0.282	1.67 (0.53-5.23)	0.381
Northerners	1.78 (0.44-7.24)	0.418	1.61 (0.20-10.73)	0.620
<b>Marital Status</b>				
Single	1		1	
Married	0.36 (0.16-0.84)	0.017*	0.19 (0.05-0.76)	0.018*
Others <sup>a</sup>	1.04 (0.12-9.19)		3.24 (0.21-50.80)	0.402
<b>Educational status</b>				
No Education	1		1	
Primary	5.23 (0.87-31.32)	0.070	10.14 (1.0-100.42)	0.048*
Middle/JHS <sup>b</sup>	2.02 (0.56-7.27)	0.282	3.34 (0.56-20.03)	0.187
At least secondary	1.82 (0.54-6.09)	0.332	1.73 (0.32-9.44)	0.527
<b>Occupation</b>				
Employed	1		1	
Unemployed	0.77 (0.28-2.12)		0.34 (0.08-1.39)	0.133
Self-employed	1.08 (0.37-3.21)		1.72 (0.45-6.55)	0.423
<b>Tooth brushing Frequency</b>				
Twice a day	1		1	
Once a day	0.85 (0.38-1.92)	0.694	1.09 (0.40-2.95)	0.873
<b>Snack<sup>c</sup></b>				
No snack	1		1	
At least one snack a day	0.64 (0.27-1.56)	0.327	0.65 (0.21-2.03)	0.458
<b>Number of Visit to dentist</b>				
First dental visit	1		1	
Visit in the last 12 months	1.03 (0.40-2.63)		1.52 (0.50-4.60)	0.460

\*  $p < 0.05$  <sup>b</sup>JHS- Junior High school, <sup>c</sup>snack- sugar containing soft drinks or biscuits,  $X^2$ -chi-square value, <sup>a</sup>others- include widows, divorced, separated, <sup>b</sup>JHS- Junior High school, <sup>c</sup>snack- sugar containing soft drinks or biscuits

**Table 4 Bivariate Analyses of Social factors and Caries Experience among patients at the Dental Clinic of Tema General Hospital**

<b>Socio-demographic factors</b>	<b>Dental Caries present (total=130) No. (%)</b>	<b>No Dental caries present (total= 30) No. (%)</b>	<b>Total</b>	<b>X<sup>2</sup></b>	<b>p-value</b>
<b>Sex</b>				0.36	0.549
Male	51 (39.2)	10 (33.3)	61		
Female	79 (60.8)	20 (66.7)	99		
<b>Age in years</b>				7.76	0.051
<20	24 (18.5)	5 (16.7)	29		
20-39	80 (61.5)	12 (40.0)	92		
40-59	14 (10.8)	8 (26.7)	22		
>60	12 (9.2)	5 (16.7)	17		
<b>Ethnicity</b>				4.50	0.213
Akan	34 (26.2)	13 (43.3)	47		
Ga/Dangme	42 (32.3)	5 (16.7)	47		
Ewe	40 (30.8)	9 (30.0)	49		
Northerners	14 (10.8)	3 (10.0)	17		
<b>Marital Status</b>				6.21	0.045*
Single	81 (62.3)	12 (40.0)	93		
Married	42 (32.3)	17 (56.7)	59		
Others <sup>a</sup>	7 (5.4)	1 (3.3)	8		
<b>Educational status</b>					
No Education	11 (8.5)	5 (16.7)	16		
Primary	23 (17.7)	2 (6.7)	25		
Middle/JHS <sup>b</sup>	40 (30.8)	9 (30.0)	49		
At least secondary	56 (43.1)	14 (46.7)	70		
<b>Occupation</b>				0.58	0.749
Employed	33 (25.4)	7 (23.3)	40		
Unemployed	51 (39.2)	14 (46.7)	65		
Self-employed	46 (35.4)	9 (30.0)	55		
<b>Tooth brushing Frequency</b>				0.00	0.979
Twice a day	48 (36.9)	11 (36.7)	59		
Once a day	82 (63.1)	19 (63.3)	105		
<b>Snack<sup>c</sup></b>				0.34	0.560
No snack	47 (36.2)	8 (26.7)	55		
At least one snack a day	83 (63.9)	22 (73.3)	105		
<b>Number of Visit to dentist</b>				0.0035	0.953
First dental visit	99 (76.2)	23(76.7)	122		
Visit in the last 12 months	31 (23.9)	7 (23.3)	38		

