A pilot study on oral health knowledge of parents related to dental caries of their children- Karachi, Pakistan

Master thesis
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Abstract

Introduction
Dental caries is an infectious disease of the teeth in which there is the demineralization of hard tissue of teeth and eventually leading to cavitation. According to World Health Organization school going children are more affected from dental caries. Different risk factors for dental caries have been identified and they are related to change in the lifestyle of the people. Children belonging to poor environment area experiences high dental caries status, less likely visit to dental clinics with more consumption of refine sugars. The diseases can be protected if proper measures taken like oral cavity in good condition and fluoride use in dentifrices.

Objective
The objective of this study was to assess the prevalence of dental caries in school going children aged between 12-15 years in Karachi (Malir town) and to investigate the knowledge of the parents regarding oral health of their children and its association with the dental caries of their children.

Method
A cross-sectional study was conducted in school going children aged between 12 -15 years in Malir town, Karachi. The sample size was adequate, 380 students. Prevalence of dental caries was measured by DMFT index after performing clinical examination. Educational level of the parents, knowledge of parents about oral health maintenance and the knowledge of children was measured by a self structured questionnaire.

Results
There were several risk factors found which were associated with the dental caries but not statistically significant due to low number of participants, like father’s education, income, eating snacks between meals. There were 51% boys and 49% girls. The prevalence of dental caries was 70%. The mean DMFT score was 1.4in students. Mean DMFT was significantly higher in girls than boys. The carious lesion was more in girls than boys. The odds of dental caries were higher in girls than boys and were statistically significant. The dental caries increases as the age increases from 12 year age to 15 year. The odds of dental caries in students increases as the father education increases and was statistically significant. Those parents who had not used fluoride containing toothpaste for their children the odds of dental caries was higher than compared to other group.
Discussion
The overall response was low from the questionnaire that was requested from parents. The survey was done in private schools. The prevalence of dental caries occurs worldwide and there is a disparity in the distribution of risk factors among different social groups. Parents had the knowledge of oral hygiene but it seems that transfer of knowledge or guidance was inappropriate. Mother plays an important role in taking care of the oral hygiene of their children and in the guidance of tooth brushing. Dental caries was seen in prosperous families with high income and fathers' education. Those homes where fluoride toothpaste was used and the parents had knowledge of dental plaque, there was low prevalence of dental caries. Children had inappropriate knowledge of oral hygiene and only 25.3% of parents knew the exact cause of dental caries. The results also showed that parents play an important role in taking care of oral hygiene of their children as compared to knowledge gained in schools.

Keywords
Students, parents, socio economic, education, oral hygiene, DMFT
1 Introduction

History of dental caries goes back to centuries and today millions of people are affected from dental caries. Dental caries is an infectious disease of the teeth in which there is the demineralization of hard tissue of the teeth (enamel, dentin, and cementum) eventually leading to cavitations. The lesion only occurs if there is a sustainable environment present in the oral cavity. Collection of bacteria especially cariogenic streptococcus mutants, diet and oral hygiene and time play an important role in carious lesion (1). However dental caries is not a typical classical infectious diseases it is rather a multifactorial diseases where several risk factors are involved it occurs because of the imbalance that is created in oral environment and association of other external factors(2). Dental plaque which is a gelatinous mass forms from the diet, adheres to the tooth surface with bacteria’s embedded in it. At the early stage of dental caries, the cavitations formed is initially asymptomatic and is cannot be seen from the naked eyes and pain from the affected only occurs if it progress to the chronic stage and stimulate the dental pulp. The lesion can be arrested if certain preventive measures are taken against the formation of dental caries (3).

1.1 Definition of dental caries

“Dental caries is an infectious microbiologic disease of the teeth that results in localized dissolution and destruction of the calcified tissues” (1).

1.2 Structure of the teeth

1.2.1 Enamel

Enamel is the outer most part of the tooth and it is thickest on the occlusal and incisal surfaces of the tooth. Enamel is translucent and its colour depend upon the colour of the dentin, enamel thickness and stain in the enamel. Enamel is formed by the ameloblast cells. It is highly mineralized crystalline hydroxyappetite structure which contains 95 % to 98 % inorganic matter by weight and 1 % to 2 % organic content and water constitutes 4% by weight. It is the hardest substance of the human body. The point where enamel meets the dentin is called the dentinoenamel junction. Once enamel is damaged, it is unable to repair itself. Enamel allows permeable to certain ion and molecules and allows both partial and complete penetration. Enamel is soluble in acidic medium but presence of fluoride decreases the enamel solubility. Fluoride preserves the enamel structure by lowering acid solubility, decreasing rate of demineralization and enhancing the rate of mineralization (4).
1.2.2 Dentin

Enamel is brittle in character whereas dentine is compressive in nature and act as a cushion for enamel. Dentine forms the largest fraction of the tooth constitution extending almost full length of the tooth. Enamel covers the dentin on the anatomic crown and cementum on the anatomic root. It forms the walls of the cavity pulp chamber. Pulp chamber and pulp canals which unite to form the pulp cavity are also covered by the dentin. The formation of the dentin is continuous throughout the life of the pulp after eruption. The initial shape of the dentin is formed by the primary dentin and completed after three years of the eruption. Next type of dentin is secondary dentine which laid down at a constant rate. Other type of dentine is reparative dentine, formed in response to moderate level irritant e.g. such as attrition, abrasion, erosion, trauma, caries, and some operative procedures. It is formed as a result of a defence reaction to the external stimuli.

Dentin comprises 75% inorganic material, 20% organic material and 5% water and other materials. It is less mineralized than enamel but more mineralized than bone and cementum. Concentration of mineral increases as the age increases as well as hardening of the dentin increases. It is darker than enamel and yellowish white in colour and can change to from brown or black when it exposed to oral fluids and slowly progressive caries.

Pulp cavity of the tooth is packed by the dental pulp which consists of nerves, arteries, veins, lymph channels, connective tissue, intercellular substance, odontoblasts, fibroblasts, macrophages, collagen, and fine fibres. Structure of teeth is presented in figure 1

1.2.3 Pulp serves four important functions.

(1) Formative or developmental, production of primary and secondary dentin.
(2) Nutritive, supplies nutriments and moisture to the dentin.
(3) Sensory or protective, function provides sensory nerve fibres for the sensation of pain to the dentin and
(4) Defensive or reparative, formation of new dentin in response to irritation by mechanical, thermal, chemical and bacterial stimuli (1).
1.2.4 Cementum

It covers the root of the tooth and formed from the cells called cementoblast, Consists of about 45% to 50% inorganic material (hydroxyapatite) by weight and 50% to 55% organic matter and water by weight. The organic part consists of collagen and polysaccharides. Cementum which covers the tooth is attached to the alveolar bone via sharpey’s fibers part of the periodontal ligament. It is yellow in colour. It is formed throughout the life for the intact tooth within the socket. It is able to repair itself vital to a limited degree and is not resorbed under regular situation. Two types of cementum are formed: acellular and cellular (4).

Figure 1: structure of teeth

1.3 Pathogenesis of dental caries

The pathogenesis of caries involves from the initiation of the formation of plaque. The surface of the tooth that is covered by the plaque, when there is drop in the pH of the localized area, causes the dissolution and demineralization of tooth. Metabolism in Plaque causes the decrease in already lower pH. The plaque containing high concentration of SM and
lactobacilli that can produce acids after fermentation of carbohydrates which initiates in pH, cause demineralization of teeth. The caries can be prevented at this stage by proper oral hygiene guidelines.

This initial carious lesion is limited to the enamel where the surface remains intact but the subsurface is porous is incipient caries. When subsurface demineralization is extensive than the tooth structure collapses and cavitation occurs. Once the cavitation occurs, it cannot be reversed without performing an operative dental procedure (3, 4).

1.4 Risk factors of dental Caries

Risk is the probability that a specific event will occurs. For events to occur, chains of various risk factors are involved (5).

Risk factors for dental caries can divided into oral and non-oral risk factors. Tooth anatomy and composition of dental plaque shown in Figure 2, previous infections, restorations, and oral hygiene are categorized under oral risk factors and non-oral risk factors include age, socioeconomic status, medical condition, medications, fluoride history, dietary habits, genetic predisposition, general health, dental visits, and irregular tooth brushing.

Many researchers have proved the association between poor health status, Systemic diseases, genetics, environmental and oral related behavioural factors (poor oral hygiene, poor dietary habits, frequent use of oral medication containing sugars, insufficient exposure to fluoride and inadequate use of dental health care services). The oral health related factor or biological determinants are considers as proximal risk factors and socioeconomic status is considered as distal risk factors. These factors if control can help to reduce the caries prevalence in the population who are at great risk mainly in young children. Researchers have introduced several risk factors models for the assessment of risk of dental caries and predicting future caries risk which can and help in leading towards the prevention of dental caries (6, 7).

Children are more susceptible to dental caries, their primary teeth exfoliated and permanent dentition erupt into the mouth, their oral immunity is still in building phase, they were facing transitions of dietary habits which change from home to school. The predisposing factors for the causing of dental caries are active at this stage. it has been also seen that children at the school going age are more rely on self selection of food their infrequency of inappropriate eating practice and not proper guidance of oral hygiene increases the risk of dental caries (8,9).
Lifestyles of societies and civilization interlinked with some definite behaviours of daily-life that influences the outcomes by means of physiological procedure. Various risks are control over by the individual itself and some are totally dependent on the entire community or population (1).

Figure 2: Adherence of dental plaque to the teeth

There were several risk factors which were presented and identified by the researchers for the analysis of dental caries and several literature were reviewed for the issue of risk factors of dental caries (10) and suggest that there is still need to do some longitudinal studies and there were some potential factors that need to evaluated like impact of parental beliefs and attitude about tooth brushing and snacks on the presence of childhood caries (1) Figure 3 shows a model of risk factors of dental caries presented by Peterson (5). In this thesis I will basically focus on “risk behaviours” and “socio cultural risk factors”.

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Figure 3: Risk factors of dental caries

Health system and oral health
- Services availability
  - Prevention or curative orientation
  - Centralised or decentralised
  - Primary health care

Socio cultural risk factors
- Education
- Occupation
- Income
- Ethnicity
- Lifestyles
- Social network support

Environmental risk factors
- Drinking water
- Sanitation
- Hygiene
- Nutrition status

Use of oral health services
- Demand for dental care
- Reasons of visits
- Frequency of visits

Risk behaviour
- Oral hygiene practices
- Sugars consumption
  - Amount
  - Frequency
  - Types

Outcome
- Health status
- Prevalence of dental caries
- Relative risk/Odds ratio
- dmf or DMF (teeth/surfaces)
- d/dmf
- D/DMF
- Caries severity
- Tooth loss
- Quality of life
- Self assessment of teeth
- Pain/discomfort
- Chewing ability
- Smiling
- Social functioning
1.4.1: Oral hygiene

It is one of the socio-behavioural risk factors of dental caries but it can be used to prevent dental caries to occur if proper measures are taken. The education of oral hygiene ameliorates in preventing the dental diseases. It is attained by focusing on the importance of the removal of biofilm that covers the dental surface with the aid of proper tool for oral health maintenance. It is accomplish by mechanical way, which includes brushing with fluoride containing tooth paste, dental flossing, tongue scraping are also important. These measures are proven to be effective in controlling dental plaque. Water containing fluoride with recommended level of drinking water and brushing teeth with fluoride containing toothpaste is also beneficial for healthy teeth. The use of fluoride varnish over the tooth surface diminishes the effect of carcinogenicity. Other measures for maintaining proper oral hygiene for example xylitol chewing gums, antibacterial agents for instance chlorhexidine and iodine are also used for effective management of dental caries (11).

