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A clinical audit: dental treatment needs and treatment received by 12 and 15 year old children who attended the Wits Dental Hospital during the period: January 2006 to December 2010

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A Clinical Audit: Dental Treatment Needs and Treatment Received by 12 and 15 year old children who attended the WITS Dental Hospital during the period: January 2006 to December 2010.

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A Clinical Audit: Dental Treatment Needs and Treatment Received by 12 and 15 year old children who attended the WITS Dental Hospital during the period: January 2006 to December 2010.

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A research report submitted in partial fulfillment of the requirements for the degree of

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In the Department of Paediatric and Restorative Dentistry
School of Oral Health Sciences
Faculty of Health Sciences
University of the Witwatersrand, Johannesburg

Supervisor: Professor JL Shackleton

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Dedication

To my parents, husband and our daughters: Aa'isha and Muaazah.

Acknowledgments

I hereby extend my sincere appreciation to:

My supervisor, Professor JL Shackleton, whose mentoring and guidance have inspired me to reach higher. Thank you for your time and effort that you've invested in me.

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And last, but certainly not least, my beautiful family: I love you and thank each one of you for your unwavering love and belief in me.

Declaration

I declare that the following research report "A Clinical Audit: Dental Treatment Needs and Treatment Received by 12 and 15 year old children who attended the WITS Dental Hospital during the period: January 2006 to December 2010" is my own work, and that it has not been submitted before for any degree or assessment at any other university, and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

…….

Dr. Tashnim Bagus
B.D.S. (Witwatersrand)

Acronyms

ART:	Atraumatic Restorative Technique
CEO:	Chief Executive Officer
DEJ:	Dentino – Enamel Junction
DMFS:	Decayed – Missing – Filled – Surfaces
DMFT:	Decayed – Missing – Filled – Teeth
DT:	Decayed Teeth
CRFA:	Common Risk Factor Approach
ECC:	Early Childhood Caries
FDI:	Federation Dentaire Internationale
FT:	Filled Teeth
IADR:	International Association for Dental Research
MT:	Missing Teeth
PRR:	Preventive Resin Restoration
SD:	Standard Deviation
SPSS:	Statistical Package for the Social Sciences
WDH:	Wits Dental Hospital
WHO:	World Health Organization

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Abstract

Title

A Clinical Audit: Dental Treatment Needs and Treatment Received by 12 and 15 year old children who attended the WITS Dental Hospital during the period January 2006 to December 2010.

Key words:

Caries, Prevalence, Dental Treatment needs, Children.

Background

The majority of children and adults are affected by dental caries and its sequelae in South Africa. Children, from lower socioeconomic backgrounds in particular, continue to experience a high burden of dental caries.

Objectives

- To determine the number and profile of 12 – year – old and of 15 – year – old patients who attended the Wits Dental Hospital during the period of January 2006 to December 2010.
- To determine the dental treatment needs of the two index age groups, including caries prevalence and the teeth affected by caries.
- To determine the treatment received during this period.
- To determine the time taken to complete the treatment needed and the number of patient visits required.
- To determine the obstacles to receiving or completing the prescribed treatment.

Subjects and Methods

The study was based on a retrospective review of the dental treatment records of 12 – year – old and 15 – year – old children attending the WITS Dental Hospital during the period January 2006 to December 2010. The study was based on children treated in the dental chair and did not include children treated under general anaesthetic.

A total of 143 dental treatment records were retrieved , but only 62% (89) of the records met the specified study requirements – (*39* for 12 yr olds and *50* for 15 yr olds). Extracted data was recorded by the researcher onto specifically – formulated data capture sheets. Processing and analysis of data was carried out with SPSS for Windows, Version 13 . Chi – square tables were constructed for comparison of proportional distributions. Exact and Monte Carlo test statistics were calculated to identify significant relationships.

Results

The mean DMFT for the 12 – year – old age group was 3.0 . The DT accounted for 76.6% of the DMFT , the MT for 23.33% and the FT was nil.

The mean DMFT for the 15 – year – old age group was 3.8. The DT accounted for 92.1% of the DMFT , the MT for less than 10% and the FT was nil. There is an increase in dental caries from 12 – year – old to 15 – year – old patients. Carious teeth are left untreated. Restorative dental treatment levels are low. Low levels of completed treatment plans noted.

Conclusion

The rise in dental caries from the 12 – year – old group to the 15 – year – old group, together with high levels of untreated caries and low levels of restorative dental

treatment indicate the need to improve the oral health of school children. Evidence – based oral health prevention and promotion strategies must guide oral health policy planning, so that supportive environments are created and sustained to facilitate healthy choices and maintain optimal oral health.

CHAPTER 1

INTRODUCTION

This study aims to establish a clinical audit in the Department of Paediatric and Restorative Dentistry at the Wits Dental Hospital. The study is based on the retrospective review of dental treatment records of 12 – year – old and 15 – year – old children who presented for treatment in the Department of Paediatric and Restorative Dentistry at the Wits Dental Hospital during the period of January 2006 to December 2010.

A clinical audit can broadly be defined as a review process aimed at improving patient care with the implementation of strategies conducive to a positive outcome. The Department of Paediatric and Restorative Dentistry was concerned by the difficulties encountered by students in achieving the required number of paediatric treatment procedures, and the perception that fewer child and adolescent patients were being treated since the move of the WITS Dental Hospital to its new location.

The audit aimed to assess the dental treatment needs, and treatment received, by patients in these two age groups. It was also aimed at determining how many treatment plans were completed, and whether the perception that once the symptoms were removed child patients did not continue treatment, was accurate. The audit would provide the Department with information relating to the numbers of older children presenting for treatment of dental caries, the prevalence and severity of dental caries, the treatment required and the treatment actually completed.

Periodic evaluation of the oral health status of individuals, communities and populations must be maintained in order to evaluate the level of appropriateness of the various treatment regimens available [1]. The WHO recommends that surveys are to be conducted in children aged 6-8 years, 12 years, and 15 years [2]. The 12 and 15 year old age groups represent the index-age groups (standard age group category) which are utilized by the WHO to evaluate and compare the level of dental caries in the permanent dentition of children worldwide [3]. This is the reason for selecting children in these age groups for the study.

According to the WHO definition, an adolescent is an individual aged between 10 years and 19 years [2]. Several research fields utilize the adolescent and young adulthood periods in an individual's life, as these individuals experience significant changes biologically, emotionally and psycho-socially [4, 5]. These changes may see the individual opting for decisions that will influence their health, including their oral health [6] .

Studies evaluating dental caries experience frequently use the decayed, missing and filled teeth (DMFT) index [2]. The mean DMFT scores provide an estimate for dental caries prevalence and its treatment (tooth extraction or restorations) [2].

Numerous studies focusing on pre-school children have been carried out in an attempt to decrease the prevalence of Early Childhood Caries (ECC) [7-11] . The burden of ECC in young children and the consequences of dental caries in older children have been clearly documented [12-14]. Studies evaluating dental caries prevalence in adolescent patients are not as numerous as those involving the pre-school age groups.

The purpose of this study was to determine the dental treatment needs and treatment received by 12-year old and 15-year old children who attended the WITS Dental Hospital during the five year period. The present study was conducted on a hospital-based population who have specifically presented at the Wits Dental Hospital because they had a dental problem.

The Wits Dental Hospital is located within the Charlotte Maxeke Johannesburg Academic Hospital in Gauteng, and provides essential curative, preventive and specialist oral health care services to patients from mainly urban locations, largely from the Gauteng province. Gauteng (approximately 17 000 square kilometers) is the smallest of the nine South African provinces. This province is home to one fifth (8.8 million) of the South African population [15].

The study will provide information pertaining to the trends in dental caries prevalence and severity in adolescents presenting at the Wits Dental Hospital. The clinical audit will provide information on the treatment plans devised, the treatment performed and the treatment needs that were unmet. This information will be used to improve teaching and service delivery within the Department and the Wits Dental Hospital.

CHAPTER 2

LITERATURE REVIEW

2.1 Literature Search

An electronic search of the PUBMED database was conducted for the MeSH Subject headings “dental treatment needs”, “12 –year – old – children and 15 – year – old – children”.

The following search strategy was also used : ((“dental care”[MeSH Terms] OR (“dental”[All fields] AND “care”[All fields] OR “dental treatment” [All Fields]) AND (“health services needs and demand” [MeSH Terms] OR (“health” [All Fields] AND “services” [All Fields] AND “needs” [ALL Fields] AND “demand” [All Fields] OR “health services needs and demand” [All Fields] OR “ needs” [All Fields])) AND (and child[All Fields] OR and childbirth [All Fields] OR and childhood [All Fields] OR and children [All Fields] OR and children’s [All Fields] OR and childrens [All Fields])

Other keywords used were “dental caries prevalence” , “dental caries pattern” , “oral health” , “oral health promotion” , “common risk factor approach”. References were extracted from the search history, and subsequently abstracts and reference lists were manually checked to identify studies with a focus on the dental treatment needs in the 12 – year – old and 15 – year – old children in both developing and developed countries to establish current trends in dental caries prevalence, patterns, prevention, promotion and treatment. Relevant journal articles were identified and full text articles obtained,

either from the PUBMED database, Wiley online library or via the University of the Witwatersrand Library database.

2.2 Literature Review

Dental caries is consistently reported as one of the most common chronic bacterial diseases, which affects all humans, regardless of divides such as age, race, socioeconomic status and culture[16]. Dental caries is the disease of the dental hard tissues resulting from the "action of micro -organisms on fermentable carbohydrates," causing these dental hard tissues to decalcify[17,18].

Dental caries and its sequelae impact on one's ability to eat, socialize and communicate effectively[19]. Dental caries may not be life-threatening, but if left untreated its sequelae of oral disease, pain, pulpitis, jaw infections, tooth loss and edentulism will have deleterious effects on an individual's ability to function and will further impair quality of life. Children, in particular, suffer with dental caries and its sequelae, which include adverse effects on children's growth and development, physically, mentally and psycologically[7, 20, 21]. The burden of dental caries and its consequences has been documented[7, 20-24]. In fact, dental caries is reported as being one of the most common reasons for the rejection of young service men during the American Civil War and also the two World Wars[22].

The oral cavity is involved in multiple functions every day, including eating, speaking, communication and social interaction. Consequently, disorders affecting the oral cavity have the potential to adversely affect these daily functions. Reduced food intake, as a result of oral/dental pain and / or a compromised dental status, has been shown to

hamper growth in children[21, 23]. Thus, the nutritional status and general health of a child may also be placed at risk by dental caries[25].

Furthermore, the negative impact of pain on an individual's ability to comfortably interact socially, is also well-known[26, 27]. The pain and discomfort can also present negative effects on a child's ability to attend school as expected and absenteeism as a result of oral dental-associated pain is also well-documented[27].

The negative effect on speech development by caries and tooth loss can not be underestimated[26, 27]. The effects can extend beyond childhood into adolescence, where social acceptance by peers is tested. The socially-stigmatising result of a compromised dental status, including physical appearance and speech impairment is well documented[26,27]. The establishment of a sustained acquaintance has been shown to be greatly influenced by a good first impression of an individual. That first impression is greatly enhanced by the face, smile and teeth of that individual[5]. Research has also shown that individuals who are more attractive and better-looking, tend to attain better marks in school, and also greatly influence their teacher's outlook regarding their potential[28]. Furthemore, individuals who are perceived to be more physically attractive are also more successful at achieving better career prospects and opportunities[5, 29].

Dental Caries Prevalence

Information pertaining to the level of caries on a global scale has been recorded through the WHO oral disease surveillance systems[30]. Studies applying the WHO methodology can also provide valuable information pertaining to the level of caries on a global

scale[31]. Considerable variations in dental caries prevalence exist between countries and even between regions within countries[32].

Initial documented evidence indicated that the dental caries experience is on the decline for developed countries[19, 33-35], such as Australia, the United Kingdom and most European countries because much has been done over the past 30 years to reduce the dental caries experience[34-36]. This decline in the dental caries prevalence has largely been due to the widespread use of fluoride, including water- fluoridation, population – based preventive programmes (including flouridated toothpastes), oral health programmes focussing on oral hygiene practices and sugar – intake habits, so that prevention and oral health promotion is prioritized[37, 38].

However, in the last decade, this decrease in dental caries prevalence in developed countries has reversed. Oral health authorities around the world have admitted that there is a significant cause for concern, as report after report is signalling an increase in the dental caries prevalence levels around the world, affecting children and adults, including primary and secondary dentitions[39].

Reports from some European countries, including the United Kingdom and Norway, have indicated a reversal in the previously-reported declining dental caries rates, with Norwegian studies revealing an increase in dental caries in 12 year-old children and that more of these children were affected with dental caries in 2004 than in 2000[39].