\* p < 0.05 <sup>a</sup> others- include widows, divorced, separated

<sup>b</sup> JHS- Junior High school, <sup>c</sup> snack- sugar containing soft drinks or biscuits, X<sup>2</sup>-chi-square value

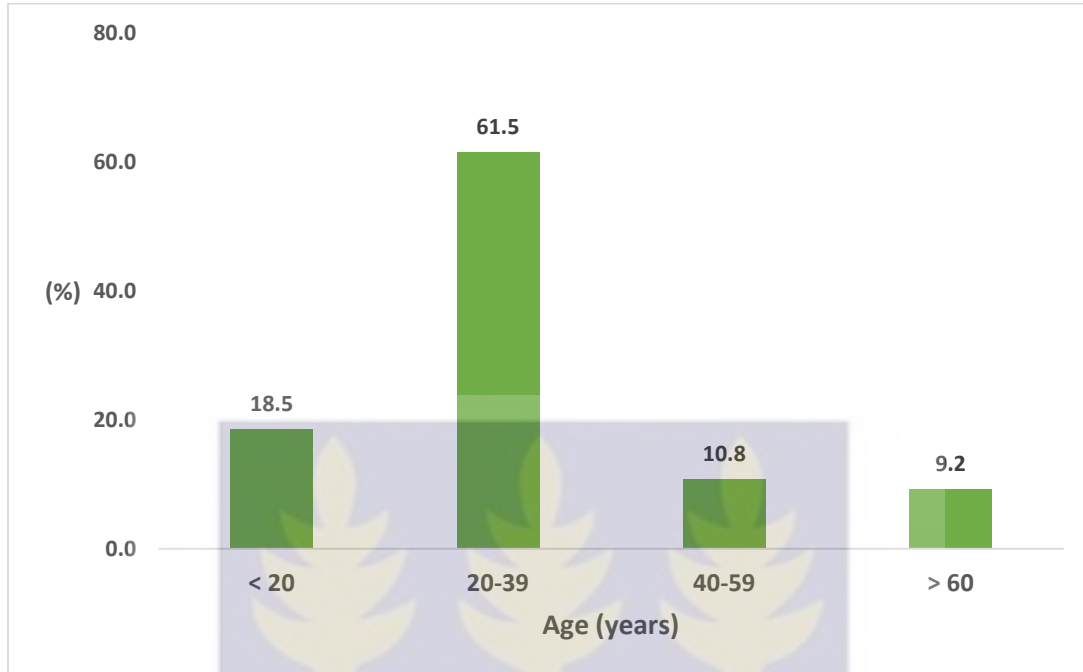


Figure 8: Percentage distribution of patients with dental caries by age

#### 4.4 Relationship between socio-economic and socio-behavioral factors

Among the various social factors, all three (Age, educational and occupational status) showed significant association with snacking (Table 5). Similar findings were observed between age/occupational status and age/ educational status relationships (p-values < 0.001 respectively).

**Table 5: Association between age, occupation, educational status and snacking among patients at the Dental clinic of Tema General Hospital**

Social Factors	Snacking		Total	$X^2$	<i>p</i> -value
	No Snack (total=55)	At least one snack a day (total=105)			
	n (%)	n (%)			
<b>Age</b>				17.42	0.001*
<20	18 (32.7)	11 (10.5)	29		
20-39	27 (49.1)	65 (61.9)	92		
40-59	9 (16.4)	13 (12.4)	22		
>60	1 (1.8)	16 (15.2)	17		
<b>Occupation</b>				9.29	0.010*
Employed	12 (21.8)	28 (26.7)	40		
Unemployed	31 (56.4)	34 (32.4)	65		
Self-employed	12 (21.8)	43 (41.0)	55		
<b>Educational status</b>				19.73	<0.001*
No education	5 (9.1)	11 (10.5)	16		
Primary	17 (30.9)	8 (7.6)	25		
Middle/JHS	8 (14.6)	41 (39.1)	49		
At least secondary	25 (45.5)	45 (42.9)	70		