Brushing technique: Brushing frequency of teeth at least twice a day or more, ideally after meals in the morning and before going to bed. When the first teeth erupt there should be supervision from adults up to the age of eight year. Minimum two minute and the technique that encourages the dispersion of toothpaste around the teeth (12).

The Muswak is a teeth cleaning instrument made from a twig of the Salvadora Persica tree. It is widely used in Asia and Africa as a habitual use for dental hygiene. It has strong antibacterial, antifungal and antiviral effects. It can help to prevent dental plaque but it also has abrasive properties (13) and it can be seen in figure 4.

Figure 4: Muswak

In industrialized countries oral hygiene status are improving by changing patterns of sugar consumption, improved oral hygiene, new lifestyles and improve standards of living and establishing school base preventive programmes (14).
1.4.2: Role of diet and eating behaviour on dental caries

The presence of fermentable carbohydrates is essential for caries to occur as cariogenic bacteria feed on them to produce acids which lower the pH of the saliva. The relationship between caries and sugars has been explained earlier by Stephan (1940) and he showed that dental plaque was acidified after the sugars were fermented by bacteria (15).

The life styles of societies and their living conditions have effect on their overall health. It changes from time to time and person to person and consequences from it have different results in different phase of life. The eating behaviour alters the oral health and people with random eating behaviour had more dental caries as compared to the people with normal eating behaviour. Both the amount and frequency of carbohydrate are contributing factors in the occurrence of dental caries to take place. The frequently eating snacks between the meal time’s drops pH of the oral cavity to its appropriate level and increase the probability of occurrence of dental caries due to presence of cariogenic environment (16, 17).

1.4.3: Socioeconomic status

The effect of Low socioeconomic status factor in developing countries affects more on dental caries than in developed countries(14). Dental caries is significantly associated with socioeconomic status(5). The oral health status is observed different in different social classes. As well as in gender and the education level of the parents are also associated with dental caries(18). The prevalence of dental caries in school going children of different social class shows significant increases of dental caries of children studying in public than private schools. The oral hygiene status of children with high social background studying in private schools are better than lower low social background studying in public schools(19).

The study of Tickle et al. conducted on children who were registered to general dental clinic in north of London, states that children belonging to poor environment area experiences high dental caries status and rarely less likely visit to dental clinics while those children who visit well in dental cares have lower experiences of dental disease and more treatments of dental diseases. The study done that was done in Karachi showed that people living in deprived area have more dental problem and more untreated dental cavities (19).

The effect of parent’s socioeconomic status has also been associated with the oral health of the children. Federal surveys report of US Surgeon General’s workshop, Children and Oral Health, had found out that there was the disparities in the oral health of the children and the access to dental clinic for treatment for dental cavities with their peer high socio economic
group and there were 60% more untreated dental diseases compared to high income group (9). Factors like parents low education, unemployment and low income are also associated with the poor health and chronic diseases (21).

Dental diseases are the most expensive diseases to treat and rank fourth in developed countries (63). Dental cavities that are left untreated can affect children's quality of life severely. The cavities which are left untreated causes the discomfort, pain, dental sepsis and as a result loss of school days. The effect also seen on the nutrition, growth and body weight, which has the harmful effect. Those cavities that spread toward the soft tissue and become chronic are the causes of hospitalization of children from the complications. Those children who have extraction and toothache have seen that they have ulceration, fistulas, pulpal involvement and peri apical abscess (22).

1.4.4: Influence of Parental dental knowledge on children oral health.

The role of the parents dental education is very important; the child who is more prone to caries it has seen that their household environment is not in a shape of proper oral health guidance and there is lower educational level of parents has been seen (16, 17). The oral health knowledge of the parents can also determine the oral health of their children and in parents who have more dental knowledge have positive effect on oral health status of their family (23) There is also the perception in parents that doctors are the responsible persons for providing all the information regarding oral health care. It has been seen that the convey of knowledge from parents to their children was from their own observation and experiences rather than from the authentic source for care of their children teeth and this lead to delay in teeth prevention from caries. In Massachusetts numerous school base care given programme were conducted where parents were taught how to help out their children while they were brushing (24).
1.4.5: Parent’s education and dental caries

The learning process for the children starts from the home under the supervision of the parents and influence the children living for a very long period. One of the major factors which effect the behaviours of children in relation to oral hygiene is the oral health knowledge and attitude of their parents and those parents who are aware of the knowledge related to oral health their children has lower caries and gingival health is healthier(25). The level of dental caries is increasing in children worldwide. It has been seen in recent studies that children’s who have dental caries are from the background where the families with low income and their parents have low level of education (26). Children’s with dental caries are completely dependent on their parents who decide whether to take them to dentist for dental caries treatment or not. This is because the parents are the gatekeepers. Research showed that Children’s from lower socioeconomically backgrounds with younger parents with lower level of education had less likely to visit dental clinics although they had more dental diseases (27).

1.5 Complications or consequences of dental caries

The severity of dental caries increases if it is not treated in its early stage. The pain which arises from dental caries does not remain confined to the effected tooth but is but over the tooth surroundings as well. The association of dental pain from dental caries is more prevalent in children in low socioeconomic status group. The discomfort from pain alters the behaviour of eating and choice of food and changes the appearance of face and creates problems in communication. Early childhood extraction results in the hindrance of speech and results in psychological trauma. It causes agony of pain in children, several visits for antibiotic prescription, pain with severe attacks, puss formation and loss of sleep, long-term effects are reduced growth nutritional and sleep problems and possible disturb of the family life. If proper measures are taken in early stage the painful conditions can be prevented. The following are the complication that can occur from dental caries if it not treated in early stage (17, 28, 29, and 30).

Pulpitits, Pulp necrosis, Acute peri apical periodontitis, Chronic peri apical periodontitis or peri apical granuloma, Acute periapical (alveolar) abscess, Inflammatory radicular cyst, Osteosclerosis, Hypercementosis, Extractions.
1.6 Burden of dental diseases

Dental caries is the chronic diseases of teeth which affects 40-50 % of the US and British children and 60-90% of children worldwide between ages of 2 and 11 years (31).

The severity of dental diseases and association of risk factors with dental disease differs from countries to countries and within the same region. Socio-behavioural and environmental factors mainly plays significant role in the occurrence of dental diseases. Dental caries is more prevalent oral disease in Asia and Latin America while less severe in Africa, relatively high in America compare to other regions. Use of refine sugar and inadequate oral hygiene increases the occurrence of dental caries in developing countries (64).

Dental caries which remain untreated causes pain and ultimately destruction of the tooth and the final outcome in most cases is the extraction of the affected tooth due to discomfort (32).

1.7 DMFT and DMFS

In oral epidemiology the most common measure used for the assessment of the dental caries is DMF index. It shows the number of untreated decayed, missed and filled teeth in a mouth of the persons to be examined. The index is internationally accepted by the dental community for recording of decayed, missed and filled teeth. It has been used for the last 65 years and it is the most important measure of caries incident in dentistry (33, 34).

For each individual the occurrence of dental caries in each individual is obtained by calculating the number of decayed teeth D (the carious teeth), Missed teeth M and the number of teeth have Fillings or Crown on tooth or surfaces. All anterior teeth have four surfaces mesial, distal, buccal and lingual. The posterior teeth have five surfaces: mesial, distal,buccal, lingual and occlusal. DMFT =0 means that there is absence of dental caries, missing teeth and filled teeth in an individual student and DMFT≥1 means that there is presence of dental caries, missing tooth and filled tooth or teeth in an individual(student). Following designations in table 1 are used to present caries data in children (35, 36).
Table 1: Measures used for different caries status of children

<table>
<thead>
<tr>
<th>Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMFT</td>
<td>Mean number of Decayed, Missing or Filled teeth</td>
</tr>
<tr>
<td>DMFT %</td>
<td>Percentage of population affecting with dental caries</td>
</tr>
<tr>
<td>DT %</td>
<td>Mean No of decayed teeth</td>
</tr>
<tr>
<td>MT %</td>
<td>Mean No of missing teeth</td>
</tr>
<tr>
<td>MNT</td>
<td>Mean No of teeth present</td>
</tr>
<tr>
<td>Ed %</td>
<td>Percentage edentulous</td>
</tr>
</tbody>
</table>

1.8 Justification of study

The reason that provoked me to do this study was my previous experience in my dental practice in Karachi. There I experience that children who were attending the clinic were mostly due to dental caries and associated pain. They were completely dependent on their parent’s decision for dental treatment. Most of them preferred extraction of the tooth when there was lesion on the tooth due to caries. They were not aware of the consequences of extraction and the difficulties that are encountered after dentition lose. The parents were less aware of knowledge of maintain of oral health. My intention in this study is to find out the knowledge of parents and relation of the oral health of their children.

For Pakistan I have not seen any published article especially for Karachi for this issue and there was no such data available for oral health knowledge of parents on school going children or there was not such kind of study done in Karachi (37). Therefore this study was undertaken to obtain information of DMFT and oral health knowledge of children and parents.

1.9 Country profile Pakistan

Pakistan is located on the north shores of the Arabian Sea in the southern Asia (figure 5) to its west are Iran and Afghanistan. India is present on its east and China is present at its north. It has an area around 796,095 square kilometres. (6th largest country in the world). The main religion of Pakistan is Islam 95% and other religions are 5% includes Hinduism and Christianity. The population of Pakistan is 187,342,721. GDP of Pakistan per capita is 2500$, GNI per capita (1050US$). Health expenditure of Pakistan is 2.6% of GDP. Life expectancy at birth in Pakistan is 65.99 years for total population and for
males it is 64.18 years and for female is 67.9 years (39). The total health expenditure (%GDP) is 2.7. The adult literacy rate is 53.7%, 66.8% for male and 40% for female Total adult literacy rate (58 %), 2005-2010 (38).