A report evaluating the oral health status in the United States revealed a startling contrast to previous studies which indicated decreasing dental caries levels over the

past thirty years. The authors revealed “no reductions were observed in the prevalence and severity of dental caries in primary teeth during the 10-year period of each survey. A large percentage of untreated tooth decay was found across all age groups and socio-demographic characteristics” [40].

Conflicting results seem to be apparent with regard to the dental caries prevalence rates in developing countries. Initial studies evaluating the dental caries rate in developing countries, such as China, Jordan and The Gambia indicated an increase in the dental caries experience[41-43]. However, studies involving developing countries and regions, such as Sudan, Sub-Saharan Africa, Middle East and North Africa, Latin America and Caribbean, indicate a decrease in the dental caries prevalence[44-47].

Developing countries like Iraq[37] and some African countries[48] have recorded a recent increase in dental caries prevalence and have attributed the limited use of flouride, unhealthy dietary habits, poor oral health resources and limited access to oral health services, as major obstacles to reducing the dental caries prevalence rates in these middle and low-income countries. Urbanisation and adoption of cheaper diets, in the wake of waning optimal public prevention programmes has seen the dental caries experience increase[37, 39, 48]. Furthermore, little priority is given to prevention, as the majority of dental treatment focus on symptomatic and curative practices[37].

Studies conducted after 2004 in other developing countries, including China, Philipines, Brazil and Mexico have revealed a consistent increase in the levels of dental caries in both children and adult population groups, with the levels of untreated caries and new caries also reaching alarming levels[39].

At this point it should also be borne in mind that the dentist/clinician's so-called "script" or criteria pertaining to caries diagnosis and treatment intervention have also changed over the last three decades, coinciding with the apparent reported reduction in dental caries levels, as revealed in studies conducted in developed countries post 1979[49]. Gimmestad *et al*[49] stated that dentists have become more inclined to adopt a less invasive or less interventional treatment strategy, compared to their earlier counterparts, who favoured an earlier and more invasive treatment strategy. The result has been a decrease in recorded DMFT scores as caries diagnosis and treatment was often postponed, resulting in more teeth been diagnosed as "sound" and consequently less tooth surfaces were recorded as "filled"[49].

Nevertheless millions of children (and adults) continue to be affected by dental caries and its consequences the world over[39, 50]. Studies also report that there are certain groups of the population that continue to experience a higher burden of dental caries[48, 50, 51].

In most developed countries, about 60 – 90 % of schoolchildren are affected with dental caries, and studies also reveal an increase in dental caries prevalence in several developing countries[31, 37]. A quotation from an article in the Journal of the American Dental Association states: "Caries levels for 12 year-olds in developing countries has been increasing constantly and this is particularly alarming owing to the fact that the developing countries represent most of our world"[39].

A joint formulation by the World Health Organization (WHO) and the Federation Dentaire Internationale (FDI) in 1981 saw the launch of the Oral Health Goals to be achieved by the year 2000[52], among which included:

- 50% of 5-6 year-olds to be free of dental caries.
- The global average to be no more than 3 DMFT at 12 years of age.
- 85% of the population should retain all their teeth at the age of 18 years.

The changing trends in the global oral disease patterns have initiated the formulation of new Oral Health Goals up to the year 2020, and is a joint collaboration between the WHO, the FDI and the International Association for Dental Research (IADR)[39, 52, 53]. The new Oral Health Goals are not meant to be prescriptive in nature, but the aim is rather to empower governments at national, regional and local levels to institute appropriate and integrated oral health policies designed at setting standards for oral health in relation to dental caries, periodontal disease, pain, trauma, tooth loss, infectious diseases, cranio-facial anomalies, oro-pharyngeal cancer, oral manifestations of HIV-infection, and also the evaluation of health care services and health information monitoring systems[53].

Dental Caries Prevalence in South African Children

Previous studies relating to the dental caries experience in South Africa indicates that dental caries prevalence is well below the World Health Organization (WHO) Oral Health goals that were set for 2000, and it is also below the Oral Health goals set by the Department of Health for the year 2000[54-56].

However, information pertaining to dental caries prevalence and severity in South Africa on a national level has been sparse. In 1983, the dental health status of 12 – year – old South African children was documented by Williams[57]. Three South African National Oral Health Surveys were conducted between 1983 and 1999 / 2002 and 1988 / 89 and 1999 / 2002[58]. Evidence indicates that concerns have been raised regarding the apparent fluctuations in the dental caries rate in South Africa[59], although in 2009, in what was based on a systematic review of the literature from 1919 – 2007, Cleaton – Jones and Fatti found a decrease in the dental caries rates in children in South Africa[47]. Data summarized from the three South African National Oral Health Surveys indicated that although there was a decrease in the dental caries experience of South African children during this period, concerns about increasing levels of untreated caries in 6, 12 and 15 – year – old age groups was identified[58]. Furthermore, although there was a decrease in the dental caries prevalence and mean DMFT for the 12 – year – old and 15 – year – old age groups during this study period, strong evidence indicates that the level of unmet treatment needs in these two age groups of the population remain alarmingly high and that there has been a significant increase in the dental caries severity from the 12 – to the 15 – year – old age group, with the DMFT scores also rising significantly from the 12 – year – old to the 15 – year old age group[58]. Another similar study [48] also indicated a noticeable increase in the dental caries prevalence, with this value percentage increasing two-fold from 12 – year old children to 15 - year old children.

van Wyk *et al* [58] also reported that the carious involvement of the primary dentition seemed to be much more severe when compared to the permanent dentition. Numerous studies evaluating dental caries prevalence in pre-school children have been conducted in an attempt to establish indices for caries prevalence in this young age group, to

identify the risk factors for Early Childhood Caries (ECC) and to provide the basis for numerous preventive regimens for ECC[21, 23, 59-61]. It is important to document the prevalence of ECC, because the presence of dental caries in the deciduous dentition may serve as a risk indicator for caries in the permanent dentition[62].

In 1994 the South African government advocated the provision of free health – care services to pregnant women and children under the age of 6 years, which saw an increase in the delivery of these services to these groups of patients[58]. Results indicate that there was a reduction of about 4 % in the percentage of untreated caries during the period 1988 to 1999 / 2002[58].

The early 1990's in South Africa saw the decentralization of health care facilities, in an attempt to negate the inequalities in the health care system that existed under the previous dispensation. There are still differences in dental caries prevalence in the South African population[58]. Certain South African population groups, for example those with a higher socio-economic status, experience lower dental caries prevalence, better access to dental services, optimal education relating to oral health care practices, fluoridated toothpastes and as a result better oral health status[34, 36, 58]. The reverse is seen in groups with a low socio-economic status, who experience increased dental caries prevalence and severity, poor access to dental services, lack of education relating to oral health care practices, poor access to fluoridated toothpastes and consequently demonstrate compromised oral health status[31, 37, 58].

A direct correlation between low socioeconomic status and increased oral disease have been demonstrated in numerous studies, both nationally and internationally[58, 63-67].

Lack of finances, transportation, perceived need for dental care, adequate knowledge pertaining to oral health contribute to the increased dental caries prevalence in disadvantaged groups of society[68, 69]. Furthermore, children from low income households very often have their first dental visit only when the consequences of oral disease, especially dental caries are established. Also, the fact that taking time off from work (and school) to escort the child only compounds the decision to delay seeking earlier dental treatment[21].

Also, adolescents from low / poor socioeconomic backgrounds have been shown to suffer more severely from oral disease[26, 64-66, 70-73]. In the study published by Van Wyk *et al* [58] speculation about the abolishment of school – based dental services and the replacement of these dental services by community – based clinics, was purported as a possible explanation for the increase in untreated caries in the 12 – and 15 – year old age groups[58].

Dental Caries in the Adolescent

The period of adolescence in an individual's life, marks the transition from childhood to adulthood [4, 5, 74] and has long acquired the reputation of rebelliousness, friction and self-assertion. Furthermore, this same period is also well known to be accompanied by quite turbulent times and decreased self-esteem[74]. Low confidence levels and poor social relations as a result of a compromised dental status may have far reaching consequences on the mental and psycological well-being of the individual[4, 5]. Today adolescents face far greater risks to their health. Some of these risks include: teenage pregnancy, alcohol and drug abuse, HIV, physical and emotional abuse, poverty and disassociation from school and society. These have resulted in adolescents being

categorized as “at risk” individuals[71, 75, 76]. These factors may contribute to the adolescent patient neglecting to seek medical and dental care, as the latter may not be high on their list of priorities.

It is also during this period of adolescence that an increase in caries experience has been documented[58, 71]. This increase has largely been attributed to the eruption of permanent second molars, into an oral environment subjected to irregular meals, fast food, frequent snacking and possibly reduced access for oral hygiene resulting in deleterious consequences for the immature newly erupted tooth enamel[77, 78].

Rendering oral health care to the adolescent patient could prove to be a rewarding experience for the oral health care provider. Despite all the negative connotations surrounding adolescence, it is during this period that the individual might be quite amenable to adopting healthier life – style options and oral health care practices[4, 79]. This period sees the individual become overly self – conscious and more acutely aware of his / her physical appearance and choices enhancing their aesthetic appeal are often favoured[4, 5]. The above, combined with the need of the adolescent to be independent and self – sufficient, are powerful motivators to adopt healthier lifestyle changes and oral health care practices[79].

Current approaches to Dental Caries Prevention

Studies concentrating on caries risk, previously focused on two chief approaches[80]. These were:

1) The prediction approach which aimed at identifying the characteristics of high – and - low – risk individuals. Various social factors and past dental caries were demonstrated as being the best predictors for high – risk groups.

2) The multi – risk approach which aimed at explaining the reasons for the variation in caries in the presence of various or multiple risks. This approach focused on the presence of disease as a result of an individual's behaviour.

Both these approaches focus on finding the chief factors which contribute the strongest to identifying high – risk individuals and the risk factors associated with dental caries. Both these approaches also utilize past dental caries experience in their study models[80]. The prediction approach studies identify factors related to past dental experience as being strong indicators for individuals who will experience caries in the future. The multi – risk approach studies explain that past dental experience is the reason for future dental caries.

Although past studies based on both or either of these approaches have provided valuable information, dental caries preventive strategies are not simple and are not the result of just one or two factors. The reason is that dental caries is multifactorial in nature[37, 81]. Oral health promotion and preventive strategies have to be re-examined in the light of the limitations of current caries risk studies[80]. Current approaches of dental caries risk studies have limitations when tackling oral health population – based preventive programmes[80, 82]. It is no longer sufficient to focus on oral health education and individual behavioural modification pertaining to oral health[82]. Studies indicate that concentrating on factors such as oral health education and oral health behaviour actually deepens or worsens oral health inequalities[83].

In the past, dental professionals applied the biomedical model of disease in an attempt to educate their patients about the causes and progression of dental disease[84]. The logic behind this approach was that once individuals are equipped with the necessary

knowledge and skills pertaining to their condition, these individuals will modify their oral health behaviour and employ oral health preventive and promotive approaches to maintain optimal oral heath[82, 84]. Studies have shown that focusing on these clinical preventive and oral education approaches alone are ineffective in providing long term sustainable oral health improvements[84]. The reason is that human behaviour is a reflection of the environment in which an individual is born, grows up, lives, works and engages. These social, economic, political and environmental factors shape an individual's behaviour and are collectively known as the "Social determinants of Health" [84-87]. These factors provide an explanation to the broader context of human behaviour.

The limited effect of clinical prevention and health education was recognized and in 1986, the WHO published the Ottawa Charter which provided guidelines for producing public health promotion strategies aimed at providing sustainable improvements in health. A series of WHO International Conferences followed which focused on the further exploration and development of health promotion policies and practices[82].
In 2008, the WHO Commission on Social Determinants of Health issued a report which challenged current public health thinking and tactics[85, 86]. In order to provide long term sustainable health improvements for entire populations, it was imperative to identify, understand and address the causes of health inequities in these populations. The Commission identified that the "true upstream drivers of health inequities reside in the social, economic and political environments" of these populations[86].

Subsequent World Health Reports now call upon the world's nations to refocus on the "holistic primary health care approach" and challenge public health policy planners to

address the true causes of health inequities so that optimal health promotion strategies may be implemented to promote sustainable health improvements for the entire population[86]. Supportive environments must be established to create and maintain these health improvements. Appropriate interventions must be implemented to improve overall levels of education, housing, job creation, equal and fair opportunities, combat barriers to health care, protection of minority / vulnerable groups in the population and prevention of social isolation[86].