\*  $p < 0.05$   $p < 0.001$ , <sup>a</sup> Others- include widows, divorced, separated

<sup>b</sup> snack- sugar containing soft drinks or biscuits,  $X^2$  -chi-square value

**Table 6: Association between different age categories and occupational status among patients at the dental clinic of Tema General Hospital**

Social Factors	Occupational status				Total N	$X^2$	<i>p</i> -value
	Employed	Unemployed	Self-employed				
	(Total=40) n (%)	(Total=65) n (%)	Total =55) n (%)				
<b>Age</b>					43.84	<0.001*	
<20	1 (2.5)	26 (40.0)	2 (3.6)	29			
20-39	31 (77.5)	29 (44.6)	32 (58.9)	92			
40-59	7 (17.5)	4 (6.2)	11 (20.0)	22			
>60	1 (2.5)	6 (9.2)	10 (18.2)	17			

\*  $p < 0.001$  $X^2$ -chi-square value**Table 7: Association between age categories and educational status among patients at the dental clinic of Tema General Hospital**

Social Factors	Educational Status				Total n	$X^2$	<i>p</i> -value
	No Education	Primary	Middle/JHS <sup>a</sup>	At least Secondary			
	(Total=16) n (%)	(Total=25) n (%)	(Total =49) n (%)	(Total=70 n (%)			
<b>Age</b>					88.31	<0.001*	
<20	1 (6.3)	17 (68.0)	5 (10.2)	6 (8.6)	29		
20-39	8 (50.0)	5 (20.0)	23 (46.9)	56 (80.0)	92		
40-59	0 (0.0)	2 (8.0)	14 (28.6)	6 (8.6)	22		
>60	7 (43.8)	1 (4.0)	7 (14.3)	2 (2.9)	17		

\*  $p < 0.001$ <sup>a</sup> JHS- Junior High School $X^2$ -chi-square value

## **CHAPTER FIVE**

### **5.0 DISCUSSION**

#### **5.1 Prevalence of Dental Caries**

There is little or no information on the prevalence of dental caries and related social factors across all age groups in Ghana. In this current study, the prevalence of dental caries and the social factors that affect or determine it were analyzed. This study provides insights into the relationship between social factors and prevalence of dental caries within the Tema Metropolis.

The prevalence of dental caries among the study patients who attended the Tema General Hospital was 81.3%. This is higher than 46.1 % recorded by the 2013 annual report from Korle-bu Teaching Hospital among a population of 21,600. This finding is similar to the nearly 100% recorded by (WHO, 2012) and (Petersen et al., 2005) in both developing and developed countries.

Previous study by (Ndanu et al, 2014) has shown a strong association between sex and dental caries, with females (19.3%) having high dental caries occurrence than males. However, this significant association could not be confirmed in this study even though 60.8% of females and 39.2% of males reported with dental caries. It could possibly mean that, because females are more concerned about their oral health related issues, they tend to report to the dental clinic for treatment hence the large numbers observed in this particular study.

In this current study, dental caries prevalence was found to be high though not statistically significant, among the productive age group (20-39). This may be due to their lifestyle activities. The mean age in this study  $31 \pm 16.9$  years was strongly associated with dental caries occurrence similar to the findings ( $34.9 \pm 14.2$  years) recorded by (Olabisi et al., 2015).

## **5.2 Regression model analyses between social factors and dental caries occurrence**

Regression model analyses showed a strong association between educational status and dental caries occurrence. Patients with low level of education in this study have 10.14 increased odds of having dental caries compared to those without any education having adjusted for sex, age, marital status, ethnicity, occupational status, snacking and dental visit. (OR = 10.14, 95% CI: 1.02- 100.42) with a p-value  $<0.05$ . The likely explanation for this finding is that, patients with low level of education, have poor knowledge about oral health hence poor dental practice. This finding is consistent with studies by (Pakpour et al., 2011), (Borges et al., 2012) and (Saldūnaitė et al., 2014).