![Map of Pakistan showing the location of Karachi.](image)

**Karachi** is the largest city of Pakistan and the capital of Sindh province. It is located on the north coast of the Arabian Sea. It is the second most populated city along with its suburbs in the world and spreads over an area of 3530 square kilometres. The population of Karachi comprises of 18 million people. It is a diverse population, which host the different people from all over the country who have settled here permanently. The population is growing about 5 % per annum, mainly from rural migration to urban areas. It is estimates that every month 45000 workers comes from different areas of the Pakistan to Karachi looking for employment. It is cultural, economical, philanthropic, educational, political hub and has the largest port of the country. It is also called the city of lights and is also the birth and death place of the founder Pakistan Quaid-e Azam Muhammad Ali Jinnah. Residents of the city are called karachities. The density of Karachi is 4115 persons/km². Regular movement from diverse area of Pakistan have contributed to a wealthy and various mix of people that live in Karachi. The city it is divided into eighteen towns which are governed by elected municipal administrations. There are total 178 subdivided localities each governed by elected union councils and all work under the city district administration in figure 6 (39).
1.9.1 Burden of dental diseases in Pakistan

Burden of oral dental diseases especially dental caries and periodontal diseases are excessively high amongst the people living in Pakistan. The 90 \% of all oral diseases in Pakistan are left untreated due to its low priority in health activity. The early ignorance of seeking dental treatment due to less perception of toothache lead the tooth to advance stage of decay which is usually beyond repair and consequently these delays lead to 90\% extraction, the treatment given in the public dental clinics.(40)

There is less number of statistics present on oral health problem within Pakistan. Little information is available about the oral health for the children’s of Pakistan. Also, not so much work has been done about the prevention of dental caries in Pakistan (41).

The DMFT data from the national survey of Pakistan obtained in 2004 and comparing data from the survey under the help of the world health organization in 1979 and 1988(42), states that the DMFT score of 12 years old decreases from 2.2 in 1979 to 1.2 in 1988.In a pilot study on dental diseases-a national pathfinder study done by Maher in 1991(43) where the prevalence of dental caries was 55 \% in children between age 12-15. In study of national health survey of Pakistan (NHSP) in 2004 it showed higher DMFT =1.6 score presented in chart 1 (44). The result from a dental survey which is done in 15 cities of Pakistan under the
school dental health education programme in 1999 by Haleem. (45), showed that the health status become well from the previous national survey which was done in 1988 (42). The caries free children’s in urban school improved from 50 % to 63.75 in that survey (45).

1.9.2 Oral health services in Pakistan

Both male and female in urban and rural resident’s areas have different pattern of care for their dental problems. 58 % of women living in rural areas never visited doctor or dentist at all, 8 % women from low socio economic status visited dental clinic and 10 % women visited doctors for consultation. Males somehow visit more to clinic for dental consulting. From low economic status 55 % male never visited to dental clinic only 19 % visited to dental clinic.33 % from with middle income status and 48 % from high economic status consulted to the clinic for dental treatment. 50% of the children between the ages of 12-15 are caries free (44). An urban resident visits clinic more for dental consultancy than rural resident, high economic status are twice as likely as low status to visit dental clinic. More than half of the Pakistani living in urban areas with high economic status, residents of male and female consult dentist for their dental problem (44).

Chart 1: Mean DMFT index score of students from different studies in Pakistan (WHO, R Maher and NHP)
The numbers of dentist in Pakistan to date are 10,518. This means that every dentist has a responsibility of 17,811 patients. The ratio of numbers of dentist to population is improving significantly over the last two decades. There are around 40000 denturist in Pakistan that includes dental technician and several unqualified people without any proper qualification and university degree who are practising all over Pakistan. In Pakistan 84% of the people having dental visit to the private dental practitioners and 16% visits to the public sector, they are the largest health care providers regardless the higher cost in private sector especially in urban areas (43, 44, 46).

The number of people from low economic status who cannot afford a private dental treatment usually visits to the unqualified practitioners for dental care who perform extractions from them. These unqualified professionals are also a great source of spreading infections and infection related diseases from their contaminated instruments which are occasionally washed from alcohol.

2 Study objectives

2.1 The aim of this study

The concept behind this study is to assess the prevalence of dental caries among school going children aged 12-15 years old in Karachi (Malir), as well as investigating, mainly the knowledge of parents that would cause dental caries in their children.

- Parents income, education level and oral health knowledge.
- Children knowledge on Oral health.

3 Methodology

3.1 Study population.

A cross-sectional study conducted in school going children between the ages of 12 -15 years old in Malir town. It is one of the 18 towns in Karachi (figure 7). Private schools were selected by simple random selection method. There are seven union councils in Malir town and two schools selected from each union. From each school about 28 students were selected for examination.
As per my observation people living in Malir town was belongs to the low socioeconomic status. There is no data available that specify standardized socioeconomic status of the different towns of Karachi.

The reason for selecting students at this age is that all permanent teeth have erupted except the third molar and all primary teeth have been exfoliated and also it is the recommended age group from the WHO (Oral Health Survey Basic Methods, Geneva 1997) for Oral health surveys (47). Before conducting the study permission was taken from the school principles and head teachers.

![Map of Malir town with boundaries of 7 union councils](image)

Figure 7: Map of Malir town with boundaries of 7 union councils

### 3.2 Sample size

One the objectives of the study were to find out the prevalence of dental caries among this specific population. The sample size was 380 which were calculated based on the previous prevalence study done by A.A khan in Lahore (48) and following formula (49) was used for the calculation of the study sample size.

$$N = \frac{Z^2 \cdot p(1 - p)}{d^2}$$
Where $z=1.96$, $P=.55$ and $d=.05$

For the sample size calculation, we adopted a standard Error of 5%, a confidence interval level of 95% and an Expected prevalence of 55%.

### 3.3 Measurements

- Dental caries measure by DMFT
- Parental education level and oral health knowledge measured by self structured questionnaire.
- Children knowledge on Oral health practices and Children Perceived dental health status, and dental visits were also measured by questionnaire.

#### 3.3.1 Written Questionnaire

The main instruments for the data collection for the research were two questioners, one for the parents and the other for children. One part of the questionnaire includes the demographic characteristics of the parent i.e. parents education level, father income and house owner and children age, sex was included in the WHO dental caries recording form. The questionnaire contained self structured close ended questions adopted from different sources like articles and research studies which were done on same study design and after the thorough examinations different questions were selected that were associated to the study design and were modified according to the target sample and supplemented to the study questionnaires. These questionnaires were translated into Urdu language for the ease of understanding of the respondents. Urdu is the national and official language of Pakistan (50) and majority of the population of Pakistan understands it. The questionnaires for children presented in Appendix 1 were circulated in the class and were collected on the same day after they have filled out the answers. The questionnaires for parents presented in Appendix 2 were handed over to the children who carried it to their home for their parents. Those questionnaires were filled by parents and children brought them back to the school and were collected from the school, the next day.
3.4 Clinical Examination

The oral assessment of every child was done by seating each subject on a chair in a good day light using required instruments. The basic oral examination instruments like plane mouth mirror, with dental explorers CPI probes (Figure 8) and dental lamp for the detection of dental caries were used. The sharp probe or explorer can damage the enamel surface irreversible during the tactile detection of dental caries therefore it is avoided during in oral examination. All 28 teeth were examined excluding the 3 rd molar, caries were recorded as when a lesion is present on enamel in pits and fissures or on smooth surface of teeth. The dental caries data was recorded into the world health organization dental status/carious recording form according to the WHO method and criteria (47)Those teeth which are filled by dental fillings on permanent teeth and those are carious lesion present on the tooth surface are considered as the carious lesion, for the record, of DMFT. The examination was done by the professional dentist who is licensed to practise dentistry in Pakistan. For the reliability of dental caries examinations, 20 students were examined prior to the study to check reliability of the oral examination, their DMFT recorded in WHO form after 30 minutes theses students examined again to see the similarities in their DMFT score both prior and after examination results were calibrated. The reliability of oral health assessment should be in the range of 85 % to 95% for when single examiner is evaluating. It means there is 5% to 15 % chance of human error in oral diagnosis according to World Health Organization (WHO) (47).

Figure 8: mouth mirror and CPI

Mouth mirror: It used for oral examination by dentist and dental auxiliaries. It reflects the mirror image of the teeth and also for retraction of the cheeks and tongue. The head of the mirror is round and commonly flat mirror is used to reflect the light into the desire area of examination.

Dental probe: There are many types of probes available. The periodontal probe is blunt or has a small ball at the end used for the detection of surface caries on enamel.
3.5 Ethical consideration

Ethical permission was taken before the start of the study from the head master/school Principals authorities for conducting the study and for oral examination of the children. The oral examination was simple and there was no chance of harm to children during examination. However, the schools’ authorities took responsibility of any harm to children during oral examination.

3.6 Statistical Analysis

Descriptive data is presented in terms of proportions for discrete variables and mean (sd) for continuous variables. Chi square test was done to assess the difference of dental caries derived from DMFT for categorical variables. Anova and independent sample ttest was done to assess the mean difference of DMFT among different groups.

Univariate and multivariable logistic regression analysis was applied to check the association of variables with dental caries (DMFT=0 vs. DMFT greater than 0). Stata/SE 11.0 software was used for the data analysis.

4 Results

Total number of 399 children participated in the study and information on oral examination for DMFT and questionnaire was obtained. The response rate from the parents questionnaire was very low and it was 150(38%) who returned the questionnaires and therefore the information on parents’ dental knowledge is limited to 150 participants.

Table 2: Distribution of age and sex in school going children of the study population in Karachi (Malir)

<table>
<thead>
<tr>
<th>Age</th>
<th>Total numbers</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>42(10.3%)</td>
<td>25(12.2%)</td>
<td>17(8.8%)</td>
</tr>
<tr>
<td>13</td>
<td>83(20.8%)</td>
<td>43(21%)</td>
<td>40(20.6%)</td>
</tr>
<tr>
<td>14</td>
<td>113(28.3%)</td>
<td>60(29.2%)</td>
<td>53(27.3%)</td>
</tr>
<tr>
<td>15</td>
<td>161(40.4%)</td>
<td>77(37.5%)</td>
<td>84(43.3%)</td>
</tr>
<tr>
<td>Total</td>
<td>399</td>
<td>205(51.38%)</td>
<td>194(48.62%)</td>
</tr>
</tbody>
</table>
4.1 Data analysis:

The analysis of data is divided into two parts. The first part contains only the analysis of the 399 children, the analysis will be done on DMFT and questionnaire variables related of the students. The second part includes the analysis of 150 children who had brought the questionnaire from their home which belongs to their parents.

4.1.1 Part I: Data analysis on 399 students

The distribution of age is presented in table 2 for both boys and girls. Of the total 399 students 205 (51.38%) were boys and 194 (48.62%) were girls was examined. The mean DMFT index score was 1.26 and range from 0-6 in girls and 0-4 in boys (Table3).

The prevalence of DMFT (DMFT greater than 0) was 66.67%. The result shows that the prevalence of untreated decayed teeth in the study sample was 59% (Table 3).

The DMFT index was 1.14 in 12 year. 1.29 in 13 years old and 1.3 and 1.25 in 14 and 15 years old children respectively. The DMFT index scores increases as the age of the children increases (table 3).

The caries data from the children after clinical examination and proportion is presented in chart 2. Girls in school had overall higher mean DT, FT and DMFT scores than boys, the DMFT difference was statistically significant. The girls had more cavities present than boys. Likewise the FT score was higher in girls as compare to the boys and was not statistically significant. Here again the girls has more dental fillings present than the boys. On the other hand MT score was same both girls and boys presented in table 3.
Table 3, Mean (SD), DMFT, D-T, M-T, and F-T and their frequencies by age and sex.