In 2010, a report published by the WHO, documented Oral Health as one of the twelve critical public health conditions[86, 88]. The previous position of Oral Health as being isolated from the rest of the body has been abolished. In the past, oral health promotion and preventive programmes were developed in isolation of other health promotive strategies.

General health cannot be viewed independently of oral health. Oral health forms an integral part of general health and wellbeing and greatly influences the quality of life[82, 89]. Therefore, the Common Risk Factor Approach (CRFA) has been globally endorsed and accepted by global health policy makers because it allows for the integration of general health and oral health prevention strategies[90]. The CRFA was originally based on the WHO Health policy recommendations in the 1980's which endorsed the integrated approach as the basis for the prevention of chronic diseases. This integrated common risk factor approach has been adapted to oral health and recognizes that chronic noncommunicable diseases such as heart disease, obesity, stroke, diabetes, cancers, mental illness and oral disease "share a set of common risk factors and conditions"[82, 90]. By targeting common risk factors and their underlying social

determinants, this integrated common risk factor approach ensures improvements of a range of chronic diseases and conditions[82, 90, 91].

However, distortion of the CRFA must be avoided by recognizing that too much focus on oral health – related behaviours and insufficient focus on their social determinants will fuel further oral health inequities[92]. Oral health policy makers need to acknowledge the importance of addressing these social determinants and direct action on these upstream determinants of health inequalities. Policies must be amended to direct health promotion strategies which incorporate the impact of these political, economic, social and environmental factors influencing health inequalities. The need to focus on these upstream drivers and only "drift downstream" to concentrate on individual behavioural factors, is recognized and known as "lifestyle drift"[92, 93].

The WHO Commission on the Social Determinants of Health (CSDH) outlined a conceptual framework which highlights the social determinants of health (including sociopolitical factors, structural determinants, socioeconomic status and intermediary determinants such as living and working environments, and access to health care services)[85, 86, 92]. This model aims to explain the causes of health inequalities and adopts a life course perspective which is integral to understanding how health inequalities originate.

The inequalities in health are prevalent not only between different countries but also within countries[85-87]. This overlap of health inequalities seen between high income and low income countries, is also common to the diseases which occur in these countries[87]. This same overlap between health inequalities and diseases prevalent is also

demonstrated in countries which have high income, middle income and low income groups[87]. People occupying the higher ranks on the socioeconomic ladder experience better oral and overall health. Studies have documented the effect of early socioeconomic rank on the health outcomes in later adult health[92, 94].

However, public health policies focusing solely on the very poor is not the solution. The reason is that there exists a social gradient in health[85, 87]. A stepwise gradient relation exists between socioeconomic status and health and disease. While this social gradient indicates that the main focus must be on the poor, this social gradient also demonstrates that entire groups and populations must be included so that appropriate actions are targeted across the whole of the population[87].

The implementation of a combination of strategies are required to promote oral health and sustain it.[82] The previous approach of focusing on clinical preventive and oral health education alone are not effective in achieving optimal long term sustainable oral health[84]. This previous approach is limited and may deepen already existing health inequalities[82, 87, 95]. Those at the top of the socioeconomic ladder enjoy the benefits of better education, more wealth and "have greater control over their lives" and are the only ones to benefit positively from the previous individualistic approach[87]. The conceptual model of the CSDH allows for appropriate interventions to be introduced at any of its levels and therefore have the potential to decrease health inequalities[87, 92].

Oral health prevention and promotion strategies available for implementation must take in to account the evidence base available for these strategies[82, 96]. The evidence – based approach is not limited to prevention strategies alone, but must be applied to all aspects of oral health care and delivery[97]. This approach must encompass an understanding of the oral condition, its impact and its determinants. Monitoring and periodic and

appropriate reassessment of intervention strategies is core to the evidence – based approach. Therefore the usefulness of the various preventive strategies available is assessed and tailored appropriately to meet the needs of the communities and populations at large. It provides a logical way forward in providing appropriate oral and dental care, with the ultimate goal of sustained optimal oral health being more achievable. The responsibility of all oral health personnel, especially those in research, must be acknowledged in order to achieve and sustain optimal oral health for all[97].

South African studies[48, 58] have shown that the level of dental caries increased from the 12 – year – old group to the 15 – year – old group and that the levels of restorative care is low. However, the numbers of children presenting for treatment in the Department of Paediatric and Restorative Dentistry remain low, resulting in clinical students experiencing difficulties with meeting the required quota for treatment procedures.

Patients receiving dental treatment in the Department of Paediatric and Restorative Dentistry at the WDH, may present there for treatment or may have been referred from other departments within the WDH, such as the Department of Orthodontics and also the Oral Hygiene Department. The numbers of children screened in the Department of Orthodontics are high, but only those patients who qualify for treatment within this department will have files opened, resulting in the remainder not been entered in to the WDH record system.

Early Childhood Caries (ECC) has received a lot of attention[21, 23, 59-61]. However, this is not the case with caries in older schoolchildren, who have been shown to suffer the burden of dental caries with increasing levels[48, 58]. This was the reason for deciding to

look at the dental treatment records of the 12 – year – old and 15 – year – old children presenting for treatment in the Department of Paediatric and Restorative Dentistry at the WDH. The audit would provide information about the level of dental caries in these patients, the type of treatment required and also the number of treatment plans completed. This information can be used to improve the levels of student learning in the department and also be beneficial for patients and parents, who will benefit from improved service delivery in the department and the WDH.

CHAPTER 3

METHODOLOGY

3.1 Research aim

The aim of this study was to determine the dental treatment needs and treatment received by 12-year old and 15-year old children who attended the WITS Dental Hospital during the period January 2006 to December 2010.

3.2 Study objectives

The study objectives were as follows:

1. To determine the numbers and socio-demographic profile of the 12 year old and of the 15 year old patients who attended the WITS Dental Hospital during the period of January 2006 to December 2010.
2. To determine the dental treatment needs of the two age groups including caries prevalence and the teeth and tooth surface affected by caries.
3. To determine the dental treatment received during this period.
4. To determine the time taken to complete the treatment needed and the number of patient visits required.
5. To determine the obstacles to completing the prescribed treatment.

3.3 Methods and Materials

3.3.1 Study design :

Retrospective record-based review

3.3.2 Study site :

The location for this study was the Department of Paediatric and Restorative Dentistry at the WITS Dental Hospital (WDH). The WDH is located within the Charlotte Maxeke Johannesburg Academic Hospital in Gauteng, and provides essential curative, preventive and specialist oral health care services to patients of mainly urban locations, largely from the Gauteng Province (with a population of 8.8 million).

3.3.3 Study population :

The study was based on a hospital-based population who came to WDH because they had a problem.The study was based on the retrospective review of dental treatment records of 12-year old and 15-year old children who presented for treatment in the Department of Paediatric and Restorative dentistry during the period 1 January 2006 to 31 December 2010. The study was based on dental treatment records of patients who were treated in the chair and did not include patients treated under general anaesthetic.

3.3.4 Study sample :

The dental treatment records of 12-year old and 15-year old children at the WDH for the period from 1 January 2006 to 31 December 2010 were reviewed. All the dental treatment records of 12-year old and 15-year old patients having presented for treatment in the Department of Paediatric and Restorative Dentistry at the WDH during

this period were included in the study. These patients were treated by dental students supervised by dental staff from the Department of Paediatric and Restorative Dentistry.

Consultation with a statistician at the commencement of this study revealed that a minimum total of *40* (forty) complete records for the 12 – year – old age group and a minimum total of *40* (forty) complete records for the 15 – year - old age would be required to meet the statistical, analytical and reliability requirements. It was for this reason that all the dental treatment records for each of the two age groups were reviewed, so as to maximize the number of the dental treatment records made available for the study. This approach also safeguarded against the possibility of dealing with missing data.

Only those dental treatment records, in which the details of all the required study parameters were fully documented, were selected.

3.3.4.1 Inclusion criteria :

Study period : The dental treatment records of 12-year old and 15-year old patients presenting for treatment in the Department of Paediatric and Restorative Dentistry from the period 1 January 2006 to 31 December 2010 were reviewed.

Age : A 12 year old patient was defined as one from the day of the twelfth birthday up to and including the day before the thirteenth birthday. A 15 year old patient was defined as one from the day of the fifteenth birthday up to and including the day before the sixteenth birthday.

Gender : The dental treatment records of both male and female patients were included.

Treatment plan : The dental treatment record must have a documented treatment plan authorized and signed by the dental student supervisor prior to commencement of treatment.

A total of 143 dental treatment records were retrieved, but only 62% (89) of the records met the specified study requirements – (*39* for 12 yr olds and *50* for 15 yr olds).

3.3.5 Data collection

Data captured for analysis was from the dental records. Data captured was transcribed on to specifically – formulated data capture record sheets (Appendix A). Data capturing was performed solely by the researcher. Confidentiality and standardization was ensured by the researcher being solely responsible for transcription of the data from the dental treatment record to the data capture sheet.

The socio-demographic variables of these patients, pertaining to age, gender and hospital grouping were recorded. The Hospital grouping (or financial classification) is determined by the income of the child's family at the time of presentation for treatment, and forms a guide to the socioeconomic status of the patient (Appendix B).

The dental status of the children was recorded from the dental charting. The DMFT scores were calculated from the dental charting. The mean DMFT was calculated and recorded for each age, gender and hospital group. The treatment needs of each age group was expressed as a percentage by dividing the D (Decayed) of each age group with the mean DMFT of the same group. The DMFS index was recorded to provide information with regard to the specific tooth and tooth surface involvement.

The treatment received by each patient was recorded as were the number of visits required to complete the treatment.

Treatment was recorded as complete if the stipulated treatment plan was completed, as per the dental record. Treatment was recorded as incomplete if the stipulated treatment plan, as per the dental record, was not completed. If the treatment plan was not completed, the notes in the record were documented as the reason for not completing the treatment plan.

3.3.6 Data management and analysis :

The data captured was entered in to a Microsoft Excel spreadsheet for analysis.
The processing and analysis of data was carried out with SPSS for Windows, Version 13. More specifically, Chi – square tables were constructed for comparison of proportional distributions. In addition, where group sample numbers were small or sparse, Exact and Monte Carlo test statistics were calculated to identify significant relationships. A total of only *39* complete dental treatment records for the 12 – year – old – age group were retrieved. This was lower than the required minimum total of *40*, as initially advised by the statistician. Therefore, the Exact and Monte Carlo tests were utilized in order to overcome the reduced sample number and calculate or identify significant relationships. These approaches produce an estimate which is based on the exact distributions of the test statistics, and provide a *p* – value that is more accurate without relying on assumptions that may not be met by the data. This has been demonstrated in Figure 1.

Non-parametric tests were run to test for significant differences. The Mann-Whitney U-Test and Kruskal-Wallis Test were run to test for significant differences between the groups and sub-groups. Differences were regarded as significant at $p<0.05$.

Confidence interval for infinite population

x	90
n	150
α	5.0%
Proportion (P)	60.0%
$Z_{\alpha/2}$	1.960

	Lower	Upper
C.I. for P	52.1%	67.9%
Margin of error	7.9%	

Confidence interval for finite population

N	3 000
x	90
n	150
α	5.0%
Proportion (P)	60.0%
$Z_{\alpha/2}$	1.960
q	0.0390

	Lower	Upper
C.I. for P	52.4%	67.6%
Margin of error	7.6%	

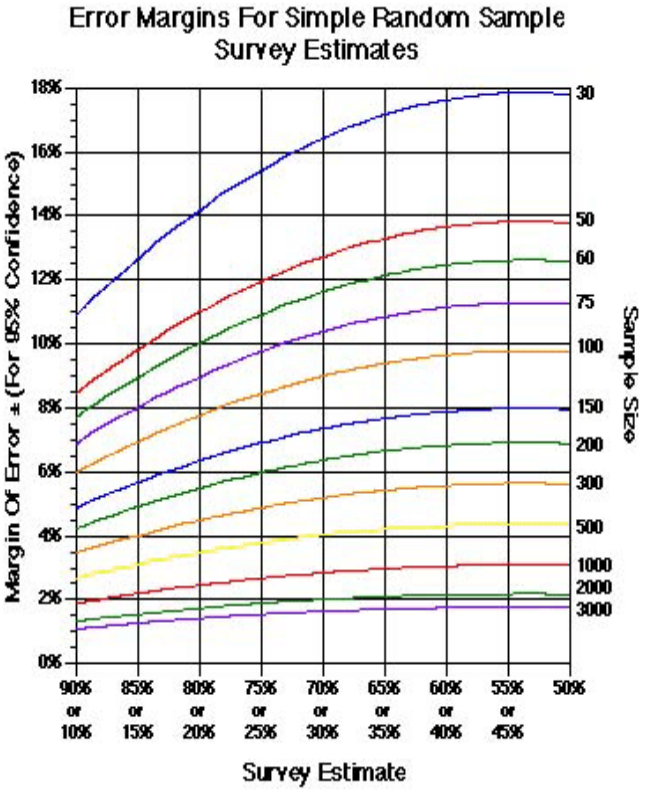


Figure 1: Comparing two sample proportions and margin of error.

