ORAL HEALTH STATUS OF CHILDREN IN THE WESTERN REGION OF THE EASTERN CAPE PROVINCE:

A REGIONAL SURVEY

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DECLARATION

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and has not previously in its entirety or in part been submitted at any university for a degree.

Dambrecht ..... 1 November 2002 .....

Signed Date

Summary

Purpose: To assess the oral health status of 4-15-year-old schoolchildren in the Western Region of the Eastern Cape Province, by determining the prevalence of dental caries, periodontal disease, dental fluorosis, malocclusion and oral mucosal lesions and to create baseline data for planning oral health services in this region. ***Materials and Methods:*** The prevalent analytic survey was undertaken on 822 schoolchildren between the ages of 4-15 years in 27 different schools. The sample size selected for this region by the Department of Statistics, University of Pretoria, for the National Oral Health Survey of 1999/2000 was used. The data on 209, 210, 209 and 194 scholars in the 4-5, 6, 12 and 15-year-old age groups respectively were collected. The World Health Organization`s (1997) criteria were used to determine the prevalence of caries, periodontal treatment needs, the dental fluorosis, malocclusion and prevalence of oral mucosal lesions. Six calibrated and trained examiners recorded the data on a survey form. The WHO survey forms were used for data collection. The data were analysed and processed by the author on Microsoft Excel 2000. ***Results:*** The sample size consisted of 1.35 % Asian, 51.89 % Black, 26.07 % Coloured and 20.06 % White scholars. Nearly equal amounts of males (48.3 %) and females (51.7%) were examined. The dental caries prevalence in the primary dentition of 4-5-year-olds with an average age of 4.43 years was 40.67%, with a mean dmft of 3,56. The dental caries prevalence in the permanent dentition of 6-, 12- and 15-year-old age groups was 67.62%, 46.05% and 67.92% respectively. The mean DMFT for 6-, 12- and 15 year olds were 0.05, 1.19 and 2.02 respectively. Gender differences and

differences in prevalence of dental caries between the populations groups were recorded. The Coloured children experienced the highest dental caries prevalence. In the 4-5- and 15-year-old groups the males were affected more than the females by dental caries. Prevalent differences were recorded between rural and urban areas in the same population group. The prevalence of periodontal disease in 373, 12-15-year-olds was 79.09%. Only 4.02 % were in need of dental hygiene instructions and polishing. Dental education, dental hygiene instructions, dental scaling and polishing were needed by 75.07% of the children. Dental fluorosis prevalence in 450, 6-15-year-olds was 13.03%. Dental fluorosis did not affect 86.97% of the scholars; 10.63% had mild fluorosis and 2.05% was severely affected. The mean fluoride concentration in the drinking water in this region were 1.07 mg/L, ranging between 0.3-3 mg/L. Definite malocclusion was recorded in only 0.48% of the 12-year-old group, whom needed elective treatment. In the 12-year-olds, 99.52% needed no or slight treatment for no or minor malocclusions. The majority of children had no oral mucosal lesions (91.55%). The prevalence of oral mucosal lesions was 8.5% in this survey. The most frequent conditions were traumatic lesions (1.96%), dento-alveolar abscess (1.22%) and herpes labialis (1.22%). The intra-examiner reliability for caries, dental fluorosis, periodontal treatment needs and prevalence of malocclusions was 97.66%, 100%, 88.89% and 86.67% respectively. The inter-examiner reliability was 98.75%, 98.34%, 100%, 100% and 100% respectively for the five examiners.

Conclusion: This survey indicated a higher prevalence of dental caries in the primary dentition (63.48%), than the permanent dentition (41.3%). The mean dmft was 3.65 and the DMFT 1.2, which indicated a low mean caries experience

for these children. The WHO goal for the year 2000 for the 6-year-olds of 50% being caries free has not reached for only 32.56% were caries free. The mean DMFT of 1.2 for 12-year-olds in this survey is below the WHO goal of a mean DMFT of 1.5 or less. The lack of available preventative service provision, were indicated by the low percentage of fissure sealants (2.8%). The need for dental treatment was highlighted by the need mostly for one-surface restorations. Preventative treatment, two-surface fillings and extractions were also needed. Periodontal disease was a major public oral health concern for this region for a prevalence of 79.09% was recorded for the 12-15-year-olds. The majority of the children affected by periodontal disease (75.07%) were in need of professional cleaning and calculus removal. The prevalence of dental fluorosis was 8.2%, 19.87% and 13.05% for 6-, 12- and 15-year age groups respectively. The prevalence of malocclusion was 0.48% for the 12-year-old group. The prevalence of oral mucosa lesions was 8.5% for 4-15-year-old schoolchildren. Therefore, the conclusion can be made that dental fluorosis; malocclusions and oral mucosal lesions were no public concern in this region. The major public oral health concerns were dental caries in the primary dentition and periodontal disease in all age groups. ***Recommendations:*** Dental services in this region should be directed towards prevention of dental caries in the primary dentition and periodontal disease in all age groups. The focus of dental services should be primarily on preventative programs and treatments. The public dental treatments needs indicated in this survey, namely scaling and polishing, restorations and extractions, consists of the primary health care package delivery. Currently, no evaluation tool exists to monitor the efficiency of oral health programs, no

baseline data for the Province exists. Therefore, the urgent need for dental research and oral health service planning and delivery are recommended.

Opsomming

Doel: Om die mondgesondheid status ten opsigte van die voorkoms van tandkaries, periodontal siektes, tandheelkundige fluorose, wanokklusie en die sagteweefsel letsels in die mond te bepaal van 4-15-jarige skoolgaande kinders in die Westelike Streek van die Oos Kaap Provinsie. Asook die wetenskaplike inligting te bekom om effektiewe tandheelkundige dienslewering vir die streek te beplan. ***Materiale en Metode:*** Die oorwegende analitiese studie is uitgevoer op 822 skoolkinders tussen die ouderdomme van 4-15 jaar, in 27 verskillende skole. Die monster in die studie was ooreekomstig die monster bepaal deur die Department van Statistiek, Universiteit van Pretoria, vir die streek in die deelname aan die Nationale Tandheelkundige Opname vir 1999/2000. Die gegewens van 209, 210, 209 en 194 skoliere in die volgende ouderdoms groepe was versamel, naamlik 4-5-, 6-, 12- en 15-jaar. Die kriteria vir tandheelkundige navorsing van die Wêreld Gesondheids Organisasie (1997) is gebruik om die voorkoms syfers te bepaal.. Ses opgeleide ondersoekers het die gegewens aangeteken. Die navorsings vorm was saamgestel uit die verksillende ondersoek vorms van die Wêreld Gesondheids Organisasie. Die inligting was deur die skryfster ontleed en verwerk met behulp van Microsoft Excel 2000. ***Resultate:*** Die ondersoek monster het uit die volgende bevolkingsgroepe bestaan: 1.35 % Asiate, 51.89 % Swart, 26.07 % Gekleurdes en 20.06 % Blanke skoliere. Ongeveer dieselfde hoeveelheid seuns (48.3 %) as dogters (51.7%) was ondersoek. Die voorkoms van tandkaries in die primêre gebit van 4-5 jarige skoliere was 40.67%, met `n gemiddelde dmft van 3.56. Die gemiddelde

ouderdom van die groep was 4.43 jaar. Die voorkoms van tandkaries in die permanente gebit van die 6-; 12- en 15-jarige groepe was 67.62%; 46.05% en 67.92% onderskeidelik. Die gemiddelde DMFT tellings vir die onderskeie ouderdoms groepe was 0.05, 1.19 en 2.02. Die voorkoms van periodontal siektes van 373 skoliere in die 12- en 15-jarige ouderdoms groepe was 79.09%. Die behoefte vir mondgesondheid inligting, instruksies en polering was bepaal in 4.02% van die skoliere. Die meeste skoliere (75.05%) het egter intensiewe behandeling nodig naamlik: mondgesondheid inligting, instruksies, professionele skalering en polering. Die voorkoms van tandheelkundige fluorose vir 449, 6-15-jarige kinders was 13.03%. Tandheelkunde fluorose was afwesig in 86.97% van die skoliere. Slegs 2.05% van die 13.03% skoliere het erge fluorose en die res het slegs ligte/effe fluorose (10.63%) getoon. Die gemiddelde fluoride konsentrasie in die drink water in die streek was 1.07 mg/L en het gewissel tussen 0.3-3 gm/L. Defnitiewe wanokklusie in 0.48% van die 12-jariges toon `n behoefte aan geselekteerde ortodontiese behandeling. Normale okklusie of `n geringe wanokklusie was gevind in 99.52% van die 12-jariges, wat geen of geringe ortodontiese behandeling nodig het. Die meerderheid (91.55%) van die kinders het geen sagte weefsel letsels getoon nie. Die voorkoms van letsels was slegs 8.5% waarvan die volgende letsels die algemeenste was: traumatiese (1.96%), tandabsesse (1.22%) en herpes labialis (1.22%). Die intra-ondersoeker betroubaarheid vir tandkaries, periodontal siektes, tandheelkundige fluorose en wanokklusies was 97.66%, 100%, 88.89% en 86.67% onderskeidelik. Die inter-ondersoeker betroubaarheid was 98.75%, 98.34%, 100%, 100% en 100% onderskeidelik vir die ses ondersoekers.