<table>
<thead>
<tr>
<th>Variables</th>
<th>DMFT</th>
<th>% DMFT&gt;0</th>
<th>D-T</th>
<th>%DT&gt;0</th>
<th>M-T</th>
<th>%MT&gt;0</th>
<th>F-T</th>
<th>%FT&gt;0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys(205)</td>
<td>1.06(1.12)</td>
<td>60.5</td>
<td>0.91(1.05)</td>
<td>53</td>
<td>0.04(.22)</td>
<td>5</td>
<td>0.10(.3)</td>
<td>10</td>
</tr>
<tr>
<td>Girls(194)</td>
<td>1.46(1.34)*</td>
<td>73.2</td>
<td>1.2(1.21)*</td>
<td>65</td>
<td>0.05(.22)</td>
<td>5</td>
<td>0.20(.54)*</td>
<td>5</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12(42)</td>
<td>1.14(1.26)</td>
<td>54.7</td>
<td>0.95(1.14)</td>
<td>47</td>
<td>0.02(.15)</td>
<td>2</td>
<td>0.16(.37)</td>
<td>17</td>
</tr>
<tr>
<td>13(83)</td>
<td>1.29(1.40)</td>
<td>61.5</td>
<td>1.16(1.28)</td>
<td>60</td>
<td>0(0)</td>
<td>0.12(.36)</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>14(113)</td>
<td>1.30(1.25)</td>
<td>71.7</td>
<td>1.04(1.09)</td>
<td>62</td>
<td>0.04(.20)</td>
<td>5</td>
<td>0.21(.50)</td>
<td>18</td>
</tr>
<tr>
<td>15(161)</td>
<td>1.25(1.17)</td>
<td>69</td>
<td>1.02(1.11)</td>
<td>60</td>
<td>0.09(.28)</td>
<td>9</td>
<td>0.11(.43)</td>
<td>9</td>
</tr>
<tr>
<td>Total(399)</td>
<td>1.26(1.25)</td>
<td>66.7</td>
<td>1.05(1.14)</td>
<td>59</td>
<td>0.05(.21)</td>
<td>5</td>
<td>0.15(.44)</td>
<td>12.5</td>
</tr>
</tbody>
</table>

DMFT= decayed, missing, and filled teeth; DT = decayed teeth; MT = missing teeth by caries; FT = filled teeth, *p-value< 0.05

As a response from the question about “who guide you to brush the teeth”, 228(57%) were guided by their mothers, 110(28%) were guided by their fathers and to the remaining 61(15%) said that there was no guidance from their parents and they did it by themselves. The mother seems more responsible for the taking care of the oral hygiene of their children. From the result, it is seen there was no statistically significant difference in boys and girls in regards to the taking care.

The results showed that students who had heard about fluoride, there were 54% of students who heard about fluoride and 45% didn’t hear about fluoride. The question regarding the fluoride that either it protect the teeth or not from decay, both boys and girls, 72% said that it can protect the teeth from decay, 21% said it cant and only 7% & said that they don’t know whether fluoride protect the teeth or not from decay is presented in table 6. Out of 399, there were 72% who replied “fluoride protect the teeth from decay”, of whom 33% students were caries free. The corresponding figures were not different between boys and girls (Table 6).
Chart 2: Proportion of student with decay missed and filled teeth

The response from the question that from which source you have obtained the knowledge of oral hygiene, 298(74%) of both sex answered parents was the source of providing them knowledge to their children, 47(12%) replied school as their source of providing them with the knowledge and 54(14%) got the knowledge from advertisements and presented in table 4. The proportion of children who obtained their knowledge from school was very less as compared to the other children.

The response from the children about the question “when they last brush their teeth”, 274(69%) brush their teeth today, 87(22%) brush their teeth yesterday and 38(9%) brush their teeth day before yesterday (Table 5).

The prevalence of “frequency of brushing”, 58(14.%) of boys and girls who brush their teeth three times a day, 167 (42%) brush their teeth once a day and 174(44%) brush their teeth twice a day. there was no significant difference between the boys and girls in frequency of brushing their teeth a day presented in table 5.
Regarding the tool for using for cleaning the teeth 363(91%) use toothbrush and toothpaste for cleaning their teeth, Muswak and finger used by 6% and 3%. The frequency of time spending on tooth brushing was identical in both boys and girls and the proportion was same in brushing less 3 minutes, more than 3 min and those who don't know the time.

For the question “the reason for the brushing their teeth”, 50% replied that they do for clean and brighter teeth, 31% that they do it to prevent dental caries. Children were more aesthetic conscious. The remaining 19% brushed their teeth for the prevention of bleeding gums, ulcers, to get rid of bad breath and set examples for others.

The question for the children about the knowledge of the plaque and what is called the food remnants in the oral cavity that stick to the teeth after eating food. There was the significant statistically difference between the knowledge of plaque between boys and girls (Chart 3).

The 263(66%) students know the remnant of food was called plaque, 75(19%) said that it was the calculus, 24(6%) stains and 37(9) don’t know (Chart 4). The percentage of girls, regarding plaque definition was high as compared to the boys (Table 6).
Of 263 students who knew about plaque, 178 (68%) of them replied the correct respond to “the place of plaque stick to the teeth”, 47 (18%) responded that gum is the position where the dental plaque stick, 6 (2.28%) said it stick to tongue, other 21 (7.98%) said it stick to the teeth and to the tongue, 2 (.76%) never heard about the place of plaque to stick and 9 (3.42%) said that they don’t know.

The response from the questions “what is the cause of dental caries” is presented in table 4; there were seven options for that question. There was a significant difference between the results of boys and girls respondent to this question. There was 118 (30%) students who chose the option “sweet and toffees”, 101 (25%) said “chocolates”, 70 (17%) said “bacteria” which was the correct answer, 12% replied “other causes” and 16% said that they don’t know the cause of dental caries. However the level of knowledge was not satisfactory.
Table 4: Proportion of children with knowledge of causes of dental caries.

<table>
<thead>
<tr>
<th></th>
<th>Boys (N=205) N (%)</th>
<th>Girls (N=194) N (%)</th>
<th>Total (N=399) N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweet and toffees</td>
<td>66(32%)</td>
<td>52(26%)</td>
<td>118(30%)</td>
</tr>
<tr>
<td>Soft drinks</td>
<td>5 (3%)</td>
<td>7(4 %)</td>
<td>12(3 %)</td>
</tr>
<tr>
<td>Chocolates</td>
<td>55(27%)</td>
<td>46(24 %)</td>
<td>101(25%)</td>
</tr>
<tr>
<td>Food from vendors</td>
<td>4(2%)</td>
<td>0(0 %)</td>
<td>4(1%)</td>
</tr>
<tr>
<td>Unbrushing the teeth</td>
<td>15(7%)</td>
<td>15(8%)</td>
<td>30(7%)</td>
</tr>
<tr>
<td>Bacteria</td>
<td>25(12%)</td>
<td>45 (23%)</td>
<td>70(17%)</td>
</tr>
<tr>
<td>Don’t know</td>
<td>35(17 %)</td>
<td>29(15 %)</td>
<td>64(16 %)</td>
</tr>
</tbody>
</table>

The question asked from the children “had you ever visited to dentist”, 212(53.13%) replied “yes” and 187(46.87%) said that they had not visited the dentist. There were 55% boys and 51% girls who visited to dentist.

The reasons for those who visited dentist, 24.31 % boys and girls visited for regular dental check up, 22 % visited the dental clinic with dental pain, 1.75 % visited for dental filling and 5.01 % visited for extraction. The treatment they had on their last visit was, 53% of those visited dental clinic, 63.67% had taken medicine from the dental clinic, 19.18% had dental fillings on their teeth, and 3.7 % had orthodontic treatment and 12.7% did extractions of their teeth.

Regarding rinsing their mouth after eating, there were 220(55%) students who rinse their mouth sometime, of whom 149 (67%) have dental caries. There were 179(45%) students who always rinse their mouth, of whom, 117(65%) have dental caries. There was no significance difference between those who rinse their mouth sometimes and those who rinse mouth always in dental caries status.

The question “how many times a day you eat sweets” there were 157 (40) students who eat sweets once a day, 52(13) students eat sweets twice a day, 73(18) eat sweets thrice a day and 117(29) students don’t eats sweets every day. There was significance difference between boys and girls in the behaviour of eating sweets (Table 6).
There were 118 (30%) students who eat snacks between meals and 281 (70%) students who don't eat snacks between meals. There was no difference between boys and girls in their eating behaviour (Table 6).

For the preferred times of eating sweets, 63 (16%) said they eat sweets at meal times, 23 (6%) eat sweets between meal times, 252 (63%) eat sweets after meal and 61 (15%) eat sweets all the day. There was no difference between boys and girls in preferred time of eating sweets and also there was no difference in their dental caries status (Table 6).
Table 5: Distribution of oral health knowledge and % DMFT by gender (N=399)

<table>
<thead>
<tr>
<th>Questions</th>
<th>N (%)</th>
<th>% DMFT N (%)</th>
<th>Boys(N=205) N (%)</th>
<th>Girls(N=194) N (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many times a day you brush your teeth.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once a day</td>
<td>167(42%)</td>
<td>113(68%)</td>
<td>95(46.6%)</td>
<td>72(37.2%)</td>
<td>0.15</td>
</tr>
<tr>
<td>Twice a day*</td>
<td>174(44%)</td>
<td>113(64%)</td>
<td>81(39.2%)</td>
<td>92(47.9%)</td>
<td></td>
</tr>
<tr>
<td>Thrice a day</td>
<td>58(14%)</td>
<td>40(69%)</td>
<td>29(14.2%)</td>
<td>29(14.9%)</td>
<td></td>
</tr>
<tr>
<td>how much Time you spent on brushing teeth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than 3 min</td>
<td>131(33%)</td>
<td>82(62%)</td>
<td>74(36.1%)</td>
<td>75(29.4%)</td>
<td>0.26</td>
</tr>
<tr>
<td>3 min or more*</td>
<td>145(36%)</td>
<td>103(71%)</td>
<td>74(36.1%)</td>
<td>71(36.6%)</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>123(31%)</td>
<td>81(66%)</td>
<td>57(27.8%)</td>
<td>66(34%)</td>
<td></td>
</tr>
<tr>
<td>Which things you use for cleaning your teeth.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muswak</td>
<td>24(6%)</td>
<td>18(75%)</td>
<td>13(54%)</td>
<td>11(46%)</td>
<td>0.84</td>
</tr>
<tr>
<td>Brush and tooth paste*</td>
<td>363(91%)</td>
<td>239(64%)</td>
<td>185(51%)</td>
<td>178(49%)</td>
<td></td>
</tr>
<tr>
<td>With finger</td>
<td>12(3%)</td>
<td>9(75%)</td>
<td>7(58%)</td>
<td>5(42%)</td>
<td></td>
</tr>
<tr>
<td>When did you last brush your teeth?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Today*</td>
<td>274(69%)</td>
<td>178(64%)</td>
<td>131(64%)</td>
<td>143(74%)</td>
<td>0.06</td>
</tr>
<tr>
<td>Yesterday</td>
<td>87(22%)</td>
<td>63(72%)</td>
<td>49(24%)</td>
<td>38(20%)</td>
<td></td>
</tr>
<tr>
<td>Day before yesterday</td>
<td>38(9%)</td>
<td>25(66%)</td>
<td>25(12%)</td>
<td>13(6%)</td>
<td></td>
</tr>
<tr>
<td>when do you brush your teeth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>morning *</td>
<td>321(80%)</td>
<td>204 (63%)</td>
<td>163(79%)</td>
<td>158(81%)</td>
<td>0.7</td>
</tr>
<tr>
<td>afternoon</td>
<td>1(1%)</td>
<td>1</td>
<td>0</td>
<td>1(1%)</td>
<td></td>
</tr>
<tr>
<td>before going to bed</td>
<td>7(2%)</td>
<td>6 (86%)</td>
<td>4(2%)</td>
<td>3(2%)</td>
<td></td>
</tr>
<tr>
<td>other time</td>
<td>70(17%)</td>
<td>55 (78%)</td>
<td>38(18%)</td>
<td>32(16%)</td>
<td></td>
</tr>
</tbody>
</table>