3.3.7 Ethical Considerations :

- Written permission was obtained from the CEO of WITS Dental Hospital and Head of the School of Oral Health Sciences, to allow access to the dental treatment records of the study population.
- An application for Ethical clearance and approval was made to the Human Research Ethics Committee: (Medical) of the University of the Witwatersrand, Johannesburg. A clearance certificate was obtained (M10427 – Appendix C).
- The confidentiality of the information obtained from the dental treatment records was maintained by the use of a case-specific numbering code, (exclusive for each patient), when transcribing on to the specifically-formulated data capture sheets.
- Transcription of all data was performed solely by the researcher.

Confidentiality and standardization was ensured by the researcher being solely responsible for transcription of the data from the dental treatment record to the data capture sheet.

CHAPTER 4

RESULTS

A full enumeration of the dental treatment records for 12 – year – old and 15 – year – old children seeking dental treatment in the Department of Paediatric and Restorative Dentistry at the WITS Dental Hospital yielded a total of 143 dental records for the period 1 January 2006 to 31 December 2010. However, because of missing data, 89 dental treatment records were selected for the study. Only 62% of the available records met the requirements of the study.

4.1 Demographic profile per age group and gender :

The 12 – year – old age group made up 43.8% of the study population and the 15 – year – old age group made up the other 56.2%. The gender distribution between the 12 – year – old and 15 – year – old age group was even and a summary of the male : female ratio in the two age groups is shown in Table 1.

Table 1: Male : Female distribution in the two age groups

	Age Group		Total
	12 Year Old	15 Year Old	
Gender: Male n	20	24	44
%	51.3	48.0	49.4
Female n	19	26	45
%	48.7	52.0	50.6
Total n	39	50	89
%	100.0	100.0	100.0

4.2 Demographic profile per Financial group :

The Financial Classification or Hospital Grouping of each patient in both the 12 – year – old and 15 – year – old age groups is summarized in Table 2.

The H1 group represents the highest contribution to the study population followed by the P group (representing those patients either belonging to a Medical Aid Scheme and / or belonging to a household where the monthly income is more than R6001). The H0 group (formally unemployed / receiving a grant) makes up 17.2 % and the H2 group the remaining 4.6 % of the study population. In the 15 year old age group, there is a 50.0% contribution by the H1 group (representing patients where the annual income is less than R36 000.00 and / or where the monthly income is between R0.00 – R3000.00).

Table 2: Financial classification distribution in the two age groups

Hospital Grouping	Age Group		Total
	12 Year Old	15 Year Old	
H0 n	11	4	15
%	28.2	8.3	17.2
H1 n	12	24	36
%	30.8	50.0	41.4
H2 n	2	2	4
%	5.1	4.2	4.6
P n	14	20	32
%	35.9	37.5	36.8
Total n	39	50	89
%	100.0	100.0	100.0

Table 3: The distribution of dental visits in the two age groups, gender and financial groups

12 Year Old							
Gender		Total	Hospital Grouping				Total
Male	Female		H0	H1	H2	P	
3		3	2			1	3
15.0%		7.7%	18.2%			7.1%	7.7%
4	3	7	1	3	1	2	7
20.0%	15.8%	17.9%	9.1%	25.0%	50.0%	14.3%	17.9%
13	16	29	8	9	1	11	29
65.0%	84.2%	74.4%	72.7%	75.0%	50.0%	78.6%	74.4%
20	19	39	11	12	2	14	39
100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

15 Year Old							
Gender		Hospital Grouping					Total
Male	Female	Total	H0	H1	H2	P	
1	2	3		2		1	3
4.2%	7.7%	6.0%		8.3%		5.6%	6.3%
2	4	6		2	1	2	5
8.3%	15.4%	12.0%		8.3%	50.0%	11.1%	10.4%
3	4	7	2	3		2	7
12.5%	15.4%	14.0%	50.0%	12.5%		11.1%	14.6%
12	6	18	2	9		8	19
50.0%	23.1%	36.0%	50.0%	37.5%		44.4%	39.6%
6	10	16		8	1	5	14
25.0%	38.4%	32.0%		33.3%	50.0%	27.8%	29.2%
24	26	50	4	24	2	20	50
100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The frequency and distribution of dental visits by the 12 – year – old and 15 – year – old age groups for the period 1 January 2006 to 31 December 2010 is shown in Table 3. The number of children in the P Hospital group in the 12 – year – old age group for the study period was 35.8% and in the 15 – year – old age group was period 36%. The H1 Hospital group comprised 30.7% in the 12 – year – old age group and 48% in the 15 – year – old age group.

4.3 DMFT Scores :

The dental status of the children was calculated. The mean DMFT index (with standard deviation SD) was expressed and compared across each age group, gender group and hospital group. Non-parametric tests were run to test for significant differences between the two age groups, gender and hospital groups. None of the groups showed significant statistical differences, (all having $p>0.05$). However, clinical differences are still relevant. The DMFT Scores are shown in Table 4.

4.3.1 12 year-old age group

The mean DMFT was 3.0 – 2.5 for females and 3.5 for males. The D component accounted for 76.67% (72% in females and 77% in males). The M (Missing) component of the DMFT accounted for 23.33% and the F (Filled) was nil.

4.3.2 15 year-old age group

The mean DMFT was 3.9 for females and 3.8 for males. The D component of the DMFT accounted for 92.1% in this age group. The D component accounted for 94.8% in females and 86.8% in males. The M component accounted for less than 10%, while the F component was nil.

The mean DMFT score in the 12 – year – old age group, increased from 3.0 to 3.8 in the 15 – year – old age group. The mean DMFT percentage showed an increase of 78% in the 15 – year – old age group .

4.3.3 DMFT per Financial group :

The mean DMFT for the 12 – year – old age group also presented some similarities and some differences within the various hospital groupings. The mean DMFT for the H0 (3.3), H1 (3.5) and H2 (3.0) were similar but showed a decrease in the P Hospital group which was 2.4 in this age group. A similar decrease in the mean DMFT score was seen in the P Hospital group (2.9) in the 15 – year – old age group as compared to the higher mean DMFT scores recorded in the H2 (10.5) and H1 (4.0) Hospital groups, within this age group. The H0 group had a DMFT of 2.0, which is lower than the other 15 year olds. A total of only four patients in this group could explain the reason for this aberration.

Appendix D shows the DMFT data in detail.

Table 4: The dental status, including the DMFT compared across each age group, gender group and Hospital group

	Age Group															
	12 Year Old								15 Year Old							
	Gender		Total	Hospital Grouping				Total	Gender		Hospital Grouping					Total
	Male	Female		H0	H1	H2	P		Male	Female	Total	H0	H1	H2	P	
Decayed (D) Mean	2.7	1.8	2.3	1.7	3.0	3.0	2.0	2.3	3.3	3.7	3.5	1.8	3.5	10.0	2.7	3.3
SD	1.9	2.0	1.9	1.4	2.5	2.8	1.6	1.9	3.7	3.6	3.6	1.7	3.9	1.4	2.8	3.6
Missing (M) Mean	.8	.7	.7	1.5	.5	.0	.4	.7	.5	.2	.4	.3	.5	.5	.2	.4
SD	1.5	1.5	1.5	2.0	1.2	0.	1.1	1.5	1.0	.8	.9	.5	1.2	.7	.6	.9
Filled(F) Mean	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
SD	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
DMFT Index Mean	3.5	2.5	3.0	3.3	3.5	3.0	2.4	3.0	3.8	3.9	3.8	2.0	4.0	10.5	2.9	3.7
SD	2.4	2.9	2.6	3.1	3.2	2.8	1.8	2.6	3.6	3.5	3.5	2.2	3.6	2.1	2.8	3.5
DMFT % Mean	12.3	9.0	10.7	11.7	12.5	10.7	8.4	10.7	13.5	13.9	13.7	7.1	14.3	37.5	10.3	13.2
SD	8.6	10.3	9.4	11.1	11.3	10.1	6.4	9.4	12.7	12.6	12.5	7.7	13.0	7.6	9.9	12.5

Table 5: Results for DMFS index compared across each age group. gender group and Hospital group

	Age Group															
	12 Year Old								15 Year Old							
	Gender		Total	Hospital Grouping				Total	Gender		Hospital Grouping					Total
	Male	Female		H0	H1	H2	P		Male	Female	Total	H0	H1	H2	P	
Surface: Inc Mean	.5	.1	.3	.2	.4	.5	.2	.3	.5	.3	.4	.0	.5	2.0	.2	.4
SD	.7	.2	.6	.4	.8	.7	.4	.6	1.1	.7	.9	.0	.9	1.4	.5	.8
Surface: 0 Mean	2.9	2.9	2.9	3.0	3.0	2.5	2.8	2.9	4.1	4.2	4.1	5.8	4.3	7.0	3.3	4.2
SD	3.7	3.6	3.6	3.5	3.3	2.1	4.3	3.6	4.7	4.3	4.5	6.1	5.0	1.4	4.2	4.7
Surface: M Mean	.7	.0	.4	.3	.6	.0	.3	.4	.8	.7	.8	.0	.6	3.5	.4	.6
SD	1.0	.0	.8	.6	1.1	.0	.6	.8	1.6	1.3	1.5	.0	1.1	2.1	.9	1.1
Surface: D Mean	.3	.1	.2	.2	.2	.5	.1	.2	.8	.4	.6	.0	.2	3.5	.5	.4
SD	.7	.2	.5	.6	.4	.7	.5	.5	1.8	1.1	1.5	.0	.5	2.1	1.2	1.1
Surface: L Mean	.5	.2	.3	.3	.3	1.0	.3	.3	.5	.4	.4	.0	.3	3.0	.5	.4
SD	.8	.5	.7	.6	.7	1.4	.6	.7	1.0	1.2	1.1	.0	.7	2.8	1.2	1.1
Surface: B Mean	.4	.2	.3	.2	.1	.5	.5	.3	.6	.5	.6	.0	.4	4.5	.3	.5
SD	.7	.9	.8	.6	.3	.7	1.2	.8	1.2	1.1	1.2	.0	1.0	.7	.6	1.1
DMFS Index Mean	5.3	3.4	4.3	4.1	4.5	5.0	4.2	4.3	7.4	6.5	6.9	5.8	6.3	23.5	5.3	6.6
SD	4.6	3.7	4.2	4.1	4.5	5.7	4.5	4.2	7.2	7.2	7.1	6.1	6.1	6.4	5.8	6.8
DMFS % Mean	18.8	12.0	15.5	14.6	16.4	17.9	15.1	15.5	26.5	23.2	24.8	20.5	22.6	83.9	18.8	23.6
SD	16.4	13.3	15.2	14.6	16.0	20.2	16.0	15.2	25.9	25.6	25.5	21.7	21.7	22.7	20.9	24.4

4.4 DMFS Scores :

The mean DMFS index was also calculated to yield information pertaining to the caries patterns, including specific tooth and tooth surface involvement by caries. Results of these have been summarized in Table 5. The findings reveal an increase of 62% in the mean DMFS index in the 15 – year – old age group (6.9), as compared to the 12 – year – old age group (4.3), and also a similar increase of 62.5% in the mean DMFS percentage in the 15 – year – old age group (24.8) and (15.5) in the 12 – year – old age group. The mean DMFS index in the male 12 – year – old age group (5.3) was higher than the mean DMFS index in the female population of the same age group (3.4). A similar result was found to be true in the Mean DMFS index for the male 15 – year –

old age group (7.4), and the Mean DMFS index for the female population of this age group was lower at (6.5), although markedly higher than its female counterparts in the 12 – year – old age group (3.4).

The H2 Hospital group representing patients of an annual income of between R36 000 and R72 000 yielded a high contribution to the mean DMFS index of both the 12 – year – old and 15 – year - old age groups.

The occlusal component (contribution) to the mean DMFS index was dominant in both the 12 – year – old and 15 – year – old age groups. The same was found when compared between the H0, H1, H2 and P hospital groups. A significant increase of 70% was found in the occlusal component or contribution to the mean DMFS in the 15 – year – old age group (4.1) as compared to the occlusal component / contribution to the mean DMFS in the 12 – year – old age group (2.9).