Gevolgtrekking: Die studie toon dat die voorkoms van tandkaries meer algemeen in die primêre (63.48%) as in die permanente gebit is (41.3%). Die gemiddelde dmft is 3.65 en die DMFT 1.2, wat `n relatiewe lae voorkoms van karies in die streek toon. Die Wêreld Gesondheid Organisasie se doelwit vir sesjariges om 50% karies vry te wees teen die jaar 2000, is nog nie behaal nie. Slegs 32.56% is karies vry. Die doelwit vir twaalfjariges is `n DMFT laer as 1.5, wat wel bereik is, met die gemiddelde DMFT van 1.2. Die tekort aan voorkomende tandheelkundige behandelings is aangetoon deur die lae persentasie van fissuur seëlings in die studie (2.8%). Die behoefte aan tandheelkundige behandeling is beklemtoon deur die behoefte aan hestellings, veral eenvlak herstellings. Die behoefte vir voorkomende behandeling, ekstraksies, een-en tweevlak herstellings is aangetoon. Periodontale siektes bleik egter om `n groot openbare gesondheid probleem vir hierdie streek te wees. Die voorkoms van periodontal siektes is 79.09% vir die 12-15 jarige skoolkinders. Die behoefte aan professionele verwydering van kalkulus en polering is beklemtoon. Die voorkoms van dentale fluorose is slegs 8.2%, 19.87% en 13.05% vir die 6-, 12- en 15-jarige groepe onderskeidelik. Die voorkoms van wanokklusie is slegs 0.48% vir die 12-jariges. Die voorkoms syfer van die letsels van die sagteweefsel van die mond is slegs 8.5%. Dentale fluorose, wanokklusie en letsels van die sagte weefsel in die mond is nie van belang in die streek nie, as gevolg van hul lae voorkoms syfers. Die gevolgtrekking kan gemaak word dat tandkaries in die primêre gebit en periodontal siektes in alle oudersdomsgroepe van uiterste openbare mondgesondheids beland in hierdie streek is, as gevolg van hul hoë voorkoms syfers. ***Aanbevelings:*** Mondgesondheid dienste in hierdie streek moet gebaseer word op die voorkoming van tandkaries in

die primêre gebit en swak mondhigiëne in alle ouderdoms groepe. Die primêre doel van alle mondgesondheid programme moet gebaseer word op voorkoming en tweedens op die tandheelkundige behandelings wat benodig word, naamlik professionele skalerings en polerings asook herstellings. In die streek bestaan geen primêre mondgesondheid inligting om programme en behandelings se doeltreffenheid te bepaal nie, daarom word aanbeveel dat tandheelkundige navorsing op `n deurlopende basis moet geskiet en dat mondgesondheids dienslewering effektief beplan en gelewer moet word volgens die wetenskaplike behoefte bepalings.

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Glossary

NOHS:	National Oral Health Survey
WHO:	World Health Organization
DMFT:	Decayed, Missing and Filled teeth in the permanent dentition
dmft:	Decayed, Missing and Filled teeth in the primary dentition
ECP:	Eastern Cape Province
HIV:	Human Immunodeficiency Virus
AIDS:	Acquired Immunodeficiency Syndrome
DI-S:	Oral Debris Index
CPI:	Community Periodontal Index
CPITN:	Community Periodontal Index for Treatment Needs
F:	Fluoride
TSIF:	Teeth Surface Index of Fluorosis
mg/L:	Milligrams per Liter
ppm:	Parts per million
ppm F:	Parts per million Fluorides
O.I.:	Occlusal Index
TB:	Tuberculosis
STD:	Sexually Transmitted Diseases
KS:	Kaposi`s Sarcoma
ANUG:	Acute Necrotising Ulcerative Gingivitis
OML:	Oral Mucosal Lesions
NUG:	Necrotising Ulcerative Gingivitis

OHL:	Oral Hairy Leukoplakia
HL:	Hairy Leukoplakia
SGD:	Salivary Gland Disease
FREQ:	Frequency
SAS:	South African Statistics
D:	Decayed Permanent
DT:	Decayed Permanent Teeth
M:	Missing Permanent
MT:	Missing Permanent Teeth
F:	Filled Permanent
FT:	Filled Permanent Teeth
d:	Decayed Primary
dt:	Decayed Primary Teeth
m:	Missing Primary
mt:	Missing Primary Teeth
f:	Filled
ft:	Filled Primary Teeth
DFI:	Dean's Fluorosis Index
DAI:	Dental Aesthetic Index

CHAPTER I

Introduction

In 1978, the World Health Assembly (WHO) accepted the Alma Ata declaration of "Health for all by the year 2000". The declaration includes the oral health goals for children which states that 50% of the 5-6-year-old children must be caries free by the year 2000 and the 12-year-olds must only have three decayed, missing or filled teeth (DMFT).

A population of 47 million for South Africa is estimated by the year 2000 (WHO). The population of the Eastern Cape Province (ECP) is approximately 7,5 million (1996 Census), which consists 76,7% of the Black ethnic group. The growth rate for this group is 2,7% per annum (South African Health Review, 1999). The preponderance of the age structure of children and young people of the Black ethnic population group indicates that South Africa is a typical developing country (Reddy, 1992).

In Africa the incidence of oral disease are increasing, due to massive social disruption. Oral health disease is not life threatening, but is an important public health problem because of their high prevalence, severity and impact on individuals and society. Oral health improvements has been limited for accessibility to all communities or excluded due to constrains, such as class, demography and political status (Hobdell *et al.,* 1997). Global dental caries trends indicate that dental caries in developed countries is declining, while in developing countries, such as South Africa, the trend is increasing (Holm, 1990). In Africa, the prevalence of dental caries in primary teeth is increasing. The DMFT in Uganda rose

from 0,4 to 1,5 from 1966 to 1982. Similar trends were seen in Chile and Kenya (Holm, 1990). Due to the lack of dental caries data in the rural areas of South Africa, the question arises if this caries trend is similar in the ECP, for 60% of the population is residing in rural areas. The question cannot be answered for the literature study over the last twenty years on dental caries, periodontal disease, dental fluorosis, malocclusion and oral manifestations of HIV infection in children aged 4 – 15 years in South Africa, indicated that during this period only 6 studies were conducted in this Province. The need for oral health data for this Province has thus been highlighted.

Literature review: Dental status of children in the Eastern Cape Province: 1980-2000.

AUTHOR	PLACE	YEAR	AGE COHORT	% FREE OF PERIODONTAL DISEASE	DMFT/ dmft	% CARIES FREE
National Oral Health Survey	Port Elizabeth (Urban)	1988/89	6 years 12 years 15 years	 2.7-44 1.8-24.6	 1.7 DMFT	27.9 39.5-49.5 19.9-31
Rudolph & Brand	Transkei	1989	All	14-20		16,9
Chikte	Engcobo	1990	12 years	5.7	1,7 DMFT	47
Du Plessis	Port Elizabeth (Urban)	1997	6 years 12 years 15 years		4.96 dmft 1.7 DMFT 3.6 DMFT	
Carstens	Langkloof	1993	6 year		1,37 DMFT 9,51 dmft	1,36
Lambrecht	Graaff-Reinet	1998	6-7 year	83	0,6 DMFT 3,41 dmft	20,72

Firstly, the lack of oral health epidemiological data in the ECP results in a lack of baseline data to establish dental caries trends. The lack of data also affects oral health management negatively. All aspects of the service are at stake, for example the planning and delivery of services, the norm and distribution of the human resources, the standard of facilities, financial requirements and an equitable service throughout the Province is affected by the lack of dental data.

Secondly, the pandemic of HIV/AIDS has become the most serious public health issue in South Africa and also in the ECP. The study done on pregnant women during October every year, at public antenatal clinics to establish their HIV-status, indicated a sharp increase in the prevalence of HIV infection in South Africa. In the South African Health Review of 1999, it was indicated that the prevalence in this cohort of the population was 23% in 1998, which was a 34% increase on the prevalence in 1997. In the ECP the prevalence of HIV infection increased from 12,6% in 1997 to 26,3 % in 1998. The oral cavity presents the first manifestations of this pandemic infection. Therefore, the oral health professionals can become the frontline of recording and recognizing the first signs of HIV infection in the population at risk. The prevalence of oral manifestations has therefore become an essential part in establishing the oral health status of schoolchildren.