*Correct answer
Table 6: Distribution of oral health knowledge by gender (continued)

<table>
<thead>
<tr>
<th>Questions</th>
<th>N (%)</th>
<th>%DMFT</th>
<th>Boys(N=205)</th>
<th>Girls(N=194)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remnants of food particles on mouth are called?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plaque</td>
<td>263(66%)</td>
<td>175(66%)</td>
<td>113(55%)</td>
<td>150(77%)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Calculus</td>
<td>75(19%)</td>
<td>49 (65%)</td>
<td>52(25%)</td>
<td>23(12%)</td>
<td></td>
</tr>
<tr>
<td>Stains</td>
<td>24(6%)</td>
<td>17 (71%)</td>
<td>20(10%)</td>
<td>4(2%)</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>37(9%)</td>
<td>25 (67%)</td>
<td>20(10%)</td>
<td>17(9%)</td>
<td></td>
</tr>
<tr>
<td>Do you know what fluoride is?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>217(54%)</td>
<td>144 (66%)</td>
<td>112(55%)</td>
<td>105(54%)</td>
<td>0.91</td>
</tr>
<tr>
<td>No</td>
<td>182(45%)</td>
<td>122 (67%)</td>
<td>93(45%)</td>
<td>89(46%)</td>
<td></td>
</tr>
<tr>
<td>Fluoride protects the teeth against decay?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>287(72%)</td>
<td>193 (67%)</td>
<td>144(70%)</td>
<td>143(73%)</td>
<td>0.70</td>
</tr>
<tr>
<td>No</td>
<td>84(21%)</td>
<td>58 (69%)</td>
<td>45(22%)</td>
<td>39(21%)</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>28(7%)</td>
<td>15 (53%)</td>
<td>16(8%)</td>
<td>12(6%)</td>
<td></td>
</tr>
<tr>
<td>How many times a day you eat sweets?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once a day</td>
<td>157(40%)</td>
<td>103(65%)</td>
<td>83(53%)</td>
<td>74(47%)</td>
<td>0.002</td>
</tr>
<tr>
<td>Twice a day</td>
<td>52(13%)</td>
<td>36 (69%)</td>
<td>14(27%)</td>
<td>38(73%)</td>
<td></td>
</tr>
<tr>
<td>Thrice a day</td>
<td>73(18%)</td>
<td>53 (72%)</td>
<td>41(56%)</td>
<td>32(44%)</td>
<td></td>
</tr>
<tr>
<td>Don’t eat sweets every day</td>
<td>117(29%)</td>
<td>74 (63%)</td>
<td>67(57%)</td>
<td>50(43%)</td>
<td></td>
</tr>
<tr>
<td>Do you eat snacks between meals?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>118(30%)</td>
<td>82 (69%)</td>
<td>58(28%)</td>
<td>60(31%)</td>
<td>0.56</td>
</tr>
<tr>
<td>No</td>
<td>281(70%)</td>
<td>184(66%)</td>
<td>147(72%)</td>
<td>134(69%)</td>
<td></td>
</tr>
<tr>
<td>Preferred times for eating sweets.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At mealtimes</td>
<td>63(16%)</td>
<td>40 (63%)</td>
<td>35(17%)</td>
<td>28(14%)</td>
<td>0.137</td>
</tr>
<tr>
<td>Between mealtimes</td>
<td>23 (6%)</td>
<td>18 (78%)</td>
<td>8(4%)</td>
<td>15(8%)</td>
<td></td>
</tr>
<tr>
<td>After meals</td>
<td>252(63%)</td>
<td>163 (65%)</td>
<td>136(66%)</td>
<td>116(60%)</td>
<td></td>
</tr>
<tr>
<td>At all times</td>
<td>61(15%)</td>
<td>45 (73%)</td>
<td>26(13%)</td>
<td>35(18%)</td>
<td></td>
</tr>
</tbody>
</table>
4.1.2 Univariate analysis

The following table shows the contribution of different independent variables on the occurrence of dental caries.

Table 7: Odds ratios of dental caries with regard to different characteristics of students

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>1</td>
<td>0.007</td>
</tr>
<tr>
<td>Boys</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>1.31</td>
<td>0.473</td>
</tr>
<tr>
<td>14</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>1.8</td>
<td></td>
</tr>
<tr>
<td>How many times a day brush teeth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Once a day</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Twice a day</td>
<td>0.36</td>
<td>0.014</td>
</tr>
<tr>
<td>Thrice a day</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>Have you ever visited to dentist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>yes</td>
<td>1</td>
<td>0.001</td>
</tr>
<tr>
<td>no</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>Last visited to dental clinic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Last six month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One year</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td>never</td>
<td>0.48</td>
<td>0.013</td>
</tr>
<tr>
<td>Treatment on last dental visit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental medication</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Filling</td>
<td>14.3</td>
<td>0.000</td>
</tr>
<tr>
<td>Orthodontic</td>
<td>1.19</td>
<td></td>
</tr>
<tr>
<td>extraction</td>
<td>8.9</td>
<td></td>
</tr>
</tbody>
</table>

The odds ratio of dental caries in boys was 0.56 and statistically significant. The girls had more dental caries than boys due to more cavities the girls also had more filling present on their teeth. The odds ratios of dental caries increases as age increases. Those students who brush twice a day had experienced less dental caries. Those students who never visited dental clinic had also lower odds of dental caries. It seems the visits to dental clinics were based on
their caries exposure. For the treatment on last visit the odds of dental caries in those who had done filling were higher and significant from other options.

4.1.3 Part II: Data analysis by socio demographic for 150 students

In the following section, I will present the results of those 150 students for whom we had the complete information of their parents.

Table 8 Mean DMFT (SD), D-T, M-T, and F-T and frequencies of DMFT by age and sex.

<table>
<thead>
<tr>
<th>Variables</th>
<th>DMFT</th>
<th>%of DMFT</th>
<th>D-T</th>
<th>%DT</th>
<th>M-T</th>
<th>%MT</th>
<th>F-T</th>
<th>%FT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boy (n=73)</td>
<td>1.16(1.14)</td>
<td>64</td>
<td>.97(1.10)</td>
<td>52</td>
<td>.04(1.19)</td>
<td>4</td>
<td>.15(1.36)</td>
<td>15</td>
</tr>
<tr>
<td>Girls(n=77)</td>
<td>1.62(1.38)*</td>
<td>77</td>
<td>1.36(1.30)</td>
<td>70</td>
<td>.06(1.24)</td>
<td>6.5</td>
<td>.15(1.56)*</td>
<td>9</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 (n=15)</td>
<td>1.33(1.44)</td>
<td>60</td>
<td>1.13(1.30)</td>
<td>53</td>
<td>0</td>
<td>0</td>
<td>2(41)</td>
<td>20</td>
</tr>
<tr>
<td>13 (n=36)</td>
<td>1.33(1.53)</td>
<td>61</td>
<td>1.16(1.38)</td>
<td>58</td>
<td>0 (0)</td>
<td>0</td>
<td>4(6.44)</td>
<td>14</td>
</tr>
<tr>
<td>14 (n=39)</td>
<td>1.41(1.18)</td>
<td>77</td>
<td>1.15(1.13)</td>
<td>64</td>
<td>7(.26)</td>
<td>7.7</td>
<td>17(5.5)</td>
<td>13</td>
</tr>
<tr>
<td>15 (n=45)</td>
<td>1.45(1.18)</td>
<td>75</td>
<td>1.2(1.19)</td>
<td>64</td>
<td>8(.27)</td>
<td>8.3</td>
<td>1(4.35)</td>
<td>8</td>
</tr>
<tr>
<td>Total (n=150)</td>
<td>1.4(1.29)</td>
<td>70.7</td>
<td>1.17(1.22)</td>
<td>61</td>
<td>.05(1.22)</td>
<td>5</td>
<td>.15(4.7)</td>
<td>12</td>
</tr>
</tbody>
</table>

Notes: DMFT = decayed, missing, and filled teeth; DT = decayed teeth; MT = missing teeth by caries; FT = filled, *p-value <0.05

The distribution of boys and girls by socio demographic is presented in table 9. There were 22% students whose father education is less than 10 year and 49% students were belongs to the family where there father education is 11 -12 years and 29% student’s father educations is greater than 12 years of education.

There were 39 % of students whose mother’s education is less than 10 years, 49% with mother’s education between 11-12 years and 12% whose mother’s had education more than 12 years.

Regarding socio demographic characteristic 31% students belongs to the family where the fathers’ monthly income is less than 15000 Rs and 69% of students belong to the family where there father income is greater than 15000 Rs.
Table 9: Distribution of parents’ socioeconomic variables of children by gender.