The contribution to the mean DMFS index by the other tooth surfaces was low when compared to the occlusal component contribution. The above result was the same in both age groups, for both male and female and also across all the Hospital groups. The contribution of the occlusal, incisal, mesial, distal, lingual and buccal tooth surfaces to the mean DMFS index in the H2 Hospital Group was significant, and the same was seen in both age groups and between both male and female patients in both age groups. There was a higher involvement of caries in the above tooth surfaces, in this H2 Hospital Group.

Appendix E shows the DMFS data in detail.

4.5 Treatment Received :

The results of the treatment received are summarized for both age groups, gender groups and across all the Hospital groups in Table 6.

Table 6: Results indicating treatment received

	n	%
Preventative Rx	27	29.0
Extraction	23	24.7
Class I	15	16.1
Pulpal Treatment	12	12.9
Class II	6	6.5
Class IV	3	3.2
Preventive Resin Restoration	2	2.2
Class III	2	2.2
Class V	2	2.2
Other forms of Restorative Rx	1	1.1
Total	**93**	**100.0**

The Preventive treatment, (including scaling and polishing, topical fluoride treatment, and placement of fissure sealants), ranked higher (29.0%) than the other forms of treatment, these including Extraction (24.7%), Class I Restorations (16.1%), pulpal treatment (12.9%), Class II Restorations (6.5%), Class IV Restorations (3.2 %), Preventive Resin Restorations (2.2%), Class III Restorations (2.2 %) and Class V Restorations (2.2 %).

Appendix F has details for treatment received across the two age groups, gender groups and financial classification.

4.6 Completed Treatment Plans :

The results for the percentage of patients who had all treatment completed as per the dental record treatment plan, was low in both age groups, gender groups and across all Hospital groups. These results are shown in Table 7.

Table 7: Treatment completion rates

Treatment Completion	Age Group												
	12 Year Old								15 Year Old				
	Gender		Hospital Grouping				Gender		Hospital Grouping				
	Male	Female	H0	H1	H2	P	Male	Female	Total	H0	H1	H2	P
Completed: Mean	2.1	1.7	2.1	2.3	.0	1.6	2.4	2.1	2.3	.5	2.4	4.0	1.6
Not Complete: Mean	1.4	2.3	1.7	1.8	3.0	1.7	2.4	2.8	2.6	6.0	2.8	6.0	2.1
All Teeth: Mean	3.4	3.9	3.8	4.0	3.0	3.4	4.8	5.0	4.9	6.5	5.2	10.0	3.7
% Complete: Mean	37.5	36.0	32.1	52.7	.0	32.1	31.9	34.8	33.4	4.5	26.5	44.4	38.1

36.8% of patients in the 12 – year – old age group, were recorded as having had their treatment completed, with a similar result ratio for both male (37.5%), female (36%) in this age group. Patients in the H1 Hospital group category yielded a 52.7% completion of treatment, while the patients in the P Hospital group yielded a 32.1% completion of treatment.

33.4% of patients in the 15 – year – old age group, were recorded as having had their treatment completed with the male population showing a percentage of 31.9%, as compared to 34.8% of females in this age group, who had treatment completed. In the 15 – year – old age group, more treatment plans were completed in the H2 Hospital

group (44.4%), and the P Hospital group (38.1%). This was in contrast to the other hospital groups, where H0 showed a 4.5% and H1 a 26.5% completion of treatment.

Table 8: Number of dental visits

Number of visits:	**n**	**%**
<2	47	50.5
2 – 4	34	36.6
5 – 7	5	5.4
Not specified	7	7.5
Total	93	100.0

Table 9: Number of dental visits by age, gender and Hospital groups

Number Of Visits	**Age Group**												
	12 Year Old								**15 Year Old**				
	Gender		**Hospital Grouping**				**Gender**		**Hospital Grouping**				
	Male	**Female**	**H0**	**H1**	**H2**	**P**	**Male**	**Female**	**Total**	**H0**	**H1**	**H2**	**P**
1 n	9	11	5	7	1	7	12	14	26	2	11	1	11
%	45.0	57.9	45.5	58.3	50.0	50.0	50.0	53.8	52.0	50.0	45.8	50.0	61.1
2 – 4 n	7	6	4	4		5	10	9	19	1	10	1	6
%	35.0	31.6	36.4	33.3		35.7	41.7	34.6	38.0	25.0	41.7	50.0	33.3
5 – 7 n	2			1		1	1	1	2	1	1		
%	10.0			8.3		7.1	4.2	3.8	4.0	25.0	4.2		
Not Specified n	2	2	2		1	1	1	2	3		2		1
%	10.0	10.5	18.2		50.0	7.1	4.2	7.7	6.0		8.3		5.6
Total n	20	19	11	12	2	14	24	36	50	4	24	2	18
%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

4.7 Number of Patient visits :

Tables 8 and 9 illustrate the results for the number of visits attended by patients and the results are compared between the 12 – year – and – 15 year – old age groups, both gender groups, and across all the Hospital groups. Results indicated a high response for visits between 1 and 4 in number, with 1 visit having the highest response at 50.5% and 2 – 4 visits at 36.6%. A low 5.4% was seen with number of visits exceeding 4 visits (i.e. in the 5 – 7 visit categories).

4.8 Obstacles to completing prescribed treatment :

Notes were recorded in the dental treatment records when patients failed to keep their dental appointments. Reasons listed for non-attendance or failure to complete the treatment were:

- The symptoms or pain was gone.
- The time of the dental appointment was not convenient.

CHAPTER 5

DISCUSSION

This audit was based on the retrospective review of dental treatment records of 12-year-old and 15-year-old children presenting for treatment in the Department of Paediatric and Restorative Dentistry at Wits Dental Hospital (WDH) during a five year period from January 2006 to December 2010. These children were treated in the chair and did not include the children treated under general anaesthetic. This audit was the first to be conducted in this department at WDH and provided information on the demographic profiles, treatment needs, treatment plans and treatment completed for these children in the two index age groups.

Demographic profile of patients per age group, gender and financial group

The WDH provides oral health care services to patients of mainly the surrounding urban locations, largely from the Gauteng province. There was a higher attendance by the 15-year-old age group (56.2%) than by the 12-year-old age group (43.8%) with an even gender distribution between the two age groups. The period of adolescence is often accompanied by an increased awareness of physical appearance by these individuals, who then often seek out options available to enhance their physical attractiveness[4, 5]. Some of the patients presenting for treatment at the Department of Paediatric and Restorative Dentistry were referred from other departments like the Department of Orthodontics, where these adolescent patients may have presented first as a result of their aesthetic concerns. The overall number of patients presenting for

treatment in the Department of Paediatric and Restorative Dentistry is low, even though high numbers of children are screened for suitability for undergraduate and postgraduate orthodontic treatment. However, only those children qualifying for the orthodontic treatment will have files opened and the rest do not enter the WDH system. Results from the study indicate that the H1 hospital group contributed the highest to the study sample (41.4%), followed by the P hospital group (36.8%). There was a low contribution by the H0 group (17.2%), which represents those patients coming from households where the wage earner is unemployed. The smallest contribution to the study sample came from the H2 hospital group (4.6%), who represent patients whose family's annual income is between R 50 000 to R 100 000.

DMFT scores of patients per age group, gender and financial group

It has been reported that more than ninety percent of the South African population are affected by oral disease, especially dental caries[48] and that more than seventy percent of dental caries in 6, 12 and 15-year-old children go untreated[58]. Dental caries is the most prevalent oral disease and is an oral health problem among schoolchildren worldwide[21, 97]. According to data obtained from the three National Oral health surveys conducted in South Africa (1982, 1988 / 89, 1999 / 2002) and published by van Wyk et al[58], there was a significant reduction in the dental caries severity in both the 12-year-old and 15-year-old age groups. The DMFT in 12 - year olds decreasing from 2.5 in 1982 – 83, to 1.73 in 1988 - 89 to 1.17 in 1999 - 2002). The data further showed the DMFT in 15 - year old children decreasing from 3.23 in 1988 – 89 to 2.35 in 1999 - 2002. These results reflect the dental caries distribution in four regions within only four of the South African provinces, namely : Metro Cape in the Western Cape, Port Elizabeth in the Eastern Cape, Durban in Kwa-Zulu Natal and Bloemfontein in the Free State Province.

The results of this study indicate an increase in the dental caries severity with the mean DMFT of 3.0 in the 12 – year - old age group and 3.8 in the 15 – year - old age group. However, the DMFT of 3.0 in the 12 – year - old age group falls in line with the Oral Health Goals as set out in 1981 by the WHO and the FDI World Dental Federation, as targets to be achieved by the year 2000[52].

This increase in the DMFT in the 15 – year – old age group (DMFT = 3.8) when compared to the 12 – year – old age group (DMFT = 3.0), is consistent with other studies in South Africa[48, 58], as well as studies in developed countries[71, 98]. Results from a study by Bajomo *et al* [48], conducted in Venda in the Northern Province of South Africa revealed a two-fold increase in dental caries prevalence from the 12 year-old to the 15 year old age groups[48]. Furthermore, the results published by van Wyk *et al* [58] as obtained from the three National Oral Health surveys, also indicate a rise in DMFT scores from the 12- year-old age group to the 15-year-old age group[58].

Dental caries experience has been shown to increase during adolescence[58, 71]. This increase has been attributed to the eruption of permanent second molars, into an oral environment subjected to unbalanced meals, recurrent snacking and poor access for oral hygiene. The immature enamel of these newly-erupted second molars is adversely affected by the increased exposure to cariogenic factors[77, 78].

This study also revealed that the D (Decayed) component of the mean DMFT was large in both the 12 – year – old and 15 – year – old age group: accounting for over 70% in the 12 – year – old age group and over 90% in the 15 – year – old age group. This high DT component of the DMFT indicates a large amount of untreated caries. The above results are consistent with other South African studies [48, 58] including studies from other African[64, 99] countries and developing countries[100].

The low and insignificant contribution of the MT (Missing) and FT (Filled) component to the DMFT score is also well demonstrated in this study.

The high DT contribution to the overall DMFT score is evidence that most carious lesions are left untreated, a finding similar to other African and South African studies[48, 62]. These studies highlight that poor access to acceptable dental care, especially at government hospitals, combined with the increased cost of dental treatment at private dental facilities have contributed to poor dental health. Low levels of filled teeth and restorative care (FT) have also been found in a similar South African study[48]. Dental caries is left to progress and extend beyond the dentine, so that prevention is not possible, leaving restoration or extraction as the only treatment option.

The DMFT in the 12 – year – old age group, revealed differences in the gender distribution, with the DMFT in males being higher than females. This is in contrast to results from other African studies[78] , which showed the caries experience to be higher among females than males[64].

The DMFT in the 15-year-old age group revealed no differences in gender distribution. However, results from this study revealed that the DT component accounted for 95% of the DMFT score in the female group of the 15-year-old age group. This could be explained by the earlier eruption of teeth in females, resulting in the teeth being exposed earlier to cariogenic factors.[78]

This study revealed that the caries experience (DMFT) was consistently higher among the children of both age groups from a lower socio-economic background, as compared to the decrease in caries experience among children from a higher socio – economic background. Patients categorized into the P Hospital group, had a mean DMFT of 2.4 (12 – year - old age group) and 2.9 (15 - year – old age group). This P Hospital group

category represents patients where the annual income is R72 000 and more or has Medical Aid. Numerous studies have shown those patients who are more affluent or from higher socio – economic backgrounds have better access to education, have more money to buy healthier foods, have better access to fluoridated toothpastes and other products which promote optimal oral health. These patients also enjoy access to more frequent professional dental services and so have better oral health[58, 101].

By contrast, the DMFT in both the 12 – year – old and 15 – year – old age groups was higher among patients categorized in the H0, H1 and H2 Hospital groups, representing lower socio – economic backgrounds. "Children of poverty"[63] have always presented challenges to the dental profession, which include increased dental caries experience and poor access to professional dental services. By implication, low socio – economic status may predict low levels of knowledge about suitable diet, optimal oral hygiene, home care practices and prevention techniques. Consequently these children lack the opportunity to have early preventive treatment alternatives and very often invasive dental treatment, like extraction, is the only remaining option for children who come from low socio-economic backgrounds.

Socioeconomic levels and educational backgrounds have long been identified as important determinants of oral health and oral health behaviour[6, 102]. Increased levels of dental caries in children and adolescents have been associated with low educational levels of parents and also with low socio-economic status. Studies in developed and developing countries have indicated that the levels of parental education have profound effects on the level of dental caries and oral hygiene in children[37, 38]. Furthermore, the association between increased sugar consumption, low socioeconomic and maternal education levels is also well documented[21, 37]. Plaque removal and oral hygiene

practices like tooth brushing, have also been found to be poor in children from low income families. Disadvantaged children start tooth brushing later, and also have their first dental visit later than their advantaged peers[21]. Children whose parents have a higher educational level and socioeconomic status, attend dental health care facilities more often and also report a higher level of treated dental cavities[37].