There was a strong association between marital status and dental caries occurrence after adjusting for possible confounders (OR= 0.19, 95% CI: 0.05-0.76). This implies that, married couples are 81% protected from having dental caries compared to single individuals. This finding could not be compared to any literature due to the limited studies available.

Interestingly, there was a significant association between ethnicity and dental caries occurrence in this current study. Comparing the Ga/Dangme's to the Akans (tribes in

Ghana), dental caries occurrence is higher among the Ga/Dangmes by 4.33. (OR=4.33, 95% CI: 1.09-17.16). This may largely be due to some kind of food they eat or generally their perception about oral health problems and dental treatment. This is similar to a study done in England (Williams, Whittle, & Gatrell, 2002).

### **5.3 Bivariate Analyses between social factors and dental caries occurrence**

In this study, only marital status was strongly associated with dental caries occurrence using the bivariate analyses. All the other social factors did not show any significant association. However, among the occupational status, the unemployed, recorded the highest prevalence of dental caries. This may be due to inability to afford dental services hence most of the dental caries are untreated. Studies by (Borges et al., 2012) and (Saldūnaitė et al., 2014) have similar findings.

The consistency of snacking and once daily tooth brushing with dental caries occurrence is largely due to the presence of sugar on the tooth surface and inadequate brushing of tooth which form the basic risk factors for dental caries as determined by literature (Laura and David a. Mitchell, 2007)

### **5.4 Relationship between Socio- economic and behavioral factors**

Significant association was established between the various social factors (age, occupational and educational status) and snacking. In this study, there was a strong association between patients within the age group 20-39 years and snacking. The possible

explanation may be due to their lifestyle and exposure to snacks. Studies by (Pakpour et al., 2011) and (Peterson et al., 2005) showed similar findings.

Among the various occupational status, significant association was observed between the self-employed and snacking. The possible explanation is that high income earners purchase snacks (sugar containing foods) in between meals. This finding is consistent with studies by (Pakpour et al., 2011), (Borges et al., 2012) and (Saldūnaitė et al., 2014) .

Similarly, patients with higher level of education showed a stronger association with snacking. This may be due to the increasing awareness and knowledge about snacks (sugar-containing foods or drinks). A similar finding was reported by (Pakpour et al., 2011).

### **5.5 Limitations of this study**

The number of children representation as recommended by WHO in this study was grossly inadequate and therefore the data may not represent the true prevalence of dental caries for this age group.

The sample size for this study may not be large enough to be able to establish the causal relationship between snacking and dental caries occurrence as have been established by literature.

## CHAPTER SIX

### 6.0 CONCLUSION AND RECOMMENDATION

#### 6.1 Conclusion

Prevalence of Dental caries was found to be 81.3% with 92.3% having complete destruction of the tooth which is significantly high compared to the annual report from Korle-bu teaching Hospital (the nation's biggest and referral hospital). The mean age of patients with dental caries was found to be  $31 \pm 16.9$ . Significant association was found between the age group (20-39) and occupation, educational status and snacking. It can be concluded that, married couples are more protected from having dental caries compared to those who are single. Patients with low level of education have an increased odds of having dental caries compared to those with higher education.

#### 6.2 Recommendations

Based on this study, the following are some recommendations.

The Ghana Dental Association in collaboration with the Dental schools should engage in community outreaches to encourage the public to seek early treatment and regular dental check-up at least once a year.

Further studies should be conducted by researchers to establish and document the prevalence of dental caries and risk factors in other regions of the country.

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## APPENDICES

### **Appendix III: Informed consent**

Informed consent for study on dental caries prevalence and related factors in patients attending the dental unit of the Tema General Hospital, Tema

#### **Background**

I am Sophia Quist, a student of the School of Public Health, University of Ghana. As part of the requirements for the award of the Master of Public Health Degree, I am conducting a research on Dental Caries Prevalence and Related Factors in Patients Attending the Dental unit.

#### **Procedure:**

We will conduct an interview after you have been attended to by the Doctor and record the diagnosis in your folder. A structured questionnaire will be used for the interview. No xrays will be taken or any invasive procedure will be done, thus, no physical harm. There will be no financial compensation for participation.