<table>
<thead>
<tr>
<th></th>
<th>Boys (N=73)</th>
<th>Girls (N=77)</th>
<th>Total (150)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fathers education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 10</td>
<td>(19) (26)</td>
<td>(14) (18)</td>
<td>(33) (22)</td>
<td></td>
</tr>
<tr>
<td>11-12</td>
<td>(35) (48)</td>
<td>(39) (50)</td>
<td>(74) (49)</td>
<td>NS</td>
</tr>
<tr>
<td>more than 12</td>
<td>(19) (26)</td>
<td>(24) (32)</td>
<td>(43) (29)</td>
<td></td>
</tr>
<tr>
<td>Mothers education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-12</td>
<td>(31) (42)</td>
<td>(43) (55)</td>
<td>(74) (49)</td>
<td>NS</td>
</tr>
<tr>
<td>more than 12</td>
<td>(8) (12)</td>
<td>(9) (12)</td>
<td>(17) (12)</td>
<td></td>
</tr>
<tr>
<td>Socioeconomic status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 15000</td>
<td>(21) (28)</td>
<td>(26) (34)</td>
<td>(47) (31)</td>
<td></td>
</tr>
<tr>
<td>More than 15000</td>
<td>(52) (72)</td>
<td>(51) (66)</td>
<td>(103) (69)</td>
<td>NS</td>
</tr>
</tbody>
</table>

4.1.4 Data analysis of questionnaire belong to the parents for 150 students

The DMFT sore by parent’s education is presented in table 10. The dmft score with father education less than 10 was 1.24, the father education group with 11-12 years education the dmft was 1.5 and the father education greater than 12 years the dmft score was 1.32. The mean DMFT for students with mother education less than 10 years of education was 1.42, for students with mothers at intermediate level was 1.50 and 0.88 for those whose mothers had education greater than 12 years. The dmft score increases from 1.3 to 1.4 when socioeconomic status increases from income less than 15000 Rs to more than 15000Rs.
Table 10: Mean (SD) of DMFT index of students by socio-demographic factors

<table>
<thead>
<tr>
<th></th>
<th>D-T</th>
<th>M-T</th>
<th>F-T</th>
<th>DMFT</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fathers education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 10</td>
<td>1.03(1.1)</td>
<td>.06(.24)</td>
<td>.15 (.36)</td>
<td>1.24(1.3)</td>
<td>.54</td>
</tr>
<tr>
<td>11-12</td>
<td>1.25(1.3)</td>
<td>.067(.25)</td>
<td>.16 (.49)</td>
<td>1.5(1.4)</td>
<td></td>
</tr>
<tr>
<td>More than 12</td>
<td>1.13(1.1)</td>
<td>.02(.15)</td>
<td>.14 (.51)</td>
<td>1.32(1.1)</td>
<td></td>
</tr>
<tr>
<td><strong>Mothers education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 10</td>
<td>1.17(1.3)</td>
<td>.07(.25)</td>
<td>.15 (.36)</td>
<td>1.42(1.3)</td>
<td>.20</td>
</tr>
<tr>
<td>11-12</td>
<td>1.3(1.21)</td>
<td>.04(.19)</td>
<td>.15 (.56)</td>
<td>1.5(1.3)</td>
<td></td>
</tr>
<tr>
<td>More than 12</td>
<td>0.64(.86)</td>
<td>.06(.24)</td>
<td>.18 (.39)</td>
<td>0.88(.78)</td>
<td></td>
</tr>
<tr>
<td><strong>Socio economic status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 15000</td>
<td>1.15(1.2)</td>
<td>.04(.20)</td>
<td>.1 (.3)</td>
<td>1.3(1.2)</td>
<td>.51</td>
</tr>
<tr>
<td>more than 15000</td>
<td>1.18(1.2)</td>
<td>.06(.23)</td>
<td>.17(.5)</td>
<td>1.4(1.3)</td>
<td></td>
</tr>
</tbody>
</table>

The question that was asked from the parents about the knowledge of plaque and dental caries. For question of plaque whether you know what is plaque caused by 80(53.33%) said plaque is remaining of food debris, 49(32.67) said plaque was called the stains and 21(14%) said that they don’t know what is plaque.

For the effect of plaque on teeth, 62(41%) of parents replied with the answer said that the plaque was the cause of the dental cavity. there were 40(26.67%) said that bleeding gum was effect of plaque, 33(22%) respond with the answer that it changes the colour of the teeth and 15(10%) replied with the option that they don’t about the effect of plaque on teeth.

Another questions related to the plaque that what are the factors for the cause of dental caries. The result was not satisfactory in regards to the proportion of distribution of answer of the question. Only 38(2%) respond with option bacteria, 37(24%) chose the sweets the cause of the dental caries, 22(14.67%) said the sugar, 23(15.33%) said snacks and the approximately the same respond with the answer that they don’t know the cause of the dental caries.

Most of the parents replied for the question of using instrument for cleaning of teeth, 139(92.67) was using brush and toothpaste devices for the cleaning of their children teeth and 11(7.33) reply with the answer Muswak tool for the cleaning of their teeth. There was no satisfactory result from parents for the use of toothpaste which contains fluoride, 97(65%) used fluoridated toothpaste and the other remaining 53(35%) was not using fluoride toothpaste.
The response for the question “can brushing teeth prevent caries” 114 (76%) who said that the brushing of teeth protect dental caries. Out of these 114 there were 32 students who were caries free and 82 students had dental caries. There were 31 (20.67%) students who said "No" and 5 (3.33%) said they don’t know (Table 11).
Table 11: Mean (SD), proportion of children with dental caries in relation to oral knowledge of parents.

<table>
<thead>
<tr>
<th>Questions</th>
<th>N=150 n (%)</th>
<th>Mean(SD) DMFT</th>
<th>Dental caries (%)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brushing teeth protects dental caries.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>114 (76)</td>
<td>1.4(1.3)</td>
<td>54.7</td>
<td>0.5</td>
</tr>
<tr>
<td>No</td>
<td>31 (20.7)</td>
<td>1.2(1.1)</td>
<td>13.3</td>
<td></td>
</tr>
<tr>
<td>I don’t know</td>
<td>5 (3.3)</td>
<td>1.2(1.1)</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td><strong>Guide your children how to brush teeth.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>98 (65.3)</td>
<td>1.4(1.3)</td>
<td>46</td>
<td>0.8</td>
</tr>
<tr>
<td>No</td>
<td>52 (34.7)</td>
<td>1.4(1.3)</td>
<td>24.7</td>
<td></td>
</tr>
<tr>
<td><strong>Tool your children use for cleaning.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brush and toothpaste</td>
<td>139 (92.7)</td>
<td>1.4(1.3)</td>
<td>65.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Muswak</td>
<td>11 (7.3)</td>
<td>1.8(1.5)</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td><strong>The cause of dental caries is.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugar</td>
<td>22 (14.7)</td>
<td>1.8(1.6)</td>
<td>10.7</td>
<td></td>
</tr>
<tr>
<td>Sweets</td>
<td>37 (24.7)</td>
<td>1.4(1.2)</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Soft drinks</td>
<td>9 (6.0)</td>
<td>1.2(1.1)</td>
<td>3.3</td>
<td>0.6</td>
</tr>
<tr>
<td>Snacks</td>
<td>23 (15.3)</td>
<td>1.1(1.2)</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td>Bacteria *</td>
<td>38 (25.3)</td>
<td>1.4(1.2)</td>
<td>19.3</td>
<td></td>
</tr>
<tr>
<td>I don’t know</td>
<td>21 (14.0)</td>
<td>1.4(1.3)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><strong>What is dental plaque?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food remaining on teeth*</td>
<td>80 (53.3)</td>
<td>1.4(1.2)</td>
<td>38</td>
<td>0.08</td>
</tr>
<tr>
<td>Stains</td>
<td>49 (32.7)</td>
<td>1.2(1.2)</td>
<td>21.3</td>
<td></td>
</tr>
<tr>
<td>I don’t know</td>
<td>21(14.0)</td>
<td>2 (1.62)</td>
<td>11.3</td>
<td></td>
</tr>
<tr>
<td><strong>What does plaque do to your teeth?</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change the colour of teeth</td>
<td>33 (22.0)</td>
<td>1.3(1.4)</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Dental cavity*</td>
<td>62 (41.3)</td>
<td>1.3(1.3)</td>
<td>28.6</td>
<td></td>
</tr>
<tr>
<td>Bleeding gums</td>
<td>40 (26.7)</td>
<td>1.5 (1.3)</td>
<td>20</td>
<td>0.8</td>
</tr>
<tr>
<td>I don’t know</td>
<td>15 (10.0)</td>
<td>1.5 (1.3)</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

*Correct answer

Regarding the question “how to protect the teeth from the dental caries”, there were 75(50%) parents said that brushing was the mode of technique to protect the teeth from dental caries but there were 49 students present with dental caries and 26 students were caries free. 32(21.33%) said that low consumption of sweets protect the teeth from the dental caries again there were only 12 students were free from any lesion present on their teeth and 20 students with dental caries, 19(13%) said that frequently visiting to dental clinic protect the teeth dental caries out them 1 student is caries free 18 students had dental caries and 13(8%) said that they don’t know how to protect teeth from dental caries and 11( 7%) said for protection of teeth avoid the food from vendors.

There were 64% of parents who knew about fluoride. However their children’s mean DMFT was not significantly lower compared to those who have no knowledge about fluoride (Table 12).
The knowledge from the parents that “fluoride prevents teeth from dental cavity”, 70% said it can prevent the teeth and 30% said it cannot. Mean DMFT was marginally significant between these two groups (P=0.053, Table 12). 

There were several opinions about “what is the function of the fluoride”. Mean DMFT was highest for those who believed it is for Whitening of teeth. Those parents who respond with the answer that it helps in cleaning of teeth, their children’s mean DMFT was lowest compared to other responses (Table12).
Table 12: Parental knowledge of fluoride with mean DMFT of their children

<table>
<thead>
<tr>
<th>Questions</th>
<th>N=150</th>
<th>Mean DMFT</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you know what fluoride is?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>96(64%)</td>
<td>1.375</td>
<td>0.753</td>
</tr>
<tr>
<td>No</td>
<td>54(36%)</td>
<td>1.444</td>
<td></td>
</tr>
<tr>
<td>Do you use fluoride toothpaste for your child?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>97(64%)</td>
<td>1.25</td>
<td>0.0497</td>
</tr>
<tr>
<td>No</td>
<td>53(36%)</td>
<td>1.68</td>
<td></td>
</tr>
<tr>
<td>Does fluoride helps preventing teeth from dental caries?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes*</td>
<td>89(59%)</td>
<td>1.35</td>
<td>0.552</td>
</tr>
<tr>
<td>No</td>
<td>61(41%)</td>
<td>1.47</td>
<td></td>
</tr>
<tr>
<td>Can fluoride reverse the dental cavity?</td>
<td></td>
<td></td>
<td>0.053</td>
</tr>
<tr>
<td>Yes*</td>
<td>105(70%)</td>
<td>1.53</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>45(30%)</td>
<td>1.09</td>
<td></td>
</tr>
<tr>
<td>What is the function of the fluoride</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whitening of teeth</td>
<td>26(27%)</td>
<td>1.58</td>
<td></td>
</tr>
<tr>
<td>Cleaning of teeth</td>
<td>46(31%)</td>
<td>0.93</td>
<td>0.022</td>
</tr>
<tr>
<td>Make teeth hard</td>
<td>32(21%)</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Protect the teeth from bacteria*</td>
<td>21(14%)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>don’t know</td>
<td>25(17%)</td>
<td>1.44</td>
<td></td>
</tr>
</tbody>
</table>

* Correct answer

Regarding the frequency of visiting to dental clinic, 64(43%) parents visit every six month, 33(22%) parents visit once year and 45(30%) visit when there was pain on the teeth and 8(6%) had never visited the dental clinic.

The question “what do you prefer for treatment if you had dental cavity” 77(51%) like to do dental filling for the carious teeth, 36(24%) prefer extraction, 21(14%) said that they do
nothing and 16(11%) said that they take medication for dental cavity instead of doing anything else for dental treatment.

The brushing habit for both mother and fathers was similar. The frequency of fathers’ brushing was 76(51%), 63(42%) and 11(7%) once a day, twice a day and three times a day, respectively. The corresponding figures of mothers were 73(49%), 63(42%) and 14(9%), respectively.