The high DT contribution to the DMFT scores in this study, combined with the low MT and FT contributions, indicate high levels of untreated carious teeth and unmet treatment needs. Parents of children tend to seek dental treatment for their children when there is disruption to their normal daily functions like eating, speaking, sleeping[103]. The main focus of these dental visits is for symptomatic relief rather than for preventive or early intervention. Very often caries is left untreated, leaving extraction as the only treatment alternative. Child and parent education in oral health promotion and disease prevention need to emphasize the importance of early attendance at dental health care facilities to maintain optimal oral health. However, failure to recognize and rectify the true causes of health inequities, namely the socio-political, economic, structural and intermediary determinants such as living and working conditions, as well as access to health care services, will only deepen existing inequalities in health and widen the gap between the high and low socio-economic groups of a population[87, 92, 93]. Focus must be maintained primarily on these upstream drivers in order to reduce and eradicate these health inequalities prevalent among the high and low income groups of society [86, 87, 92, 93].

DMFS Scores

There is a high occlusal surface contribution to the DMFS score. This indicates high levels of occlusal caries. This is consistent with other studies which indicate that the molar teeth are more commonly affected by caries[48, 104, 105]. However, the sample size was too small to validate these findings.

The predominance of occlusal caries compared to proximal and the other tooth surfaces was evident in this study. This finding is consistent with other studies, which have demonstrated that the carious involvement of the proximal surfaces of teeth in children and adolescents is low. This is because the exposure of these tooth surfaces to caries promoting factors is limited and caries progression is delayed[38].

The basic morphology and anatomy of molar teeth, with their pit and fissure system provides a protective niche for, and enhances the retention of, cariogenic food particles and plaque, thereby making them more susceptible to caries attack. The progression of dental caries within this "protected" pit and fissure system can be rapid, due to the fact that the depth of the fissure is very often closely approximated to the DEJ (Dentino - Enamel Junction), and consequently the dentine, which is more susceptible than enamel to caries attack and progression[106]. This would explain the reason for the rapid progression of pit and fissure caries once it reaches dentine, as opposed to smooth surface carious lesions whose path to dentine is still obstructed by a more substantial enamel layer. The prevention and treatment of pit and fissure caries and that of smooth surface carious lesions therefore differ, due to the fact that the caries' histopathologic involvement and progression is different. The application of fluoride in its variety of forms (systemic and / or topical), improvement of oral hygiene practices and plaque removal together with reduced sugar intake are usually sufficient in combating smooth

surface lesions, as long as the surface layer remains intact, allowing for remineralization of previously demineralized areas to occur. However, the control of pit and fissure caries is more efficiently achieved by the application or placement of pit and fissure sealants as well as preventive resin restorations (PRR)[106]. The high number of occlusal lesions in this patient group demonstrates the need for preventive dental procedures such as fissure sealants and PRR's.

The choice of restorative dental materials is also important. Fluoride – releasing fissure sealants and glass – ionomer – based materials will have the added benefit of providing a fluoride reservoir, capable of leaching fluoride into the local environment, and decreases caries activity and protects against new caries lesions. The contribution of fluoride to the reduction in global dental caries prevalence is universally accepted[106]. Fluoride increases the resistance of the host tooth surface structure to demineralization and further promotes remineralization. The replacement of the hydroxyapatite by flourapatite structure further improves the host surface structure and defence against decay. Fluoride also decreases the cariogenic potential of dental plaque.[106]

The WHO – endorsed minimally invasive dental techniques such as ART (Atraumatic Restorative Technique) has also contributed to the control of caries in developing countries[107, 108] where dental manpower, equipment and technology are limited. ART has also been recommended in South Africa[43]. This technique provides an easy interim solution to curb the progression of dental caries until a permanent restoration can be placed. This technique is relatively quick, requires minimal equipment and is painless. The glass ionomer based restorations have the added benefit of releasing fluoride into the local environment with the effect of increasing the host tooth surface structure and resistance to dental caries.

Numerous studies have shown the exposure to fluoride reduces the levels of smooth surface carious lesions much more than that of occlusal caries[71]. Consequently the combination of fluoride therapy (water fluoridation, exposure to therapeutic fluoride agents, fluoride – containing toothpastes) together with placement of occlusal sealants can be used to protect all surfaces of the teeth. However, municipal water supplies are not fluoridated, so access to fluoride is for those who can afford, or have access to fluoridated toothpastes, fluoride supplements and rinses.

Treatment Received

The type of treatment received by both 12 – year and 15 – year – old age groups, across both gender groups and across all Hospital groups, indicate that preventive treatment (29%) - (including scaling and polishing, topical fluoride treatment, and placement of fissure sealants) - is only slightly higher than treatment by extraction (24.7%) of all treatment. The high DT component in both the 12-year-old and 15-year-old age groups, combined with the low FT component indicates large amounts of untreated carious teeth and low levels of restorative dental care. In the study by van Wyk *et al* 2010, the termination of school – based dental services and the replacement of these dental services by community – based clinics, was regarded as a possible explanation for the increase in untreated caries in the 12 – and 15 – year old age groups.[58]

Countries such as the United States and New Zealand have well known and established school – based oral health preventive programmes, where "high risk" individuals in the 6 – 7 year old age groups and 12 – 13 year old age groups are granted the opportunity to receive preventive sealant restorations, timeously placed to coincide with the

eruption of the first and second molar teeth. The appropriate tailoring of preventive oral health care programmes such as these has contributed to the reduction in the dental caries prevalence in these and other developed countries[109, 110].

Children from low socioeconomic backgrounds have an increased risk of developing caries[86, 87]. Studies investigating the cost effectiveness of occlusal sealants revealed that the placement of sealants on "eligible" molars is the most "cost-effective prevention strategy" for children from low-income families[111, 112]. Results from other studies investigating the advantages of occlusal sealant placement revealed that sealants are effective in preventing pit and fissure caries in children and adolescents and also decrease the percentage of noncavitated carious lesions progressing to cavitated carious lesions in children, adolescents and young adults[113, 114]. Pit and fissure sealants also lower bacteria levels in cavitated carious lesions in children, adolescents and young adults[115]. There is a reduction in the need for the restoration of occlusal surfaces with placement of occlusal sealants during late adolescence and early adulthood[116]. Furthermore, research evidence indicates that the potential caries risk for teeth in which part or all of a sealant has been lost does not exceed the potential caries risk for teeth that was not sealed[117]. Therefore, children who are lost to follow-up school programmes will benefit from sealant placements as well[113].

Completed treatment plans

This clinical audit showed that only 36.8% of patients in the 12 – year – old age group had their dental treatment completed, and only 33.4% in the 15 – year – old age group had their treatment plans completed. This result was evident in both gender groups and

across all the Hospital groups. On average the P hospital group was recorded as having the highest number of completed treatment plans. These patients whose parents have a higher socioeconomic status and by implication higher levels of education, are in a better position to benefit from this increased awareness and knowledge for maintaining optimal oral health[58, 86, 87, 101]. In the 15-year-old age group, the H0 and H1 hospital groups were recorded as having the lowest percentage of completed treatment plans. These hospital groups represent patients who have a lower socioeconomic status. These socially-disadvantaged groups are exposed to low levels of education and possess inadequate knowledge about maintaining optimal oral health and often experience higher levels of dental caries[37, 38, 63, 86, 87]. Frequently, other socio-economic factors drive this behaviour, such as fear of taking time off work, cost of transport to facility etc. Even if they are aware of the consequences of dental disease for their child, they do not have the resources to follow through treatment to completion.

Number of patient visits

Results from the number of appointments taken to complete the treatment plans indicate that patients' response was higher when appointment numbers were kept low. Therefore, when drafting the required treatment plan, the number of dental appointments should be kept to a minimum, to ensure optimal patient attendance and completion of treatment.

If time constraints exist and multiple visits are a problem, the option of the ART may also be considered. These may be placed as an interim solution on multiple teeth, to curb caries progression and reduce bacterial niches. The fluoride – releasing properties of these materials will be beneficial, until a permanent restoration can be placed at a

more appropriate time[107, 108]. This should also be followed up by education reinforcement that the absence of pain is not cure, but that treatment must be completed in order to prevent recurrence. Also, parents and caregivers must be advised that the time and costs of treating caries at a later stage will be greater than if caries is removed early.

Obstacles to completing prescribed treatment

Notes were recorded in the dental treatment records of patients who failed to keep their dental appointments or could not complete their prescribed treatment plans. These records indicate that the majority of patients and their parents reported that absence of pain or other symptoms and inconvenient times of dental appointments were the main reasons for missing dental appointments.

The utilization of dental services by patients remains centred around a problem-oriented dental care approach. Patients seek dental care when there is a disruption to their normal / daily activities, like eating, speaking, sleeping etc. Very often the clinical symptoms associated with oral disease may not be sufficiently severe to prompt seeking early dental care[103].

Research indicates that pain is the single most important driving force for patients and parents to seek dental treatment[37, 103]. Very often children or their parents seek dental treatment for symptomatic relief, rather than for early diagnosis and prevention. Therefore, the low utilization of dental services can also be attributed to the lack of dental awareness, or lack of knowledge with regard to maintaining optimal oral health. Patients and parents need to be made aware that the absence of pain does not equal the

absence of a dental problem. It is therefore important to attend professional dental care facilities to benefit from services and information provided at these facilities about maintaining optimal oral health[103].

The majority of patients in this audit sample were classified as belonging to the H1 hospital group. These patients are from lower socioeconomic backgrounds, and studies have indicated that this is associated with increased dental caries experience, poor access to professional dental services, low levels of education, low levels of knowledge about appropriate diet, poor oral hygiene home care practices and prevention techniques[21, 37, 38, 63]. Less emphasis is placed on oral health care, as most of these patient's earnings are often committed to essential living expenses. In addition, additional transport costs, time off from work and school may influence patients and their parents' decision to cancel or avoid dental appointments[21].

Factors like low levels of perceived need for dental care, financial constraints, "negative beliefs about dentists", lack of adequate knowledge, parental and cultural belief systems and values concerning oral health and its importance, reduced accessibility to oral health care services and facilities and the extent to which the required dental treatment is available are core determinants for maintaining optimal oral health in an individual[102]. Research also shows that high levels of untreated carious lesions are associated with reduced accessibility and shortage of adequate dental facilities and staffing especially at government hospitals[62]. Reduced accessibility to adequate dental treatment at government hospitals, long waiting lists, compounded by increased cost of dental treatment at private dental facilities, very often results in patients only seeking dental treatment when they have a problem, thereby reducing the chances for early and preventive intervention strategies, leaving more invasive and

surgical approaches as the only alternative[118]. In addition, studies also indicate that high levels of untreated dental caries have been associated with high levels of dental fear and anxiety[6]. Therefore, improving knowledge about factors influencing the utilization of dental care services, by implication, will result in the improvement of oral health and oral health care behaviour[6, 102, 103, 118].

There is a need to improve the oral health of schoolchildren. A child forms part of a family, and families form communities. The oral health of children is dynamic and is dependent upon their environment, including the home, school and community environments. It is important that supportive structures be created and maintained for children within these micro-environments in order to affect positive oral and overall health changes[24, 86, 120-122].

Childhood caries or past dental caries experience is a strong indicator for dental caries developing in the future [80, 119, 123]. Therefore there is a need to identify children who have active dental caries and who are at risk of developing dental caries, so that appropriate intervention and prevention strategies are implemented. Focusing on preschool children and their parents are important when considering measures for reducing dental caries in older schoolchildren and adolescents. Research shows that the younger a child is when receiving oral health education, the less likely the chances of this information reaching the parent [83]. The importance of parental involvement cannot be overemphasized as the children's dependence on parents for financial, emotional and physical support are important determinants of oral health behaviour in children[118, 119, 124, 125]. Decisions about food choices, using fluoridated toothpaste when brushing and making appointments for dental visits are decisions controlled by the parents [122, 124, 125]. The oral health status of children from early childhood to mid-teenage years is a

reflection of the environment in which they live[119]. The dental habits and oral health attitudes of parents, especially the mother, are transferred to their children and are important determinants of children's oral health and oral health behaviour[119]. Alm *et al*[119] found a low prevalence of dental caries in adolescence with the establishment of good oral health habits, like low sugar intake during early preschool years. It is therefore important that parents of young children be targeted and educated about the importance of reducing sugar frequency intake and establishing daily tooth brushing routines and using fluoridated toothpastes. This highlights the need for oral health care teams and policy-makers to provide optimal and adequate oral health care promotion and prevention models for parents and caregivers (including public healthcare workers), at pre-school and primary school levels, so as to enable / empower them to adopt and implement effective oral health preventive strategies for their children. Oral health care education must include information on the importance of reducing sugar consumption and its frequency in their diets, information on good oral hygiene practises, the use of fluoridated toothpastes and also the importance of attending dental health care facilities (even in the absence of clinical symptoms) as early attendance at dental care facilities will provide an opportunity for children and parents to obtain care and advice from oral health care professionals. However, the latter describe strategies focussing on the downstream drivers affecting health inequalities. The primary focus however should be on the upstream drivers which are the true causes of health inequities in societies [86, 87, 92, 93]. Educational policies focussing on individual behavioural modification are relatively ineffective without addressing issues which will serve to uplift an individual and his or her environment.