Finally, a second National Oral Health Survey for South Africa is planned for 1999/2000. The last National Oral Health Survey for South Africa was conducted in 1988/89. The last sample size only included the metropolitan areas in the Provinces. In the ECP, only Port Elizabeth was included in the survey. The National planning committee of the National Oral

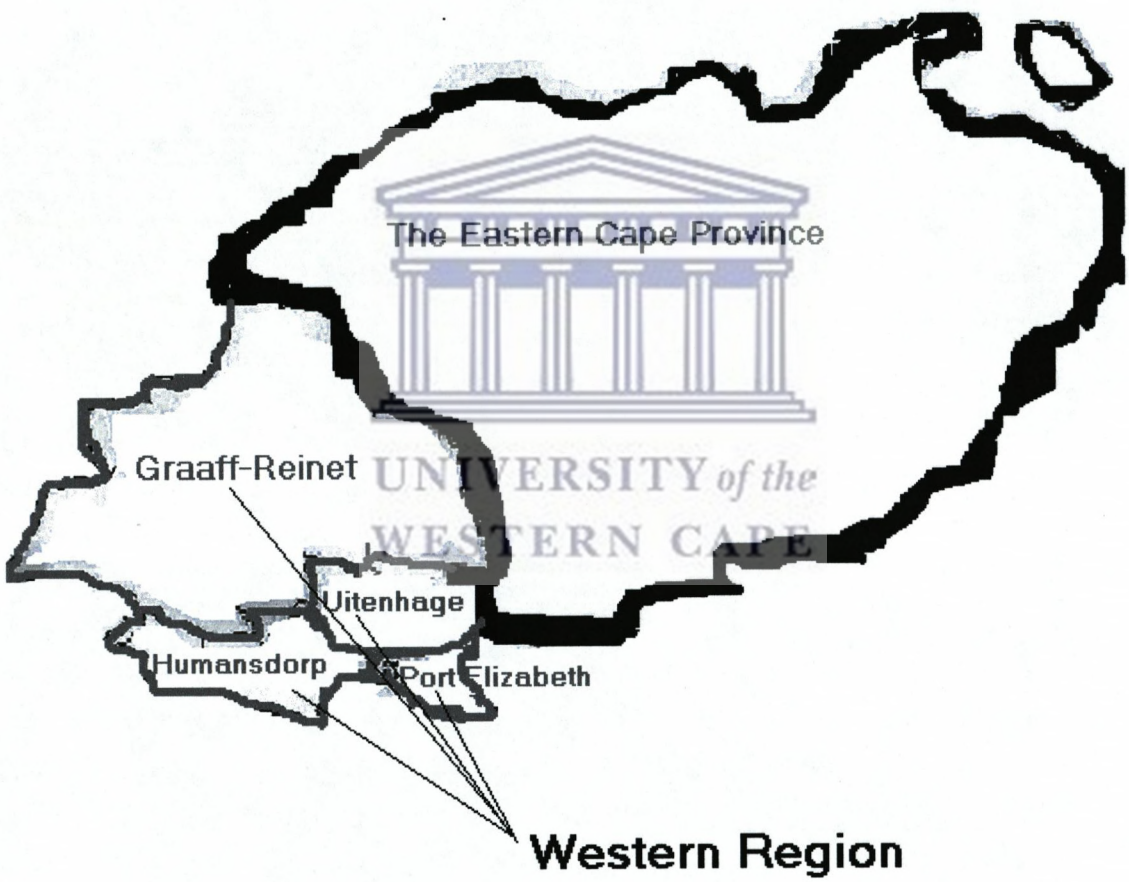
Health Survey for South Africa for 1999 decided that the survey has to be conducted in all nine provinces in South Africa, including the rural and urban areas. The survey excludes adults and will only be conducted amongst children in the following age groups: 4 to 5 years, 6 years, 12 years and 15 years. The survey will take place in nursery schools or equivalent i.e. child-minders and public schools. The Department of Statistics at the University of Pretoria, determined that the sample size for the ECP is 5 700 children. The institutions for the collection of the data for all five regions of the ECP were also identified. The institutions identified for the western region will be used to obtain the data for this survey. The size of the survey sample consists of 960 children in 27 different schools between the ages of 4-15 years.

The western region of the ECP consists of the Port Elizabeth, Uitenhage, Humansdorp and Graaff-Reinet Magisterial Districts. The 1996 Census indicates a total population of 1 204 241 for this region. The population per district is 775 255, 235 329, 91 426 and 102 231 respectively for the Port Elizabeth, Uitenhage, Humansdorp and Graaff-Reinet Districts. The population of 4-15-year-olds per district is approximately 107 365, 35 426, 14 239 and 17 689 for the Port Elizabeth, Uitenhage, Humansdorp and Graaff-Reinet Districts, resulting in a total of 174 719 children for the region (Appendix 1: Assessment of the health status in the Eastern Cape Province).

It is very clear that very little to no data can be found on the oral health status of children in the ECP, especially in the rural areas. The lack of data results in a lack of baseline data to be used in planning preventative and promotional oral health programs. The data from the dental

research in the western region of the Province will indicate the dental treatment needs required by the population. The proper planning and management of the Oral Health Program for this region is inadequate, without the baseline oral health data. Therefore, the main objective of this study is to determine the dental status by recording the prevalence of dental caries, periodontal status, malocclusion, dental fluorosis and oral manifestations of HIV infection of the 4-15-year-old scholars in the ECP.

The Western Region of the Eastern Cape Province



Background

A huge fall of illness and death in the eighteenth century was due to improved living standards and hygiene, specific preventative immunization, like smallpox vaccine and curative measures, like antibiotics and drugs. The problems in the world that led to illness and disease were undernourishment, homelessness, unsafe water and sewage. The struggle for health began in both the un- and developed world. In the developed world the main cause of death were lung tumours, ischeamic heart and cerebrovascular diseases. Health service in the developed world was delivered in health facilities, with personnel forming a health team. Auxiliary personnel, traditional healers and international medical services, like organizations, rendered the health services in the undeveloped world. The cause of death in the poor undeveloped world was nutritional defects and communicable diseases. In the undeveloped countries medical doctors were mostly in towns, which was inaccessible to most people in the rural areas and led to rural neglect, racism and inequitable distribution of health services (Sanders, 1985).

Poverty was a focus point in all health statements during the time of the Alma Ata declaration of "Health for all by the year 2000" (WHO, 1978). It was rare in a prominent international health statement not to address inequalities, know as health inequalities. During annual reports in the United Kingdom, two major reviews were presented as "Decennial Supplements" covering the two decades, 1851±60 and 1861±70. The widely heralded Black Report in 1980, was titled "Inequalities in Health", which recognized social inequalities in health as one of the major challenges for public health (Whitehead, 1991). The declaration of the Alma Ata states that "The existing gross inequality in the health status of people –

particularly the develop and developing countries as well as within them – is politically, socially and economically unacceptable and is, therefore, of common concern to all countries" (Werner & Sanders, 1997). The 1984 target of the WHO was to reduce the actual differences in health status between countries and within groups within countries by 25% (Gwatkin, 2000). The political struggle for improved health will only be successful if we understand the relationship between, health, illness and capitalism, and between capitalism and medical practice. The focus being traditionally on the medical practice (Doyal, 1979).

Health is not caused by a single factor, but by multiple risk factors (Fitzpatrick, 1986). Medical and social approaches have been directed to reduce these risk factors. The decline in mortality rates cannot be attributed to the improvements in medical care. In modern society economical factors play a predominant role in disease patterns and health services. According to Hart medicine did not make a significant attribute to improving people's health in the past (Hart, 1986). The role of modern medicine as the cure and treatment as the primary goal was the primary medical practice. The bio-mechanical model believed that disease were organic, to be cured, disease is temporary or episodic and the best place for treatment was a medical environment (Hart, 1986). Today medical practices are based on McKeown`s believed that the approach of the bio-mechanical model led to indifferences to the external influences and personal behaviour. Two medical models are necessary to understand health and disease, namely the "medical model" and the "psycho-socio-environmental model". The term "medical model" means the intervention of medicine on the approach to health. This approach includes the role of medicine, health and disease in the

improvement and maintenance of health. This term was given for the traditional or scientific mode of thinking in medicine as implicated by Hart (McKeown, 1979).