#### **Freedom to Participate:**

Your participation is completely voluntary and you may refuse to participate. You may ask me to stop the interview if it makes you feel uncomfortable, or you may also decline

to answer any questions if you are uncomfortable with it.

**Risks and Benefits:**

You may feel uneasy with some of the questions that we will be asking you and the examination that will be done. However, they will be helpful to us and to the providers of healthcare in Ghana if you could answer all the questions and partake in the examination. The information you provide will contribute to the efforts aimed at mitigating the effects of dental caries on children, adults, elderly and pregnant women.

**Privacy, Anonymity and Confidentiality:**

Your name will not appear. The information you provide for the interview will be used only for the purpose of the study and you will be assured of its confidentiality.

**Whom to contact:**

For any question regarding the Research, you may contact

Hannah Frimpong

Administrative Secretary, Ghana Health Service Ethics Review Committee

Telephone Number: 050-704-1223.

Email: [ghserc@gmail.com](mailto:ghserc@gmail.com)

**Principal Investigator**

Sophia Quist

Telephone Number: 026-666-222-8

Email: [squistsey@gmail.com](mailto:squistsey@gmail.com)

**Statement of consent;**

I, ..... after  
understanding the information given on the study, hereby give consent to participate in  
this study.

.....  
(signature/ thumbprint of participant) Date

**Statement of the Researcher:**

I have provided verbal information regarding this study. I agree to answer any future  
questions concerning the study as best as I can. I will adhere to approved protocol

Name of Researcher.....

Signature.....

Place.....

Date.....

**Appendix IV: Questionnaire**

Questionnaire for study on Prevalence of dental caries and related social factors in patients attending the dental unit of Tema General Hospital

**QUESTIONNAIRE**

**Introduction**

Having consented to participate in this study, we entreat you to answer the following questions. We would need information on your background characteristics and health related information in relation to the topic from you and from your folder. The questionnaire will be administered to you. Kindly fill it to the best of your knowledge and always remember you can opt out if you so desire. Thank you.

Respondent's sign/ Thumbprint

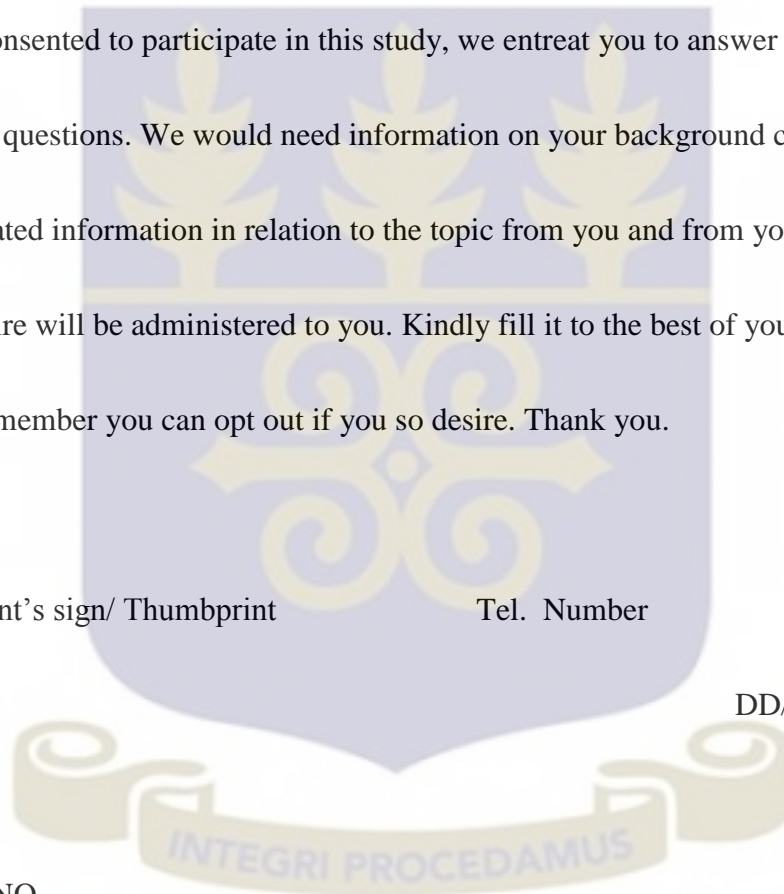
Tel. Number

Date:

DD/MM/YYYY(DOB)

SERIAL NO.