4.1.5 Univariate analysis based on 150 students

The odds ratio of dental caries in boys is 0.55 compared to girls which was not statistically significant (p =0.102). The girls had more carious lesion than boys.

The odds of dental caries increases as the father education increases. The OR of dental caries for children whose fathers had 11-12 years of education was 1.98 and for children whose fathers had greater than 12 years of education it was 2.43, compared to less educated fathers. The OR was not significantly different.

The odds ratio of dental caries for children with father who had higher income was 1.19 compared to fathers with less income.

The odds ratio of dental caries in children increase to for those parents who didn’t use fluoride toothpaste for their children compared to those who uses fluoride toothpaste for their children. For the knowledge of parents for that fluoride prevents the dental caries (OR= 2.3, p value=.034) showed the significant effect on dental caries of their children. Those parents who said fluoride didn’t prevent dental caries the odds of dental caries were higher.

4.1.6 Multivariable logistic regression analysis

After adjusting for other variable the odds ratio of dental caries was statistically significant for father education and children’s gender. Boys were significantly more protective for having free from dental caries. The OR of dental caries increases while father’s education increases. The OR of dental caries is 3.34 times for children with father’s high education compared to children with fathers who have low education (table 13).

Those parents who don’t use fluoride tooth paste the odds of dental caries was 3 times higher than those who don’t use fluoride toothpaste (P=0.009, Table 13). The knowledge of parents about fluoride was significantly associated with occurrence of dental caries and those who didn’t know about this fact had 1.82 times higher odds to get dental caries compared to those who knew (P=0.028, Table 13).
Table 13: Univariate and multivariable logistic regression model to calculate OR for children’s characteristics effect on dental caries (N=150).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Univariate P value</th>
<th>Univariate OR (95% CI)</th>
<th>Multivariable P value</th>
<th>Multivariable OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>0.10</td>
<td>0.55 (.27-1.12)</td>
<td>0.027</td>
<td>0.40 (.11-.84)</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td></td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>0.94</td>
<td>1.04 (.30-3.58)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>0.94</td>
<td>2.22 (.62-7.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>0.94</td>
<td>2 (.61-6.55)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Father education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 10</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-12</td>
<td>0.12</td>
<td>1.98 (.84-4.7)</td>
<td>0.028</td>
<td>3.34 (1.90-7.89)</td>
</tr>
<tr>
<td>More than 12</td>
<td></td>
<td>2.43 (.90-6.53)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 10</td>
<td></td>
<td>1</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>11-12</td>
<td>0.23</td>
<td>1.59 (.74-3.40)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 12</td>
<td></td>
<td>0.94 (.30-2.91)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Father income</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 15000</td>
<td>1</td>
<td></td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>Greater than 15000</td>
<td>0.64</td>
<td>1.19 (.56-2.52)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rinsing the mouth after meals.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(question for children)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>0.442 (.21-.90)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of fluoride tooth paste</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0.006</td>
<td>3.31 (1.40-7.82)</td>
<td>.009</td>
<td>2.97 (1.39-7.9)</td>
</tr>
<tr>
<td>Fluoride prevents caries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0.034</td>
<td>2.3 (1.06-4.92)</td>
<td>.028</td>
<td>1.82 (1.05-5.02)</td>
</tr>
</tbody>
</table>
5 Discussions

The study was done to explore knowledge of parents and children and their DMFT score in schools of Karachi of students at the age of 12-15. From the 399 students, oral examinations and questionnaire was done in all children, there was low response rate from the questionnaire belongs to the parents, only 150 forms was filled out by the parents and students handover to the respective responsive person.

The response was 38% of the questionnaires that belongs to the parents. The reason may be the short time, it was told to the students that bring the filled form next day. The lack of time and short period of study that is February and March could be the cause of low response rate but there were several reminders given to the principals of schools for the collection of forms and I also told them to announce in all classes where examination was done. Before leaving Karachi for Sweden I went to schools although there were no further forms brought from the students.

Initially my aim was to include both public and private schools but later on when I went to schools there was the attitude difference in giving permission for conducting surveys. Although the attitude from the headmasters of both public and private schools was not appropriate however headmaster’s of private schools allowed me to do surveys in their school that is why I concentrated on private schools.

Discussion section is based on the results from parents and children analysis. Despite the fact that some results were not statistically significant, I compare the results of my study with existing studies.

The mean DMFT index score was 1.4 for 150 students and was smaller than the previous national health survey of Pakistan (NHSP) which was 1.6 (44). The prevalence of dental caries was 70% which was similar to the study that was carry out in urban Kenya but was higher from oral health survey that was done in 2004 where it was 50% (43, 51). The mean DMFT weight was higher due to the increase number of decayed teeth present in both boys and girls and girls had higher DMFT score than boys which was statistically significant. On the other hand decayed, missed and filled tooth index of boys and girls showed that girls had higher decayed teeth and less filled teeth. Eating habits between meals and after meals was the same for boys and girls and the results showed the similarity to the study that was done in school going children in U.A.E (53).

Higher DMFT in girls can be explained by several factors. Teeth erupt earlier in girls than boys therefore girls have more exposure time for cariogenic oral environment, relationship of girls to snacking during food preparation and the pregnancy and hormonal influences also
influence on their oral cavity. There is the difference in biochemical composition of saliva and rate of flow in girls and boys. Clinical and experimental caries research done by Lukacs and Largaespada validate the effect of hormonal fluctuations on the quantity and quality of saliva thus on oral ecology. Although the distribution of parents’ education and income was the same between boys and girls (Table 9), the physiological factors and other factors like poor oral hygiene and negligence from children and parents could be the cause of higher dental caries between girls than boys (52).

The high number of sugar containing food is easily accessible in large number of shops and due to the food that children buy from the schools with their pocket money that their parents gives them may be the cause of more dental caries among those with higher income families. Also the biscuits and toffees advertisement from the companies that target mainly schools may be the cause of large number of dental cavities in high income parents. High income parents who do not have proper oral hygiene knowledge have higher odds of occurrence of dental diseases in their children. The combination of high income and poor parental education is a new risk factor which needs further investigation. Same phenomenon was also seen in children in Abu Dhabi where the students had the high dental caries status in high income families (54).

It has been seen that in countries which are developing fast and where there is transition in the society lifestyles. The validated socioeconomic classifications are not well documented and established in Karachi, Pakistan. Since it is important to classify the society for the purpose of this study into two groups, I set the cut-off of 15000 to categorize parents in two groups (high income and low income) in that region.

There were disparities of knowledge of oral health in girls and boys and the results were similar in study done in Japan (55). The study reveals that girls have more knowledge and were more oral health conscious as compared to boys but the mean DMFT score was greater than boys. This is more likely due to the socioeconomic status, and girls were from the families where there were no gender differences with regard to priorities for attainment of education between girls and boys. National health survey in Hungary also found out the gender difference in dental caries experience and in the increase of prevalence of caries and as age increases which is the same as our study (53).

The DMFT index score increases as the father and mother education increases from lower to intermediate but it shows decrease in the parents with higher education. The mothers of the children with higher education had lower DMFT index score as compare to the other intermediate and lower education groups. As there were some previous studies which also showed same DMFT in different education groups (56). But there are contrast on the DMFT
score with high level of income. That means father with high income more than Rs 15000, their children also had high DMFT score, and on the other hand, high income also relates to the higher decayed, missed teeth surprisingly there were also higher numbers of fillings present on their children teeth with high level of income. It reflects that consumption of sugar and cariogenic food was increasing as the income increases and causing more teeth decay to occur as well as perception of visiting to dental clinic increases for the restorative treatment.

There was the lack of dental knowledge seen in students; only 68% of the students had replied the correct answer for the knowledge of plaque whereas other students replied to the incorrect response such as stains and calculus. On the other hand 53 % parents replied to the correct answer.

The study also reveals that there were false-positive responses chosen by many students under the study. There was the question about dental plaque (“what the remnants of food particles in mouth are called”) and the next part was “where it sticks in the mouth”. Those who gave the correct answer for the question number one they selected the answer of the second question wrong. This may introduce bias in the study. The false positive findings were also seen in the study done in Copenhagen (57).

There was the misconception seen in the causes of dental caries in students most of them were unaware from the exact cause of the dental cavity and believes that sugar and related products are the factors for the occurrence of dental caries rather bacteria. This may be from the fact that there was no dental education programmes conducted in any school which reflects from the question of acquiring dental knowledge, school was in the last category for the choice of obtaining dental awareness. Therefore there should be some oral health education programmes conducted in school or they include basic information for oral hygiene in text book of their curriculum so it would be basic source of knowledge of oral hygiene to parents, teachers and students.

It has been seen that two third of the respondents brush their teeth the day the survey was done and 50% of them brush their teeth twice a day that was similar the study in three different cities of Pakistan (58) and the role of mother was very vital for the instruction and guidance for the brushing and the similar finding was observe in the study that was conducted in north Jordan and (51).

It has been seen that those school going children who used toothbrush instead of other tool for cleaning their teeth they have more dental caries, similar findings were reported in study that was conducted in Karachi (41).
The driven force for the visit to dental clinic was higher proportions for regular dental check-up although the dental pain was the second factor which elicits for dental visit the results was vice versa from the study done in Bulgaria, where the dental pain was the reason for visiting to dental consultant (59).

There was no significant relationship seen in parent’s socio demographic characteristics with the mean DMFT of their children. There was less numbers of participants in the study and there was less power to reject the null hypothesis.

It has been seen that children living with the family with high socio economic status had more DMFT, decayed and the students also had more fillings presents on their teeth than compared to their counter partners from low socio economic status group. The poor status was not the factors for the occurrence of dental diseases but it was the high income that leads the disease to occur and driven them more visits to dental clinic for dental filling treatment. These results were dissimilar and contradictory from the study done in USA (60).

The reason behind the truth in the setting where the study was done the choice of victuals was limited in low socio economic than high income group. The parents had oral health knowledge but the mode of transmission of knowledge to their children was not in effective way, it was may be due to spending more time out of home for struggling with their work for more earning of money or they conceive that the school was the medium of acquiring knowledge for their children.

The question regarding the knowledge of function of fluoride from parents the, 46% of the parents said that it cleans and helps in whitening of teeth the same phenomenon was also seen in study done in (Kingdom of Saudi Arabia) (61). The presence of fluoride either in water, dentifrices, and gels or in the form of varnishes over the teeth made the teeth less vulnerable to decay and arrest the further demineralization of teeth (62).

Although the parents has some dental knowledge for oral hygiene but there was lacking of transmission of dental knowledge and oral hygiene guidance to their children was not appropriate.

5.1 Limitations of the study

Despite the sample size which was 399 children’s but the response rate for parents questionnaires was very low (38%) which made the results insignificant. The children didn’t bring the forms which were given to them for their parents and this is one of the drawbacks
of the study that makes most of the results non-significant, under-estimated and non-
response bias to the survey.

The time duration for the study (February to March) was very short. The study was self-
funded and there were the limitations in the project to evaluate further response variables on
school going children due to few resources and therefore the study was narrowed and limited
to private schools.

Even though the sample size was very low, the current study has a great potential to be used
as a pilot study (63) in future research projects in Pakistan. The descriptive results can have
important policy implications and that is the major contribution of the current study in
future plans of oral health programs among school children in Karachi.