The term "psycho-socio-environmental model" is the approach after the shift from the medicine approach to a health model based on health promotion and maintenance through social, environmental and behavior changes, thus including society and prevention. Prevention of disease is seen more important than curing disease. Prevention, management and rehabilitation of disease are more important than appropriate intervention. The main criticism of the "medical model" is that the nature and causes of health or disease is aetiology bound. The specific cause of a disease may originate from a virus or bacterium. The assumption that a patient's body can be treated like a machine and the patient is passive during treatment. The belief, that only medical knowledge and skills can make the patient better. Medical intervention focused on treatment only. The medical model is based on the technology and chemical intervention to eradicate or lower diseases, as well as infant mortality rate, for example the use of antibiotics and prophylactic immunizations (Gilbert *et al.,* 199,4, Neenan *et al.,* 1993, Kent & Croucher, 1996 & Sanders, 1985).

The main criticism of the "psycho-socio-environmental model" is that is must not be seen to exclude the use of medicine in health. The use of drugs, immunization, medical technology and treatment has significance. The model must not be seen hat the patient is the only active participant and that behavioural change will eradicate disease or ill health (McKeown, 1979, Gilbert *et al.,* 1994, Neenan *et al.,* 1993 & Kent & Croucher, 1996).

The criticism relevance to dental health programs is firstly to see dental health as an integrated part of health programs. Dental health education must be included as a part of general health and not seen as a specialty on its own. Secondly, the society's role in dental health must be acknowledged and their active part in dental health programs must be encouraged. The focus of dental health programs must be on prevention of dental disease. The shift of dental health towards a psycho-socio-environmental, must be emphasized in programs directed not only on prevention, but include the maintenance of dental health by changing behavior, social or environmental factors. Social solutions to dental health problems and diseases must be addressed in programs. Dental health problems must be addressed to the population as a whole and not only to the "high risk" or "selected" groups in the population, therefore dental health programs must be appropriate to prevent or maintain dental health (Fejerskov, 1995).

The role of health and health services are often under estimated in dental services. Dental services tend to function vertically and on their own (Johnson, 1991). The different concepts, linking critical theories with health and health services should be studied separately to indicate the implications towards dental health and services (Appendix 1: The health concepts).

The implications of the epidemiology, aetiology and prevention on the dental diseases and conditions in South Africa for the developing of a dental service to manage, treat and control the dental diseases and conditions of public health importance, is the use of the knowledge we gained, for the prediction of risks which is essential for public health planning of dental services, treatment, manpower, implementing preventive programs and health promotions.

The original response to carious tooth was to extract this tooth, which in history was a very painful and hazardous procedure. Society's response was to develop professional skills and that treatment should be limited to trained professionals. As the skills and knowledge of dental disease increased it led to a preventative and restorative approach rather than an extraction approach. Real improvement in dental health can only be obtained if the dental professionals and the community at large have the same objective namely the prevention of dental disease, the main diseases being caries and periodontal disease. Patient's attitude, dentist's attitude and knowledge, remuneration and manpower all play a crucial role in the prevention of disease in the public. The interaction between the dentists` attitude and remuneration can be seen in the changing pattern of treatment carried out in the general dental service. The publics` attitude change can be seen in the increasing of dental consultations. Governmental financial policy may have major influences on the dental prevention, control and treatment of dental diseases and conditions. Thus it has became of essential importance that the dental profession extends it's horizons beyond the traditional role of clinical, diagnostic and technical expertise for individual surgery to a more preventative, controlled and manageable public approach to try and eliminate disease or to prevent suffering in becoming more aware of the psychological and social factors relevant to preventing dental disease (Murray, 1989).

At the same time as the Alma Ata professed its concern for unacceptable health conditions among the worlds poor, the potential to close the gap between the rich and the poor was advocated by the Primary Health Care (Gwatkin, 2000). Primary health care is the key to achieving health for all the people in the world, especially in developing countries like South

Africa (Werner & Sanders, 1997). The Primary Health Care Approach (PHCA) features mainly on the essential health care that is based on practical, scientifically sound and socially acceptable methods and technology, which is available to individuals and families in the community through participation of the community at a cost the country can afford and maintain. The individuals and communities are inspired to self-reliance and self-determination. Equity and holistic views are promoted. Five principles of the PHCA are:

- Equitable distribution – this addresses the unfair and unjust differences that are unnecessary and can be avoided. Creating equal opportunities. Address accessibility of services to the whole community or population.
- Community involvement or participation – cultures, values and experience of communities are acknowledged. Community participation decides on policies, planning, implementing and controlling health programs.
- Focus on prevention and health promotion – empowerment by personal and community growth, which is an educational process.
- Appropriate technology – appropriate instruments and equipment, including facilities.
- Multi-sectorial approach – by integrating dental health into general health programs tackling common causes. Oral health should be included in the general health education and a whole population strategy must be adopted (Sheiham, 1988).

A dental health program can be planned on the basis of the PHCA if the following implications are taken into consideration in the planning of this program. The implications in the planning is as follows:

- Pursue partnerships – to create equity in a dental health program sectors such as education, nutrition, environment, social welfare, community development, etc. must be linked in the planning and be included in the planning process. Identifying the sectors and linkage is of the at most importance.
- Evaluation and research – dental personnel must be accountable to the community therefore local people must be included.
- Reform existing pedagogy - oral health is something to be achieved and not delivered therefore radical change in the training and attitude of dental personnel is necessary.
- Begin with self – re-examine the causes. Community work is based on time, trust and temperament (Mautsch & Dickson, 1997).

In South Africa the implementation of a dental services must be based on prevention of dental diseases. The method to follow is health promotion. Promotion is an adequate term to apply towards the encouraging of an applied action to improve the health status of an individual, group, community or population. Promotion includes the community planning and development, economic and agricultural planning, legal sanctions against manufacturers of disease-inducing products, environmental changes and the health advising of the primary health care team (Carstens & Louw, 1996).

The implementing of an operational plan for dentistry with goals, objectives and responsibilities for both the service renders and the community is essential. The time-frame of achievement is advisable to evaluate the programs implemented to achieve the goals, which is of crucial importance in future dental planning and implementing of preventative programs and services. The shortcomings of many dental care programs are the lack of clearly defined goals.

Health education/promotion goals should also be set. Dental health education and promotion should not be compartmentalized but be integrated into the general health education and form part of the primary health care (PHC) approach.

We should ensure that health education is equitable and all receives the education. Health education should encourage autonomy, self help and reduce the need for professionals, therefore training goals must be set, including re-orientation of training away from the medical model. Training should stress communication skills, professional responsibility and the changed attitude towards the patient. Goals for in-service training, training in health education and the redefining the dentist's attitude towards the PHC team should be stressed.

The concepts is adopted by the WHO and incorporated as principals of health promotion in an early document (WHO, 1984). The principles and priorities for health promotion are:

- The focus is the whole population.
- Action should be towards the many factors influencing health.
- Full community participation.

- A wide variety of complementary strategies and agencies should be used in health hazards.
- Health professionals play a role in education and advocacy (Schou & Locker, 1997).

A later publication, the Ottowa charter, emerged from the international conference on health promotion in 1986. The framework includes five key strategies to improve oral health promotion. The strategies include creating supportive environments, build healthy public policy, strengthen community action, develop personal skills and reorient health services (Dickson, 1993, Pack, 1998 & Schou & Locker, 1997).

The dental health strategy criteria (WHO, 1976) is:

- The degree of strategy fits with general health and actions.
- The degree of compatibility of the proposed action.
- The degree to which the strategy facilitates desirable long-term trends.
- The probability of objectives reached within time frames.
- Freedom of resource or attitude constrictions.
- The cost and effectiveness ratio.
- Anticipated desirable or undesired side-benefits or -effects (Johnson, 1991).

All preventative measures require economic, social and political strategies to ensure acceptance, implementation and effectiveness. The public oral health strategy directed towards the reducing of sugar consumption, promoting water fluoridation and the use of

fluoride toothpaste would reduce dental caries to an insignificant level. Policy makers has therefore a few options for reaching this level:

- Treatment of cases: dentists and auxiliaries
- Preventative treatment: dental team
- Behaviour change in high-risk groups: health promotion/education, public health dentist and dental team doing education and prevention
- Whole population: initial change of norms, health promotion/education including the government and industry, public health dentist and dental team
- Whole population: institutionalised change, health promotion/education including government and industry and the public health dentists (Sheiham, 1995).