FOLDER NO.



**RECORDING FORMAT FOR DMFT INDEX**

17	16	15	14	13	12	11	21	22	23	24	25	26	27
47	46	45	44	43	42	41	31	32	33	34	35	36	37

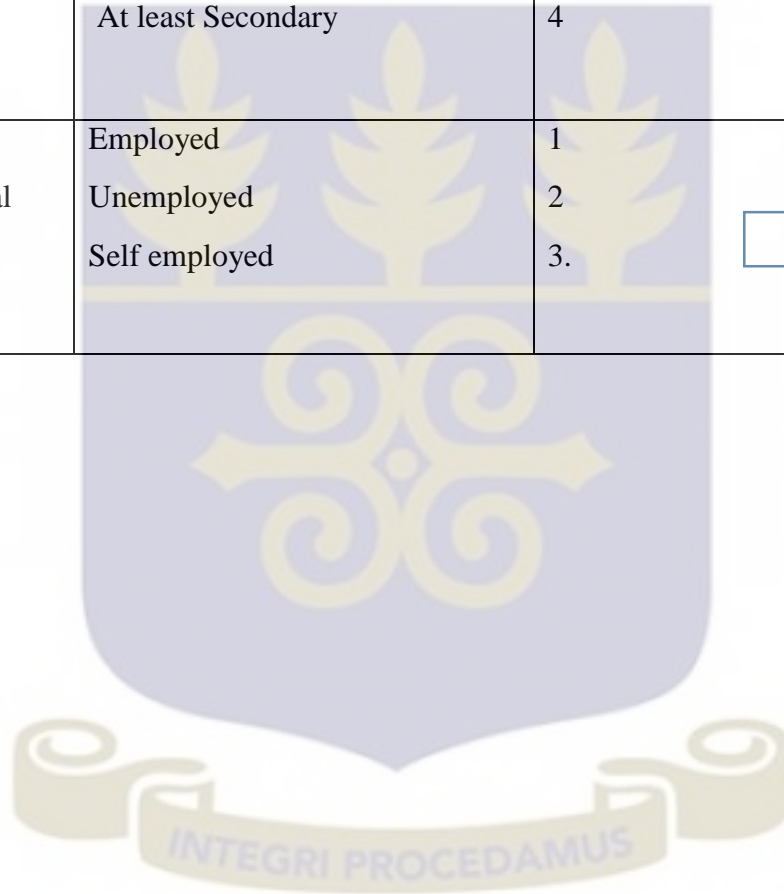
DT=  MT=  FT=  DMFT Score =

WHO predesigned questionnaire for DMFT Index



Demographic / Socio-Economic Information			
Question	Response	please write number in the box	Question number
Sex	Male	1	Q1
	Female	2	
Age			Q2
Date of birth			Q3
Place of birth	Within Tema	1	Q4
	Outside Tema	2	
Ethnicity	Akan	1	Q5
	Ga/Dangme	2	
	Ewe	3	
	Northerners	4	
Religion	Christian	1	Q6
	Muslim	2	
Marital status	Never married	1	Q7
	Married	2	
	Divorced/separated	3	
	Widowed	4	

<b>Demographic / Socio-Economic Information</b>			
Question	Response	please write number in the box	
Educational status	No Education	1	<input type="text"/>
	Primary	2	
	Middle/JSS	3	
	At least Secondary	4	
Occupational Status	Employed	1	<input type="text"/>
	Unemployed	2	
	Self employed	3.	



Self-care practice/Oral Health Habits			
Question	Response	please write number in the box	Question number
Toothbrushing frequency	Twice a day	1	Q1
	Once a day	2	
Snacking	No snack	1	Q2
	At least one snack a day	2	
Number of Visit to dentist	First dental visit	1	Q3
	Visit in the last 12 months	2	