Schoolchildren experience transference of this parental dependence as they get older[124]. Social pressures in schools and their community environments also impact on

these children's oral health choices[124]. Oral health education in schools is undermined by school tuck shops and cafeterias selling sweets and fizzy cold-drinks. Therefore school policies must be amended to support the oral health education delivered to children in schools, thereby maximizing the impact of healthy oral health choices[124].

It is obvious that a combination of approaches implemented at multiple levels is required for different individuals, communities and populations[82]. The proper evidence-base for oral health prevention strategies is required to ensure that outdated and ineffective programmes are not reintroduced [82, 96]. Appropriate and periodic assessment of these strategies is core to a reliable evidence-base system. Individuals are influenced by people around them and by their environments[119]. Therefore, local and national policies must integrate this to affect sustained optimal oral health for all.

More modern and realistic strategies are required for the creation and maintenance of optimal oral health. Research has shown that applying the biomedical model of disease as a means for prevention and oral health education is limited to focusing on individual behavioural modification and its results are short term. This individualistic and behavioural approach alone is ineffective in providing sustained long term optimal oral health [82-84]. This clinical preventive approach and the focus on oral health education alone are limited and impractical when applied to population-based oral health preventive strategies.

The oral cavity cannot be separated from the rest of the body. Likewise, the treatment of oral disease cannot be separated from the treatment of the rest of the body[82, 86-89] . The Common Risk Factor Approach (CRFA) endorsed globally by policy planners have acknowledged that the integrated approach to the prevention of chronic diseases, is key to reducing the prevalence of common chronic non-communicable diseases[82, 90-

[92]. This CRFA has allowed for oral health prevention programmes to be integrated with other health promotion and preventive strategies.

The CRFA also incorporates the fact that the true causes of disease have deep rooted socio-political, structural and environmental causes[85, 86, 92]. These are the real causes for health inequalities which exist between countries, and within countries[85-87]. Many countries, including SouthAfrica, experience these health inequalities and their effects because of the different socioeconomic strata. Countries with high income, middle income and low income demonstrate differences in disease prevalence between the high and low socioeconomic groups in populations and communities[87]. A social gradient exists with regard to health inequalities. The poor or socially-disadvantaged groups of societies experience a greater burden of disease, compared to those who come from higher socioeconomic backgrounds and enjoy better oral and overall health and benefit from better access to education and access to better health care [87, 92, 94].

This social gradient has a stepwise relation to health inequalities and disease[87]. Therefore, although focus should be on low socioeconomic groups of a population, attention is required across the whole population, including the entire socioeconomic strata, to facilitate the implementation of appropriate oral health promotion and preventive strategies, including appropriate allocation of health resources. Furthermore, studies have also shown that focusing on oral health education alone, without tackling the problem of poverty and its consequences, may serve to deepen the health inequalities, as the children in need of improved oral health, do not receive adequate levels of education because of their poor socio-economic background [87, 92, 94].

The burden of dental caries in the South African population is high[48] and a significant amount of dental caries in South African schoolchildren go untreated[58]. This does not

correlate with the low numbers of children presenting for treatment in the Department of Paediatric and Restorative Dentistry at the WDH, as it is known that caries levels are high and that most schoolchildren have high levels of untreated caries, especially on the occlusal surfaces of teeth[58].

The treatment provided to the two age groups in this audit sample was preventive in only 29%, but 24.7% of treatment was extraction. Furthermore, only 36% of patients, at best, completed the prescribed treatment. It was noted that patients with fewer appointments were more likely to complete their prescribed treatment. This information may be used as a method for improving teaching and service delivery within the Department and the WDH. Students and supervisors should be advised about the benefits of placing fluoride-based occlusal fissure sealants and PRR's in reducing caries activity. By educating students and supervisors about the high numbers of patients who fail to complete their prescribed treatment, and also about the consequences of too many dental appointments, strategies like allowing the more senior clinical students to treat patients who have more complex treatment needs, so as reduce the number of required dental appointments may be a start to improving patient attendance and compliance.

Limitations of the study :

There are limitations when interpreting the data in this study. Firstly, the study sample was biased as the study is based on a hospital-based study population. These patients specifically came to Wits Dental Hospital because they had a problem. Although the results cannot be interpreted as being representative for the Gauteng province, they will provide information about the oral health issues pertaining to the 12-year-old and15-

year-old patients who presented for treatment at the Wits Dental Hospital. Secondly, the study sample was small, even though a full enumeration of treatment records for the two age groups over the five year period was conducted. A total of 143 treatment records were retrieved for these two age groups. Missing records and missing data resulted in only 62% of these treatment records being eligible for use in this study. The current location of the WDH within the Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) presents with some logistical and infrastructure problems. Accessing patient dental treatment records presented several challenges as the actual clinical or patient treatment centre of the WDH is located in a different section of the CMJAH to that of the administrative and accounts departments. It was common for patient treatment records to be misplaced and even lost during its course between the clinical and administrative departments. Although duplicate files were made to substitute the missing files, these treatment records frequently had missing data. As there is insufficient storage facilities for patient treatment records, these files are sent to another location, situated in another building in another suburb, for archive purposes. The files are archived every three years. There is no computerized system for these treatment records, so retrieval of specific dental treatment records was very difficult once it was placed in archives. The problem of multiple operators and multiple chartings for a patient compounded the problem of inter-operator variability.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

Despite advancements in the prevention and treatment of caries, there is still an increase in dental caries experience. Evidence from the literature and the present study indicate increased dental caries in the low socio-economic groups of the population[39, 48, 58, 63-67]. There is also an increase in dental caries from the 12 – year – old age group to the 15 – year – old age group. The high levels of untreated caries and unrestored teeth indicate a great need for dental services.

Targeting individual behaviour has limited effectiveness when the aim is to create and maintain sustained long term optimal oral health. Oral health promotion and preventive strategies aimed at positively changing and uplifting an individual's environment and circumstances will have better success at establishing sustained long term results. The social condition of an individual and of societies have a greater impact on effecting long term sustained optimal oral health [84-87].

The conceptual framework of the CRFA incorporates the "true" causes of health inequalities in societies [90, 92]. This approach aims at identifying and addressing the determinants of health, with the vision of implementing various preventive and health promotion strategies at the various levels. Focusing on the true "upstream" drivers of health inequalities, such as the socio-political, structural, environmental and intermediary determinants (like education, housing, employment, neighbourhoods) are crucial, as these influence the environment of communities and individuals directly and indirectly [85, 86, 92, 93, 119]. Shifting focus to "downstream" drivers of health inequalities,

is required only as a means to augment specific health and oral health prevention strategies.

It is clear that a unidimensional approach is not the solution [82, 96]. It is imperative that the proper evidence-base for effective prevention of dental caries be incorporated when oral health policy planning takes place.

The following recommendations may be considered during the treatment planning involving adolescent patient groups at the WDH, based on the clinical audit of the two index age groups of patients who presented for treatment in the Department of Paediatric and Restorative Dentistry:

- Students and supervisors should be advised about increased levels in treatment completion rates associated with a reduced number of dental appointments.
- Patients with more complex treatment needs should be allocated to the senior clinical students for treatment, so as to maximize work in the time allowed. If permitted, junior clinical students should work in pairs to improve efficiency and maximize work in the allocated time.
- Increased co-operation between the Paediatric and Orthodontic Departments may widen the patient pool.

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APPENDIX A: Data Capture Sheets 1 - 5

DEPARTMENT OF PAEDIATRIC AND RESTORATIVE DENTISTRY
SCHOOL OF ORAL HEALTH SCIENCES
FACULTY OF HEALTH SCIENCES
UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

A Clinical Audit: Dental Treatment Needs and Treatment Received by 12 and 15 year old children who attended the WITS Dental Hospital during the period: January 2006 to December 2010.

DATA CAPTURE SHEET

Patient Case number :
_____

Date of First examination :
_____

Age group :

12 – year old 1	15 – year old 2

Gender :

Male 1	Female 2

Hospital Grouping : H0 H1 H2 H3 P

Tooth examination										
DMFT Index					Treatment		Treatment			
Tooth		Decayed **(D)**	Missing **(M)**	Filled **(F)**	Complete	Not Complete	Prev.RX	Rest. RX	Pulpal Rx	Extr.
First quadrant	11									
	12									
	13									
	14									
	15									
	16									
	17									
Second quadrant	21									
	22									
	23									
	24									
	25									
	26									
	27									
Third quadrant	31									
	32									
	33									
	34									
	35									
	36									
	37									
Fourth Quadrant	41									
	42									
	43									
	44									
	45									
	46									
	47									
Total										

Caries Present

KEY **: YES = 1**

NO = 0

Treatment: See Below

KEY

O – OCCLUSAL SURFACE

Inc -INCISAL SURFACE

L – LINGUAL SURFACE

B- BUCCAL SURFACE

M- MESIAL SURFACE

D- DISTAL SURFACE

Treatment Performed

Preventative Rx (F/S S+P F1-Rx) - 1

Preventative Resin Restoration -2

Class I Restoration (Amalgam) -3

Class II Restoration (Amalgam) -4

Class III Restoration -5

Class IV Restoration -6

Class V Restoration (Amalgam) -7

Pulpal Treatment -8

Other forms of Restorative Rx -9

Extraction -10

Number of Visits: (Please Circle)

<2

2 – 4

5 – 7

>7

MAXILLARY ARCH

17	O	M	D	L	B		27	O	M	D	L	B
16	O	M	D	L	B		26	O	M	D	L	B
15	O	M	D	L	B		25	O	M	D	L	B
14	O	M	D	L	B		24	O	M	D	L	B
13	Inc	M	D	L	B		23	Inc	M	D	L	B
12	Inc	M	D	L	B		22	Inc	M	D	L	B
11	Inc	M	D	L	B		21	Inc	M	D	L	B

MANDIBUALR ARCH

47	O	M	D	L	B
46	O	M	D	L	B
45	O	M	D	L	B
44	O	M	D	L	B
43	Inc	M	D	L	B
42	Inc	M	D	L	B
41	Inc	M	D	L	B

37	O	M	D	L	B
36	O	M	D	L	B
35	O	M	D	L	B
34	O	M	D	L	B
33	Inc	M	D	L	B
32	Inc	M	D	L	B
31	Inc	M	D	L	B

APPENDIX B:

Financial Clasifications for Wits Dental Patients

Code	Income / Assets for individual's		Income / Assets for families	
HO	Formally unemployed/Social Pensioner		Formally unemployed/Social Pensioner	
HG	Children under 6, Committed children		Children under 6, Committed children	
H1	Annual income less than R 36, 000.00 Assets less than R 151, 200.00	R 0.00 - R 3, 000.00 per month	Annual income less than R 50, 000.00 Assets less than R 231, 300.00	R 0.00 - R 4, 166.67 per month
H2	Annual income R 36, 000.00 - R 72, 000.00 Assets: R 151, 200.00 - R 321, 200.00	R 3, 001.00 - R 6, 000.00 per month	Annual income: R 50, 000.00 - R 100, 000.00 Assets not more than: R 231, 300.00 - R 473, 300.00	R 4, 157.00 - R 8, 333.38 per month
PP No M/Aid	Annual income R 72, 000.00 and more or Assets worth more than R 321, 200.00	Over R 6, 001.00 per month	Annual income R 100, 000.00 and more or Assets worth more than R 473, 300.00	Over R 8, 334.00 per month
PM	A member of a medical scheme		A member of a medical scheme	

APPENDIX C: Ethics Clearance Certificate (M10427)

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Dr Tashnim Bagus

CLEARANCE CERTIFICATE	M10427
PROJECT	A Clinical Audit: Dental Treatment Needs and Treatment Received Received by 12 and 15 year old Children who Attended the Wits Dental Hospital during the period January 2006 to December 2010 (Revised title
INVESTIGATORS	Dr Tashnim Bagus
DEPARTMENT	Department of Paediatric & Restorative Dentisry
DATE CONSIDERED	30/04/2010
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 07/09/2011 **CHAIRPERSON** .....
(Professor P E Cleaton Jones)