Several barriers to implement the primary health care approach in developing countries like South Africa, is as follows:

- Developing countries are burdened excessively by oral disease, especially periodontal disease
- The following factors aggravates the burden of dental disease: poverty, poor living conditions, ignorance in health education, lack of government funding, lack of policies and shortage of oral health care workers
- Lack of data on oral health, research of oral health problems and monitoring effectiveness of dental health preventative programs
- Delivery of oral health care is inappropriate
- Local habits – such as chewing betel nuts
- Anxiety and fear of dentists

- Mortality rates are high and malnutrition affects till 60% of the population
- Illiteracy are high
- Poverty
- Mal-distribution of dental personnel
- Remuneration of personnel are poor
- Political bureaucratic decisions (Johnson, 1991).
- Oral health services are inadequate and neglected. South African community needs emergency care (relief of pain and sepsis), basic care (one – and/or two-surface restorations and community health education (Rossouw, 1985).
- Preventative measures promoted are superimposed by traditional methods (Pack, 1998).
- The costs of high technology and sophisticated dentistry, is too expensive for developing countries (Saparamadu, 1996).
- Irrelevant training of dental personnel (Ismail, 1996).
- Integration of dental health into primary health (Haughney *et al.,* 1998).
- Lack of experience in programme analysis (Songpaisan, 1985).
- Dental personnel skills and attitudes towards PHC (Sheiham, 1992).
- Lack of inter-sectorial collaboration (Samawickrama *et al.*, 1998).
- The change of the role of the public dentist (Batchelor *et al.,* 1995 & Mason, 1994).

Evidence-based dentistry is essential to practice successfully in the new millennium. The need for evidence-based dentistry is based on the escalating avalanche of new knowledge and

the increasing public expectation and demand for successful service rendering for patients has the same access to data as the dentists (Wathen, 1994).

The role of the public dentists must be defined:

- Defining objectives
- Setting priorities
- Developing policy
- Co-ordinate strategies
- Epidemiology - monitoring and evaluating
- Education - public and other professionals
- Providing information
- Facilitating
- Coordinating care
- Local planning
- Stimulating local forums
- Lobbying politicians and decision-makers (Batchelor *et al.,* 1995 & Mason, 1994).

The future role of public dentists is: management and supervision, diagnosis and complex care and promotion and education (Johnson, 1991). Public dentists may experience difficulties in practical implication of the PHC approach for: the public can see health as granted, a treatment plan may not be feasible because of patient's priorities and difficulties, ill-health is linked to inequalities in income and skills are needed to tackle issues of ill-health (Kent & Croucher, 1997).

CHAPTER II

Review of the literature

The literature study of 224 documents over the last twenty years on dental caries, periodontal disease, dental fluorosis, malocclusion and oral manifestations of HIV infection in children aged 4 – 15 years in the Eastern Cape Province of South Africa, indicates that during this period only 6 studies were conducted in this Province (Reddy, 1992, Rudolph & Brand, 1989, Carstens *et al.,* 1993, Du Plessis, 1997, Lambrecht, 1998 & Chikte *et al.,* 1989).

The South African National Oral Health Survey (NOHS) of 1988/89 reports that approximately 30% of 6-year-olds are caries free, which is well below the WHO goal of 50% for the year 2000. The average DMFT of 12-year-olds are 1,72, which is far below the recommended WHO goal of a DMFT of 3. The data of the National Oral Health Survey included only the Metropolitan urban area of Port Elizabeth, but these data are included in the data given on the different ethnic groups, therefore no data for the ethnic groups of only Port Elizabeth could be obtained. The study indicated the difference in the same population group in different areas and the great unmet need of treatment in the Black population group. Approximately 95% of the population in the NOHS required oral hygiene instructions, scaling and prophylaxis (Reddy, 1992).

A study in Transkei indicated that dental pain was the reason for 84% of patients seeking dental care. Acute or chronic pain was experienced by 92% of these patients. The mean DMFT for this group aging from 13 years old were 5,7 and only 17% were caries free. Only

one patient presented with a dental restoration and inadequate oral hygiene practice was present in the sample. The poor oral health in this area needs urgent attention (Rudolph & Brand, 1989). Four studies indicated dental caries status in areas of the Eastern Cape Province (Carstens *et al.,* 1993, Du Plessis, 1997, Lambrecht, 1998 & Chikte *et al.,* 1989). Only one study clearly indicated the periodontal status of 12-year-old children in a rural area in the Eastern Cape Province (Chikte *et al.,* 1989). One study indicated dental fluorosis (Lambrecht, 1998). No studies on the prevalence of malocclusion or oral manifestations of HIV infection in 4-15-year-old children have been found for the Eastern Cape Province. Only eight studies on oral manifestations in South Africa could be found, but none were conducted on 15-year-old schoolchildren (Blignaut *et al.,* 1999, Blignaut & Glick, 1997, Arendorf *et al.,* 1998, Arendorf *et al.,* 1996, Maresky, 1994, Maresky, 1996, Todes *et al.,* 1997 & Naidoo *et al.,* 1994).

DENTAL CARIES

The whole population strategy is implicated in the prevention of caries. The addition of fluoride toothpaste together with the changed norms of behaviour can lead to caries reduction in developing countries. Improved public hygiene and better nutritional status leads to a greater resistance to infections. The implication of these findings leads to a major improvement in the prevention of disease. The whole population strategy seeks to control the causes of the incidence of dental caries, by identifying and controlling the relevant factors which may reduce the incidence. It is a radical approach for it determines the root of the

problem. The more effective the basic prevention strategy, the lesser the group of the population will be who will require individual prevention and treatment (Fejerskov, 1985).

South African dental caries data indicates a lack of rural epidemiological data, which results in the neglect of dental health care in rural communities (Carstens *et al.,* 1993). It has therefore become necessary that information regarding the oral health status of these communities should be collected to help in the planning and implementation of oral health services in these communities (Chikte *et al.,* 1989 & Gugushe & Rudolph, 1989). This is also a matter of urgency as it has been found in isolated studies that the prevalence of dental caries is increasing in children of rural developing communities (Sheiham, 1984). The picture, however, is not all that gloomy. Commodities, like sugar, chocolate, coke, etc., are becoming more available to rural communities and only a few rural communities are so isolated that oral health services is difficult to deliver (Moola & Vergotini, 1988).

Differences in the caries prevalence between urban and rural areas are shown in all South African studies (Carstens *et al.,* 1993 & Chikte *et al.,* 1991). The equitable distribution of resources, like human resources and equipment, for service delivery between urban and rural areas will eradicate the difference between these communities, as created in the past by racism and "apartheid". Data on urban and rural areas will enable us to deliver an accessible, quality and affordable dental service to the community as a whole (Carstens & Louw, 1996).

Gender differences gave mixed results: some studies indicate no gender differences (Carstens *et al,* 1993 & Cartens *et al.,* 1995), other studies indicate higher prevalence in girls than boys

(Chikte *et al.,* 1990), and studies with a higher prevalence in boys than girls (Moola & Vergotine, 1988), which may depend on the population group studied.

The non-availability or irregular dental services to rural areas, the lack of transport, or lack of finances results in a large number of teeth extracted and large numbers of caries left untreated (Cartens *et al.,* 1993 & Rudolph & Brand, 1989).

All South African studies were different population groups were included, shown significant differences in the dental status of these different population groups (van Wyk, 1994; Reddy, 1992; Hargreaves *et al.,* 1990; Cleaton-Jones *et al.,* 1983; etc.).

The dental caries trends in South Africa from 1985 to 1999, were studied in 57 documents (reports, articles and literature reviews) to establish the prevalence of dental caries for the 4-5-, 6-7-, 12- and 15-year-old age groups. Difficulty to compare some of these documents is experienced due to different aims and objectives, criteria, sample sizes and average age of samples.

Studies are mostly conducted on schoolchildren. Only a few studies were conducted on preschool children, therefore difficulty to establish the prevalence and incidence of dental caries in this group were experienced. Over the last twenty years no data for this age cohort in the Eastern Cape Province were found, therefore the need strongly exist and justifies this survey. Studies in Africa indicate that the prevalence in this group is increasing (Holm,

1990). Dental caries increases with age, therefore the preschool children are the crucial group to establish good oral hygiene practices in, to prevent or control dental caries.

The dental caries trends for 4-5-year-old children were studied in 13 documents (reports, articles and literature reviews). Three articles comment on data for South Africa (Chosack *et al.,* 1988, Graham *et al.,* 1993 & Richardson & Cleaton-Jones, 1986) and indicate that the average dmft for 4-year-olds is 3.42-8.2 and for 5-year-olds 2.09-9.83 (Appendix 2: Table I). The prevalence of dental caries increased from 1976/78 to 1984, in the Black (74% to 81%), Indian (44 % to 52%) and Coloured (75% to 85%) children. The prevalence of dental caries decreased from 81% to 48% in the White preschool children; therefore only White children indicated a decline in dental caries. Chronological the latest data indicates a dmft of 8,2 and only 39% caries free 4-5-year-old children in South Africa (Graham *et al.,* 1993).