6 Conclusions

Prevalence of dental caries was 70% for 150 students. Prevalence of dental caries in girls was
77% and in boys the prevalence was 64%. The mean DMFT score was 1.4. There were more
carious lesion present in students and parents were more conscious about oral health of their
children and respond to the questionnaire.

Prevalence of dental caries among 399 students was 66%. Prevalence of dental caries in girls
was 73.2% and 60.5 in boys. The mean DMFT score was 1.26.

The level of knowledge of children for oral hygiene was low and had some effect on their
dental caries but it was not significant.

There was no role of schools for the awareness and knowledge of dental education.

Children only visited to the dental clinic when they had dental pain and most of them who
obtained dental medication rather to go for dental filling. Visits to the dentist were infrequent
and most of them had never visited the dentist. Parents were aware that regular visits to
dentist can prevent dental caries but there were large numbers of parents who visited dentist
when there was the pain on teeth. There were some parents who said that they prefer to visit
physicians for dental consultation.

In Pakistan there was not very much work done on national level for the evaluation of oral
diseases in school going children, the last survey done in 2004 in different cities of Pakistan.
There was not any study carry out on this topic and publish in local or international journals.
This is the first study that focuses on both children and parents knowledge variables with
relation to the dental caries in Karachi, Pakistan. This study can be baseline or reference study for the conduct of further studies in future in Pakistan.

For parents there were some variable which had significant effect of oral hygiene to their children dental caries. The role of mother particularly those who are educated with advanced education should not be neglected and have important role in taking care of oral hygiene of their children.

7 Recommendations

Applications of the study

The main important findings of the study can be used in preventive programmes conducted in future and the results from future epidemiological survey can measure the change. There were several studies done in children for measuring dental health status but there were no data available for the knowledge of parents and dental caries in their children in Pakistan.

The following are the some important findings of the study.

- The girls had more dental caries than boys.
- Parents knowledge of fluoride and using fluoride toothpaste for their children had greater effect on their children. Those parents who used fluoride containing toothpaste their children had lower of number of dental caries.
- It was also seen that mother’s education also influence their children dental caries. Those mothers who had high education, their children also had low number of dental caries.
- Although the parents income was not significant with the dental caries of their children but the parents high income had higher odds of dental caries in their children.
- There were large numbers of dental cavities present in students with untreated cavities in both boys and girls.
- The role of schools in awareness of dental education is inadequate.

This study can help in the planning and improvement on the drawbacks of the oral health programmes in schools and in community for the local health services.

Oral health programmes should be performed in future for the oral health care awareness and promotion in schools as well as involvement of parent’s education programmes on same side to achieve the goal of healthy teeth for the society.
The regularly visits of dentist to schools will help in preventing and promoting the oral health care and help the parents to get dental report of their child from school rather to timely visit to dental clinics. There are less numbers of dentists currently present in Pakistan; therefore it is responsibility of the government and private health sectors to promote dental health knowledge in school by doing workshops in both in private and public academic institutions.

There should be broad oral health education programmes for parents and children. More emphasis should be given on research side for the problems of irresponsibility of parents not collaborating with surveys that perform for the evaluation of health related programmes in schools.

There should be full record directory present for private school registration so it is easy to follow the appropriate methods for study selection which helps the comparison of public and private schools in future.

More areas should be covered in different towns of Karachi in future for the comparison of the study. There should be large studies to be conducted in schools for oral health knowledge evaluation in local and national level. More variables of examination of oral cavity e.g. periodontitis, gingivitis and other oral lesion should be measure for further evaluation.
References

15. Stephan R Changes in hydrogen-ion concentration on tooth surfaces and in carious lesions. JADA. 1940; 27(5):718-723.


https://apps.who.int/infobase/CountryProfiles.aspx (accessed on 03th February 2012)


Oral health in Pakistan: A situation analysis.


9 Appendix 1

Dental status/Caries Recording Form
Malmö University, Department of Cariology, SE-205 06 Malmö, Sweden; Version WHO CC 02/DB

Name ___________________________ Date ____________
Area ___________________________ Ident. Numb. __________
School ___________________________ Class ____________
Age _____ Boy [ ] Girl [ ] Examiner ____________ Recorder ____________

<table>
<thead>
<tr>
<th>Permanent</th>
<th>Primary</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>sound</td>
</tr>
<tr>
<td>1</td>
<td>decayed</td>
</tr>
<tr>
<td>2</td>
<td>filled &amp; decayed</td>
</tr>
<tr>
<td>3</td>
<td>filled, no decay</td>
</tr>
<tr>
<td>4</td>
<td>missing due caries</td>
</tr>
<tr>
<td>5</td>
<td>missing, other reason</td>
</tr>
<tr>
<td>6</td>
<td>sealant</td>
</tr>
<tr>
<td>7</td>
<td>bridge abutment, crown</td>
</tr>
<tr>
<td>8</td>
<td>unerupted</td>
</tr>
<tr>
<td>9</td>
<td>excluded</td>
</tr>
</tbody>
</table>

DMFT: D _________ M _________ F _________ = _________
DMFS: D _________ M _________ F _________ = _________

- Saliva secretion, volume: __________
- Saliva ml/min: ________ (to be calculated)
- Deactobuff: blue green yellow ________ (read after 5 min exactly)
- Deactocult LB: ________ (according to chart)
- Strip mutans: ____________ (according to chart) (save)

Other observations:

Appendix 2

Social and demographic characteristics

1) Fathers Education level
   ➢ Low (less than 10 years)
   ➢ Medium (11–12 years)
   ➢ High (more than 12 years)

2) Mother education level
   ➢ Low (less than 10 years)
   ➢ Medium (11–12 years)
   ➢ High (more than 13 years)

3) Financial status or income
   ➢ Less than 15000 Rs
   ➢ And greater than 15000

4) House ownership
   ➢ Rented house
   ➢ Private house

Appendix 3

Questionnaire about oral hygiene and oral health knowledge among children

1: When did you last brush your teeth?
   a) Today
   b) Yesterday
   c) Day before yesterday

2 How many times a day you brush your teeth.
   a) Once a day
   b) Twice a day
   c) Thrice a day

3 Which things you use for cleaning your teeth.
   a) Muswak
   b) Brush and tooth paste
   c) With finger

4 how much Time you spent on brushing teeth
   a) less than 3 min
   b) 3 min or more
5. Do you clean your teeth after eating food?
   a) Yes
   b) No

6. When do you brush your teeth?
   a) Morning
   b) Noon
   c) Before going to bed
   d) Other times specify

7. Reasons for brushing teeth.
   a) Clean, bright teeth
   b) Prevention of caries
   c) Prevention of bleeding gums
   d) Prevention of oral ulcer
   e) To get rid of foul breath
   f) To set good example to others

8. Who guide you to brush your teeth?
   a) Father
   b) Mother
   c) No one

9. Are bad teeth makes smile bad?
   a) Yes
   b) No

10. Have you ever visited to dentist?
    a) Yes
    b) No

11. Do you like to visit to the dentist if you have pain?
    a) Yes
    b) No

12. When you last visited to dental clinic?
    a) During the last six months
    b) One year
    c) Never

13. For what reason you last visited to dental clinic?
    a) For regular dental check up
    b) With dental pain
    c) For filling
12 What was the treatment done on last dental visit?
   a) Dental medication.
   b) filling
   c) orthodontics braces
   d) Extraction.

13 From where you get the knowledge of oral hygiene?
   a) From school
   b) From parents
   c) From advertisements

14 What is the cause of dental caries?
   a) Sweets and toffees
   b) Soft Drinks
   c) chocolates
   d) Bad food from outside(vendors)
   e) Don’t brush the teeth after eating food.
   f) bacteria
   g) Don’t know

15 Do you know what fluoride is?
   a) Yes
   b) No

16 Fluoride protects the teeth against decay?
   a) Yes
   b) no

19 How many times a day you eat sweets?
   a) Once a day
   b) Twice a day
   c) Thrice a day
   d) Don’t eat sweets every day.

20 Preferred times for eating sweets.
   a) At mealtimes
   b) Between mealtimes
   c) After meals
   d) At all times

21 Do you eat snacks between meals?
   a) Yes
b) No

22 remnants of food particles on mouth are called?

a) Plaque
b) Calculus
c) Stains
d) Don’t know

d) Don’t know

23 Where does dental plaque stick in the mouth?

a) on the tongue
b) on the gums
c) on the teeth
d) all the above mentioned
e) never heard about plaque
f) don’t know

24 Rinsing the mouth after meals.

a) Sometimes
b) Always

Knowledge of parents of oral health and dental caries

Choose one and tick appropriate answer that suits you best.

1: Is brushing teeth preventing caries to occur on teeth?

a) yes
b) no
c) I don’t know

2 Do you guide your children how to brush their teeth?

a) Yes
b) No

3 What kind of tool your children use for cleaning their teeth?

a) Brush and toothpaste
b) Muswak
c) With finger

4 Do you know what is fluoride?

a) Yes
b) No

5 Do you use fluoride toothpaste for your child?

a) Yes
b) No

6 Is fluoride helps preventing teeth from dental caries?

a) Yes
b) No

7 From where you heard about fluoride that helps in teeth protection?
   a) From dentist
   b) From school teachers
   c) From advertisements
   d) From doctors

8 Can fluoride reverse the dental cavity?
   a) Yes
   b) No
   c) Don't know

9 What is the function of the fluoride?
   a) Whitening of teeth
   b) Cleaning of teeth
   c) Make teeth hard
   d) Protect the teeth from bacteria
   e) Don't know

10 What is the cause of dental caries?
   a) Sugar
   b) Sweets
   c) Soft drinks
   d) Snacks
   e) Bacteria
   f) I don't know

11 What is dental plaque?
   a) Food remaining on teeth.
   b) Stains
   c) I don’t know

12 What does plaque do to your teeth?
   a) Change the colour of teeth
   b) Dental cavity
   c) Bleeding gums
   d) I don’t know

13 Does frequently visits to dentist prevent the dental caries?
   a) Yes
   b) No
   c) I don’t know

14 What do you do when your child experience toothache?
a) Nothing
b) go to dentist
c) Self medication

15 How frequently you visits to dental clinic?
   a) After every six month
   b) once a year
   c) when there is pain on tooth
   d) never visited

16 Where do you go for dental consultation?
   a) Dentist
   b) Nearby doctor
   c) Quack

17 If you visited to the dentist are you satisfied from his/her work.?
   a) Yes
   b) no

18 How to prevent teeth from dental caries?
   a) Low consumption of sweets
   b) Avoid food from outside
   c) Regular brushing
   d) Frequently visiting to dental clinics
   e) Don't know

19 If your child have dental cavity what treatment do you prefer?
   a) go for Dental filling
   b) go for Extraction
   c) do nothing
   d) only medication

20 For father, how often do you brush your teeth?
   a) Once a day
   b) Twice a day
   c) Thrice a day

21 For mother, how often do you brush your teeth?
   a) Once a day
   b) Twice a day
   c) Thrice a day