*Guidelines for written 'informed consent' attached where applicable Copy: originally changed title approved & sent 07/09/2011

cc: Supervisor : Prof S Setzer

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

		Age group:																
		12 year old								15 year old								
		Gender:			Hospital grouping:					Gender:			Hospital grouping:					
		Male	Female	Total	H0	H1	H2	P	Total	Male	Female	Total	H0	H1	H2	P	Total	
Decayed (D)	Mean	2.7	1.8	2.3	1.7	3.0	3.0	2.0	2.3	3.3	3.7	3.5	1.8	3.5	10.0	2.7	3.3	
	Median	2.5	1.0	2.0	1.0	2.5	3.0	1.5	2.0	1.5	2.5	2.0	1.5	2.0	10.0	2.0	2.0	
	Minimum	.0	.0	.0	.0	.0	1.0	.0	.0	.0	.0	.0	.0	.0	9.0	.0	.0	
	Maximum	8.0	6.0	8.0	4.0	8.0	5.0	5.0	8.0	11.0	16.0	16.0	4.0	16.0	11.0	10.0	16.0	
	SD	1.9	2.0	1.9	1.4	2.5	2.8	1.6	1.9	3.7	3.6	3.6	1.7	3.9	1.4	2.8	3.6	
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48	
Missing (M)	Mean	.8	.7	.7	1.5	.5	.0	.4	.7	.5	.2	.4	.3	.5	.5	.2	.4	
	Median	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.5	.0	.0	
	Minimum	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
	Maximum	4.0	4.0	4.0	4.0	4.0	.0	4.0	4.0	3.0	4.0	4.0	1.0	4.0	1.0	2.0	4.0	
	SD	1.5	1.5	1.5	2.0	1.2	.0	1.1	1.5	1.0	.8	.9	.5	1.2	.7	.6	.9	
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48	
Filled (F)	Mean	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
	Median	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
	Minimum	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
	Maximum	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
	SD	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48	
DMFT Index	Mean	3.5	2.5	3.0	3.3	3.5	3.0	2.4	3.0	3.8	3.9	3.8	2.0	4.0	10.5	2.9	3.7	
	Median	3.0	1.0	2.0	2.0	2.5	3.0	2.0	2.0	2.0	3.0	2.5	1.5	3.5	10.5	2.0	2.0	
	Minimum	.0	.0	.0	.0	.0	1.0	.0	.0	.0	.0	.0	.0	.0	9.0	.0	.0	
	Maximum	8.0	10.0	10.0	8.0	10.0	5.0	5.0	10.0	12.0	16.0	16.0	5.0	16.0	12.0	10.0	16.0	
	SD	2.4	2.9	2.6	3.1	3.2	2.8	1.8	2.6	3.6	3.5	3.5	2.2	3.6	2.1	2.8	3.5	
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48	
DMFT Percentage	Mean	12.3	9.0	10.7	11.7	12.5	10.7	8.4	10.7	13.5	13.9	13.7	7.1	14.3	37.5	10.3	13.2	
	Median	10.7	3.6	7.1	7.1	8.9	10.7	7.1	7.1	7.1	10.7	8.9	5.4	12.5	37.5	7.1	7.1	
	Minimum	.0	.0	.0	.0	.0	3.6	.0	.0	.0	.0	.0	.0	.0	32.1	.0	.0	
	Maximum	28.6	35.7	35.7	28.6	35.7	17.9	17.9	35.7	42.9	57.1	57.1	17.9	57.1	42.9	35.7	57.1	
	SD	8.6	10.3	9.4	11.1	11.3	10.1	6.4	9.4	12.7	12.6	12.5	7.7	13.0	7.6	9.9	12.5	
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48	

APPENDIX D: Datasheet of DMFT Scores across age groups, gender and Hospital groups.

		Age group:															
		12 year old								15 year old							
		Gender:			Hospital grouping:					Gender:			Hospital grouping:				
		Male	Female	Total	H0	H1	H2	P	Total	Male	Female	Total	H0	H1	H2	P	Total
Surface: Inc	Mean	.5	.1	.3	.2	.4	.5	.2	.3	.5	.3	.4	.0	.5	2.0	.2	.4
	Median	.0	.0	.0	.0	.0	.5	.0	.0	.0	.0	.0	.0	.0	2.0	.0	.0
	Minimum	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	1.0	.0	.0
	Maximum	2.0	1.0	2.0	1.0	2.0	1.0	1.0	2.0	3.0	3.0	3.0	.0	3.0	3.0	2.0	3.0
	SD	.7	.2	.6	.4	.8	.7	.4	.6	1.1	.7	.9	.0	.9	1.4	.5	.8
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48
Surface: O	Mean	2.9	2.9	2.9	3.0	3.0	2.5	2.8	2.9	4.1	4.2	4.1	5.8	4.3	7.0	3.3	4.2
	Median	2.0	1.0	2.0	2.0	2.0	2.5	1.5	2.0	1.5	2.5	2.0	6.0	2.0	7.0	2.0	2.0
	Minimum	.0	.0	.0	.0	.0	1.0	.0	.0	.0	.0	.0	.0	.0	6.0	.0	.0
	Maximum	16.0	12.0	16.0	12.0	11.0	4.0	16.0	16.0	16.0	16.0	16.0	11.0	16.0	8.0	14.0	16.0
	SD	3.7	3.6	3.6	3.5	3.3	2.1	4.3	3.6	4.7	4.3	4.5	6.1	5.0	1.4	4.2	4.7
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48
Surface: M	Mean	.7	.0	.4	.3	.6	.0	.3	.4	.8	.7	.8	.0	.6	3.5	.4	.6
	Median	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	3.5	.0	.0
	Minimum	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	2.0	.0	.0
	Maximum	3.0	.0	3.0	2.0	3.0	.0	2.0	3.0	7.0	5.0	7.0	.0	4.0	5.0	3.0	5.0
	SD	1.0	.0	.8	.6	1.1	.0	.6	.8	1.6	1.3	1.5	.0	1.1	2.1	.9	1.1
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48
Surface: D	Mean	.3	.1	.2	.2	.2	.5	.1	.2	.8	.4	.6	.0	.2	3.5	.5	.4
	Median	.0	.0	.0	.0	.0	.5	.0	.0	.0	.0	.0	.0	.0	3.5	.0	.0
	Minimum	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	2.0	.0	.0
	Maximum	2.0	1.0	2.0	2.0	1.0	1.0	2.0	2.0	7.0	5.0	7.0	.0	2.0	5.0	4.0	5.0
	SD	.7	.2	.5	.6	.4	.7	.5	.5	1.8	1.1	1.5	.0	.5	2.1	1.2	1.1
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48
Surface: L	Mean	.5	.2	.3	.3	.3	1.0	.3	.3	.5	.4	.4	.0	.3	3.0	.5	.4
	Median	.0	.0	.0	.0	.0	1.0	.0	.0	.0	.0	.0	.0	.0	3.0	.0	.0
	Minimum	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	1.0	.0	.0
	Maximum	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4.0	5.0	5.0	.0	2.0	5.0	4.0	5.0
	SD	.8	.5	.7	.6	.7	1.4	.6	.7	1.0	1.2	1.1	.0	.7	2.8	1.2	1.1
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48
Surface: B	Mean	.4	.2	.3	.2	.1	.5	.5	.3	.6	.5	.6	.0	.4	4.5	.3	.5
	Median	.0	.0	.0	.0	.0	.5	.0	.0	.0	.0	.0	.0	.0	4.5	.0	.0
	Minimum	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	4.0	.0	.0
	Maximum	2.0	4.0	4.0	2.0	1.0	1.0	4.0	4.0	5.0	4.0	5.0	.0	4.0	5.0	2.0	5.0
	SD	.7	.9	.8	.6	.3	.7	1.2	.8	1.2	1.1	1.2	.0	1.0	.7	.6	1.1
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48
DMFS Index	Mean	5.3	3.4	4.3	4.1	4.6	5.0	4.2	4.3	7.4	6.5	6.9	5.8	6.3	23.5	5.3	6.6
	Median	3.0	2.0	3.0	2.0	3.5	5.0	3.0	3.0	5.0	4.0	4.0	6.0	3.5	23.5	3.5	4.0
	Minimum	.0	.0	.0	.0	.0	1.0	.0	.0	.0	.0	.0	.0	.0	19.0	.0	.0
	Maximum	17.0	12.0	17.0	12.0	13.0	9.0	17.0	17.0	21.0	28.0	28.0	11.0	21.0	28.0	20.0	28.0
	SD	4.6	3.7	4.2	4.1	4.5	5.7	4.5	4.2	7.2	7.2	7.1	6.1	6.1	6.4	5.8	6.8
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48
DMFS Percentage	Mean	18.8	12.0	15.5	14.6	16.4	17.9	15.1	15.5	26.5	23.2	24.8	20.5	22.6	83.9	18.8	23.6
	Median	10.7	7.1	10.7	7.1	12.5	17.9	10.7	10.7	17.9	14.3	14.3	21.4	12.5	83.9	12.5	14.3
	Minimum	.0	.0	.0	.0	.0	3.6	.0	.0	.0	.0	.0	.0	.0	67.9	.0	.0
	Maximum	60.7	42.9	60.7	42.9	46.4	32.1	60.7	60.7	75.0	100.0	100.0	39.3	75.0	100.0	71.4	100.0
	SD	16.4	13.3	15.2	14.6	16.0	20.2	16.0	15.2	25.9	25.6	25.5	21.7	21.7	22.7	20.9	24.4
	Valid n	N=20	N=19	N=39	N=11	N=12	N=2	N=14	N=39	N=24	N=26	N=50	N=4	N=24	N=2	N=18	N=48

APPENDIX E: Datasheet of DMFS Index Scores across age groups, gender and Hospital groups.

			Age group:															
			12 year old							15 year old								
			Gender:			Hospital grouping:					Gender:			Hospital grouping:				
			Male	Female	Total	H0	H1	H2	P	Total	Male	Female	Total	H0	H1	H2	P	Total
Treatment Performed:	Not specified/ None	n	7	8	15	4	4	1	6	15	11	7	18	1	11	1	5	18
		%	35.0%	42.1%	38.5%	36.4%	33.3%	50.0%	42.9%	38.5%	45.8%	26.9%	36.0%	25.0%	45.8%	50.0%	27.8%	37.5%
	Preventive Rx	n	6	5	11	4	5		2	11	9	5	14	3	7		4	14
		%	30.0%	26.3%	28.2%	36.4%	41.7%		14.3%	28.2%	37.5%	19.2%	28.0%	75.0%	29.2%		22.2%	29.2%
	Extraction	n	5	4	9	3	2		4	9	4	9	13		2	1	8	11
		%	25.0%	21.1%	23.1%	27.3%	16.7%		28.6%	23.1%	16.7%	34.6%	26.0%		8.3%	50.0%	44.4%	22.9%
	Class I	n	4	2	6	2	3		1	6	3	5	8		5		1	6
		%	20.0%	10.5%	15.4%	18.2%	25.0%		7.1%	15.4%	12.5%	19.2%	16.0%		20.8%		5.6%	12.5%
	Pulpal Treatment	n	5	1	6	1	2	1	2	6	1	3	4		3		1	4
		%	25.0%	5.3%	15.4%	9.1%	16.7%	50.0%	14.3%	15.4%	4.2%	11.5%	8.0%		12.5%		5.6%	8.3%
	Class II	n	2		2		1		1	2	2	1	3		2			2
		%	10.0%		5.1%		8.3%		7.1%	5.1%	8.3%	3.8%	6.0%		8.3%			4.2%
	Class IV	n	3		3	1	1		1	3								
		%	15.0%		7.7%	9.1%	8.3%		7.1%	7.7%								
	Preventive Resin Restoration	n	1		1		1			1	1		1	1				1
		%	5.0%		2.6%		8.3%			2.6%	4.2%		2.0%	25.0%				2.1%
	Class III	n	2		2		2			2								
		%	10.0%		5.1%		16.7%			5.1%								
	Class V	n	1		1		1			1		1	1		1			1
		%	5.0%		2.6%		8.3%			2.6%		3.8%	2.0%		4.2%			2.1%
	Other forms of Restorative Rx	n		1	1		1			1								
		%		5.3%	2.6%		8.3%			2.6%								
Total	n		20	19	39	11	12	2	14	39	24	26	50	4	24	2	18	48
	%		180.0%	110.5%	146.2%	136.4%	191.7%	100.0%	121.4%	146.2%	129.2%	119.2%	124.0%	125.0%	129.2%	100.0%	105.6%	118.8%

APPENDIX F: Datasheet of Treatment received and compared across age groups, gender and Hospital groups.