Dental caries data for 6-year-old children in South Africa indicates that only six (Lambrecht, 1998, Carstens *et al,* 1993, Du Plessis, 1997, Reddy, 1992, van Wyk, 1994 & Du Plessis *et al.,* 1996) of the ten studies, were conducted in the Eastern Cape Province (Appendix 2: Table II). Two are data on the National Oral Health Survey 1988/89 (Reddy, 1992 & van Wyk, 1994), which included only the urban metropolitan area of Port Elizabeth. Two documents reported on the data of the survey conducted in the metropolitan area of Port Elizabeth and Despatch, showing a dmft of 2.55 – 4.96 for 6-year-old children (Du Plessis *et al.,* 1996 & Du Plessis, 1997). Two studies were conducted in the rural areas of the Eastern Cape. In the Langkloof the mean DMFT = 1.37 ±1.55 and dmft = 9.51± 4.36 for 6-year-old children of whom only 1.36% were caries free (Cartens *et al.,* 1993) and in Graaff-Reinet a

mean DMFT = 0.6 and dmft = 3.41 for 6-year-old children of whom only 20.7 % were caries free (Lambrecht, 1998).

The data on 6-year-olds in South Africa indicates that the dental caries prevalence is high in the primary and low in the permanent dentition. Due to different results for the ethnic groups (Reddy, 1992 & Van Wyk, 1994), the dmft is indicated as follows: Black (dmft = 3.1), Coloured (dmft 4.1 – 9.51), Indian (dmft = 4.1) and White (dmft = 2.5) children. The percentage of caries free 6-year-old South African children were 27.9% in 1988/89 (van Wyk, 1994), and respectively 32%, 21%, 24% & 41% for Black, Coloured, Indian and White children (Reddy, 1992).

The WHO dental data bank in 1982 indicated that over the last twenty years the number of dental caries in 12-year-olds increased in undeveloped countries (DMFT = <1 to 4.1), while industrialized countries showed a decline (DMFT = 10 to 3.3). The decrease in most industrialized countries can often be linked to an increasing use of fluorides and the increase in developing countries to the higher consumption of sugar (Sheiham, 1984). Several industrialized countries have serious dental caries like Eastern Europe, Finland and Japan. Some developing countries show alarming rises in caries prevalence in 12-year-olds, like South Africa (Johnson, 1991). In Europe the dental caries prevalence for 12-year-olds was documented as low in seven countries, like Denmark, Malta, Netherlands, Scotland, Switzerland, USA and Sweden, the DMFT ranging from 1.6 to 2.4. Five countries documented very high caries prevalence like Belgium and Yugoslavia, with a DMFT ranging from 6.1 to 6.9 (Marthaler, 1990).

The dental caries data for 12-year-old children in South Africa were studied in 21 articles. Only five (Carstens *et al.,* 1993, Du Plessis, 1997, Reddy, 1992, van Wyk, 1994 & Chikte *et al.,* 1990) of these articles were conducted in the Eastern Cape Province (Appendix 2: Table III). Two studies are data on the National Oral Health Survey 1988/89 (Reddy, 1992 & van Wyk, 1994), which include only the urban metropolitan area of Port Elizabeth. One document reported on the data of the survey conducted in the metropolitan area of Port Elizabeth and Despatch indicated a mean DMFT = 1.1-1.7 for 12-year-old children (Du Plessis, 1997). The two studies in the rural areas of the Eastern Cape, the study conducted in Engcobo indicated a mean DMFT = 1.7 for 12-year-old children of whom 47 % were caries free (Chikte *et al.,* 1990) and the study in the Langkloof indicated a mean DMFT = 4.73 for 12-year-old children of whom 13.84 % were caries free (Carstens *et al.,* 1993).

The data on 12-year-olds in South Africa indicate a dental caries prevalence of between 53 - 86%, with a DMFT of between 1-5. The different results for the ethnic groups (Reddy, 1992 & Van Wyk, 1994), indicate the DMFT as follows: Black (DMFT = 1.7), Coloured (DMFT = 2.1), Indian (DMFT = 1.3) and White (DMFT = 1.8) children. The mean DMFT for 12-year-olds is 1.7. The percentage of caries free 12-year-old South African children in 1988/89 (van Wyk, 1994), are respectively 46%; 39.5%; 49.5% & 43.2 % for Black, Coloured, Indian and White children (Reddy, 1992).

Dental caries data for 15-year-old children in South Africa were studied (Appendix 2: Table IV). We find that only three (Du Plessis, 1997, van Wyk, 1994 & Rudolph & Brand, 1989) of the seven articles were conducted in the Eastern Cape Province (Louw *et al.,* 1995, *Carstens*

et al., 1995, Chikte *et al.,* 1991 & Du Plessis *et al.,* 1993). One is data on the National Oral Health Survey 1988/89 (van Wyk, 1994), which included only the urban metropolitan area of Port Elizabeth. One document reported on the data of the survey conducted in the metropolitan area of Port Elizabeth and Despatch indicated a mean DMFT = 2.5-3.6 for 15-year-old children (Du Plessis, 1997). One study in the rural Transkei indicated a mean DMFT = 5.8 for 13-20- year-olds of whom only 16.9 % were caries free (Rudolph & Brand, 1989).

The data on 15-year-olds in South Africa indicates a dental caries prevalence of between 70 – 83 %, with a DMFT of between 3-6. Due to the different results for the ethnic groups (Van Wyk, 1994), the DMFT is indicated as follows: Black (DMFT = 3), Coloured (DMFT = 4.2), Indian (DMFT = 2.5) and White (DMFT = 4) children. The mean DMFT for 15-year-olds is 3.3. The percentage of caries free 15-year-old South African children in 1988/89 (van Wyk, 1994), are respectively 29.3%, 21.8%, 31% & 19.9 % for Black, Coloured, Indian and White children (Reddy, 1992).

PERIDONTAL DISEASE

The concepts known on periodontal disease in South Africa implicates the high-risk strategy, which includes improved methods for health screening and public health planning in the management, control and treatment of periodontal disease. The periodontal health is improving and the periodontal problems are better understood, because the early reports contain methodological flaws in selection, diagnostic criteria and treatment philosophies, we have been brainwashed by averages, earlier any deviation from the normal was recorded and

the definitions of health and disease are not easily formulated in periodontology. The developing countries such as South Africa show many differences in race, religion, nutrition and health benefits, attitudes and behaviour (Johnson, 1991).

Periodontal diseases seem to be a much more problem in the developing countries in terms of poorer oral hygiene and greater calculus retention. Severe periodontal destruction seems to be a limited problem which leads to excitement on the research scene, by proposing high risk for a minority it indicates the relative safe majority and the outlook for periodontal health in populations looks better than ever, although changing risk factors do exists such as changes in acquired immune defects, endocrine and metabolic status, inflammatory disorders, diet, iron and vitamin deficiencies, drugs, habits, ageing and psychological stress. The emphasis of periodontal breakdown risks are culminated on the tail end of the population, namely the people which are more exposed to risks or have lower resistance such as the mentally, physically and genetically handicapped (Johnson, 1991).

The choice of a strategy in planning the periodontal health is a clever combination of the risk and population strategies. The risk strategy identifies those whom may develop the disease by use of predictive markers (future markers) or presences of early features of the disease. Risk strategy does not seek to alter the underlying cause of the disease, or the factors initiating the disease or prevent new cases. The population strategy seeks to control the disease determinants, to lower the mean level of risk factors and to shift the exposure in a favourable direction. Emphasizing the general factors of public hygiene, education and nutrition by means of health promotion, education and campaigns, which are

- Low in costs and harmless, such a campaign is the tooth brushing promotions which is widely accepted by the public.
- The search for disease susceptibility markers and activity must continue. Identification of risk factors is necessary for proper scientific basis for strategies to shift to a lesser risk.
- The prevention of periodontal destruction is therefore essential for aesthetic promotion and functional dentition, and means shifting the distributing factors towards a reduced exposure to risk and reducing the rate of progression.

In future the identifying of true risk factors and the biotechnology for devising potentially valuable disease markers is apace (Johnson, 1991).

The National Oral Health Survey (NOHS) of 1988/89 and 17 other documents on the prevalence of periodontal disease in 4-15-year-old children in South Africa were studied. Eleven documents were excluded from the study for one document used the oral debris index (DI-S) and not the CPITN (Cleaton-Jones *et al.,* 1984). Two studies were excluded for the periodontal status of handicapped populations was assessed (Bamjee *et al.,* 1999 and Gugushe, 1991). Two studies assessed the adult population (Louw *et al.,* 1989 and Gugushe, 1998) and one study indicated the correlation between dental caries and oral hygiene practices in infants (Gordon & Reddy, 1985). Two studies reviewed the CPITN index (Hartshorne *et al.*, 1987 & Gugushe & Rudolph, 1989). Two studies were beyond the scope of this survey, one study on 12-year-olds in Swaziland (Gugushe *et al.,* 1993) and one study in Kuilsriver commented on the need and uses of toothbrushes (Hartshorne *et al.,* 1994). The

unpublished survey in Graaff-Reinet on 6-7-year-olds scholars (Lambrecht, 1998) has no correlating age group in this survey. The NOHS 1988/89 and the five documents were tabled to assess the prevalence of periodontal disease in South African, for 4-15-year-old children (Appendix 2: Table V).

Periodontal disease presents a major public health problem in the poorer or less developed countries, even in developed countries in the world. Researchers and administrators need to prevent and control periodontal disease. They need to plan oral health programs and assess the required dental personnel (Gugushe & Rudolph, 1989). Poor oral hygiene is closely associated with periodontal diseases (Gugushe *et al.*, 1993). Plaque accumulation is also closely associated with the development of dental caries, therefore the CPITN index to measure the periodontal status in developing third world populations can be useful, to indicate children at high risk in longitudinal studies (Cleaton-Jones *et al.*, 1991).

The World Health Organization's Community Periodontal Index for Treatment Needs (CPITN) is a practical procedure to assess the periodontal status of different populations and age groups. The index is also used to assess the periodontal status and treatment needs of infancy and disabled populations. Originally the CPITN index was intended for epidemiological purposes, but was also adopted for promotional activities and monitoring periodontal treatment needs (Gugushe & Rudolph, 1989). Ainamo et al (1982) described the use of the CPITN index and the recommendations of use. The recommendations stated that under the age of 20 years the periodontal status are based on the recordings of the examination on the 16, 11, 26, 36, 31 and 46. In the 7-11 years of age only the index teeth are

examined for bleeding and calculus and/or overhangs of fillings, and the presence of pathological pockets are all recorded as the need for oral hygiene instructions (Code 1). The CPITN appears to be a quick and simple method to assess the periodontal treatment needs in a community, but the findings result in an overestimation of resources. The reasons for overestimation are: minority of marginal inflammation progress to periodontal destruction, that periodontal treatment is effective in halting the progression of disease and the role of community programme and mass education are not taken into account (Louw *et al.,* 1989 and Gugushe & Rudolph, 1989). The CPITN index ignores the fact that periodontal disease can be prevented through social and behavioral means (Gugushe & Rudolph, 1989). The accuracy and the reliability of clinical examinations are therefore crucial for evaluating diagnosis and therapy. The aim of training, standardization and calibration of examiners are to ensure the minimum clinical disagreement within and between examiners (Hartshorne *et al.,* 1987). CPITN remains as a useful tool to establish periodontal treatment need and promotion of good health, but planners must take available resources into estimations and establish the treatment priorities. Auxiliary personnel can do the in the communities. Management of periodontal disease is a primary health care problem (Louw *et al.,* 1989). The knowledge of the periodontal status of a population is thus required for appropriate planning of public dental health services (Gugushe *et al.,* 1993 & Louw *et al.,* 1989).

Periodontal disease in developing countries, like South Africa, is prevalent at an early age (Chikte *et al.,* 1989). The association between periodontal status and dental caries was clearly indicated in four documents (Gugushe *et al.,* 1993, Cleaton-Jones *et al.,* 1991, Hargreaves *et al.,* 1990 & Hartshorne *et al.,* 1994). Significant differences in the accumulation of calculus

between rural and urban areas were found in three documents (Gugushe *et al.,* 1993, Chikte *et al.,* 1989 & Hargreaves *et al.,* 1990). No significant differences in periodontal status were recorded on gender (Gugushe *et al.,* 1993).

- The only data on 5-year-olds in South Africa indicated that the prevalence of periodontal disease is 60% in the rural and 27% in the urban areas (Cleaton-Jones *et al.,* 1991).
- The study in Graaff-Reinet indicated excellent results of 6-7-year-old scholars for periodontal disease prevalence was only 17%. The fact that a school-brushing program has been present in this town for nearly eight years can justify the results obtained (Lambrecht, 1998).
- Data on 12-year-olds in Transkei indicated healthy periodontiums in 5.7 %, with gingival bleeding in 23.2% and calculus in 71.3 %. This group needed oral health instructions in 94.5 % and prophylaxis in 71.3 % (Chikte *et al.,* 1989)
- A selected population in Transkei between the age of 13 - 20 indicated that 100 % were in need of oral hygiene instructions, only 14 – 20 % presented with healthy periodontiums; 77-86 % with bleeding and in 3 % calculus were present (Rudolph & Brand, 1989).
- In KwaZulu Natal, data on 11-year-olds indicated a healthy periodontium in ± 50 %, with gingival bleeding in 19 – 25 % and calculus in 23 - 31%. This group needed no treatment in ± 50 %, oral health instructions in ± 50 % and prophylaxis in 23 – 31 % (Hargreaves *et al.,* 1990 & Mackeown *et al.,* 1995). The need for periodontal treatment was much higher in the Transkei, than in Kwazulu Natal.

- The urban data of the NOHS indicated that in the 12-year-olds the need for periodontal treatment in the Black children was by far the most unmet. 95.2 % needed oral hygiene instructions and 79.9 % needed scaling and prophylaxis. The prevalence of periodontal disease indicates that only 2.7 % of 12-year-olds had healthy periodontiums, 15.9 % presented with bleeding and 81.2 % with calculus. The data indicated a similar trend for 15-year-old children for 98.1 % needed oral hygiene instructions and 86.9 % needed scaling and prophylaxis. Prevalence indicated that only 1.8 % had healthy periodontiums, 11.3 % presented with bleeding and 85.4 % with calculus (van Wyk, 1994).

These results and the fact that the population of the Eastern Cape Province is 76.7% ethnically Black, the desperate periodontal treatment needs are highlighted.

DENTAL FLUOROSIS

Several factors can cause or attribute to fluorosis, like environmental and nutrient factors (El-Nadeef & Honkala, 1998). The fluoride content of drinking water is closely associated with fluorosis. The fluoride content of the water is also known to affect the prevalence of dental caries.

The prevalence of dental fluorosis appears to be increasing in the world. In Canada the current dental fluorosis ranges from 35-60% in fluoridated areas and 20-45% in non-fluoridated areas. In the United Kingdom the prevalence of opacities in the enamel of

permanent teeth in 12-year-olds are 39% (Rodd & Davidson, 1998). Dental fluorosis does not occur to be a public health concern in the United Kingdom (Holloway & Ellwood, 1997). In Michigan, United States of America, the prevalence of dental fluorosis was 36% in 1103, 6-12-year-old children, using the tooth surface index of fluorosis (TSIF). The fluoride content of the water averaged 1.2 ppm (Szpunar & Burt, 1988). From 1930 to 1980 the largest increase in dental fluorosis in America was recorded in the sub optimal fluoride (>0.7 ppm) areas, this increase can be explained by the exposure to multiple sources of fluoride (Beltran-Anguilar *et al.,* 2002). In North America the increase in fluorosis was primarily in the very mild and mild categories for the prevalence of fluorosis ranges between 35-60% in fluoridate communities and 20-45% in non-fluoridated areas (Clark, 1994). The 12-year-olds in Nepal had a dental fluorosis prevalence of 9% (Milson *et al.,* 1997). In Naples, Italy the 11-13-year-old children had a dental fluorosis prevalence of 9.8% in low fluoride (0.3 ppm) areas, 23% in optimal (1 ppm) areas and 53.1% in high fluoride (4 ppm) areas (Angelillo *et al.,* 1990). In Sudan no significant differences were recorded between low (0.25 ppm) and high (2.5 ppm) fluoride areas (Ibrahim *et al.,* 1997). In Kenya the prevalence of dental fluorosis was 44% two decades ago. The concentration of fluoride in 11 boreholes ranged from 2.8 to 6.8 ppm. The WHO recommended a maximum concentration of 1.5 ppm. Recommendation for de-fluoridations, such as education, water storage tanks, household-based de-fluoridation and preventative interventions, were advised (Mwaniki *et al.,* 1994). In Australia community water fluoridation continues to be the effective socially equitable measure for caries prevention (Spencer *et al.,* 1996).

The prevalence of dental fluorosis in South Africa from 1985 to 2000 for 4-15-year-old children was studied in 18 documents (reports, articles and literature reviews). Seven articles were summarized (Appendix 2: Table VI) to establish the prevalence of dental fluorosis (Carstens *et al.,* 1995, Du Plessis *et al.,* 1995, Lambrecht, 1998, Lewis & Chikte, 1991, Lewis *et al.,* 1992, Grobler *et al.,* 1986 & Zietsman, 1991). Two articles reported on the same study in KwaNdele (Lewis & Chikte, 1991 & Lewis *et al.,* 1992). In a study in Port Elizabeth and Despatch, dental caries experience of 12-15-year-olds was higher in low fluoride (0.05 ppm) area, but in the 6-year-old group, caries experience was higher in the primary dentition in the high fluoride (0.62 ppm) area (Du Plessis *et al.,* 1993). The articles indicated that the prevalence of dental fluorosis in South Africa is high (ranging from 52.7% to 100%) irrespective of the fluoride content of the water (ranging from 0.1 – 9). These studies indicate a prevalence of 73.33-80%, 15.9-91.9% and 16.8-80% for 6-, 12- and 15-year-olds, respectively.

- The prevalence of fluorosis in 6-year-olds were 73.33% in Fraserburg, where the water fluoride content ranges from 0.68- 0.78. Fluorosis increases with age and affects more males than females with age, due to the length of time of ingestion, meteorological and economical factors and physical stress exposure. The optimum fluoride level was suggested to be 0.4 ppm F in this area (Carstens *et al.,* 1995).
- The prevalence of fluorosis in 6-year-olds was 73 % in Graaff-Reinet, where the water fluoride content ranges from 0.21 – 2.63 mg/L (mean of 0,79 mg/L). Dental fluorosis was significantly higher in the urban (82%) than the rural area (37%). The fluoride content of the urban water was 0.85 mg/L and the rural water 0.71 mg/L. The question arises whether the higher concentration of fluoride in the drinking water

or the more readily availability of fluoride toothpaste to the urban community affects this higher prevalence of fluorosis in the urban area, or is it a combination of both. Further investigation must be conducted to answer this question (Lambrecht, 1998).

Five studies indicated that no significant difference could be found in the prevalence of dental fluorosis between high and low concentrations of fluoride in the water. A higher prevalence of fluorosis than expected was found in areas with low concentrations of fluoride (Carstens *et al.,* 1995, Du Plessis *et al.,* 1995, Lewis & Chikte, 1991, Lewis *et al.,* 1992 & Zietsman, 1991). The high average temperatures and the high altitude can be taken into consideration for this high prevalence (Lewis *et al.,* 1992). One study indicated the difference between prevalence of fluorosis in low and high fluoride areas. The high fluoride area (3.7ppm F) had a prevalence of 97.1% in comparison with the prevalence of 57.6% in a low fluoride area (0.62 ppm F) in the same area (Grobler *et al.,* 1986). The gender difference was indicated in the Fraserburg study, but an ethnic population difference was indicated (Carstens *et al.,* 1995). A study in the OFS Goldfields determined that the White population received more fluoride, thus the caries prevalence are definitely influenced by fluorides, for they were less affected by dental caries than the Black population in the same area (Du Plessis *et al.,* 1995).

The relationship between the reduction in caries prevalence and the fluoride content of the water was illustrated in a comparative study in Port Elizabeth (Du Plessis *et al.,* 1995). The study indicated the benefit after only 16 months of fluoridating water (0,62 ppm F) on the permanent teeth of 12- and 15-year-old children in comparison of their counterpart with

natural water (<0,1 ppm F). A negative effect on the primary dentition of 6-year-olds was recorded (Du Plessis *et al.,* 1996).

Water fluoridation results in a decrease in dental caries levels (Du Plessis *et al.,* 1995). Fluoride in the water slows the progression of smooth surface caries, but the most susceptible area of the tooth, the fissures do not appear affected by fluoride in the water (Ripa, 1985). Fluoride levels above the optimum level for an area may lead to dental fluorosis in children. The optimum level of fluoride in water for South Africa is indicated to be 0.6 – 0.8 ppm (Moola, 1996) and should never rise above the level of 0.7 ppm, if we wish to prevent fluorosis (Du Plessis, 1997). Water fluoridation can contribute positively to achieve equity (Chikte & Brand, 1999). The information gained in these four articles can be useful to policy makers and authorities in implementing water fluoridation through administration and legislation.

The concentration of fluoride in the drinking water of the different towns in the Eastern Cape Province can be selected from two articles. These articles enable us as professionals to advise the public of the correct use of topical fluorides in association with the fluoride in drinking water (Dreyer & Grobler, 1984 & Grobler *et al.,* 1991).

MALOCCLUSIONS

The prevalence of malocclusion was studied in 35 documents (reports, articles and literature reviews) from 1975 to 2000. One study in a group of urban Zambian Black 9-12-year-old

children indicated 17% of the children needed orthodontic treatment, of whom 5.2% needed specialized treatment. The occlusal index of Summers (1966) was used. The malocclusion status of Zambian children was very similar to the epidemiological recording on South African and Swazi Black children (Ghabrial *et al.,* 1998). The occlusal index of Summers was used to determine the malocclusion status of 342, 13.2-15.6-year-old rural Venda children. Twenty-eight per cent of the children required orthodontic treatment of whom 12% needed specialized treatment with fixed appliances (De Mûelenaere *et al.,* 1992). Only three orthodontic articles (Hiles, 1985, Zietsman, 1980 & Ackerman & Profitt, 1979) and five articles on treatment needs, prevention and interception for orthodontics in South Africa are applicable for this study (De Mûelenaere, 1997; Zietsman, 1979; van der Watt *et al.,* 1984; Jones, 1994 & Roux, 1991).

The use of the Dental Aesthetic Index (DAI) is based on socially defined aesthetic standards. The index is useful in epidemiological surveys to identify the unmet need for orthodontic treatment and as a screening device to determine the priority for subsidized treatment (Jenny *et al.,* 1993). The Angle (1988) classification, Steiner (1953) and the Occlusal Index of Summer (1966) are the indices frequently used in the South African studies. Three divisions compromise the Occlusal Index System (O.I.). These divisions coincide with the Angle classifications. The three divisions are again divided into seven syndromes and a scoring device was introduced to compute the severity of the malocclusion (De Mûelenaere *et al.,* 1992).

The report of the National Oral Health Survey 1988/89 (NOHS) and ten articles describe the prevalence of malocclusion in South Africa (De Mûelenaere *et al.,* 1992, Van Wyk *et al.,* 1985, Kotze *et al.,* 1982; Burger *et al.,* 1993, De Mûelenaere & Viljoen, 1987, Ackerman & Wilsthire, 1994, Zietsman, 1979, Harris *et al.,* 1994, Swanepoel, 1985 & De Mûelenaere & Wilsthire, 1995). Data on the prevalence of malocclusion in 12-year-old children in the Eastern Cape Province could not be found. The prevalence of malocclusion will only be done on 12-year-olds in this survey, therefore only data on 12-year-olds in the South African literature review will be used to predict trends in South Africa (Appendix 2: Table VII) and orthodontic treatment needs (Appendix 2: Table VIII). This is not an easy task for data indicated differences in malocclusion for the different ethnic groups in South Africa. Different indexes were used in studies. The prevalence of malocclusion was 18.9% for the 12-year-olds in South Africa. The NOHS report indicated that 53.6 % of all 12-year-olds in South Africa have a good occlusion. No treatment was needed in 71.1%. Treatment was needed in 29% of which 1.8% was urgent. The Black population had the best occlusion, 75.1 % needed no treatment, in comparison with the White population group that needed treatment in 31.8% of participants, whom 2.1 % were urgent (Van Wyk, 1994 and Zietsman 1979). Preventive and conservative dentistry was needed (Van Wyk *et al.,* 1985).

A study done in Venda describes the difference in prevalence on malocclusion between the rural and urban areas. This study indicated that the prevalence of malocclusion was higher among the urban community. 83% of the rural and 72% of the urban community had a good occlusion and was in need of no treatment. 17% of the rural and 28% of the urban community were in need of orthodontic treatment, of which respectively 5% and 12% were

urgent (De Mûelenaere *et al.,* 1992). In some of these studies only urban samples (NOHS) or selected samples (Harris *et al.,* 1994) or certain groups (Kotze, 1982) were examined, and cannot be used to indicate prevalence or the severity for the age cohort of 12 years for the studies are not representative of the population.

Malocclusion can affect the body image and self-concept of children. After successful treatment the same satisfaction in this regard is restored, than in a control group (Van der Watt *et al.,* 1984). Malocclusion has different aetiological factors, such as thumb sucking, which are seen more commonly in introverts (Roux, 1991). Socio-economical class influences orthodontics for the first molars were absent in 33.6% of children of a lower socio-economical class, when compared to a high class for only 13.5 % children had absent molars (Zietsman, 1980). The absence of molars can contribute to temporomandibular disorders (Jones, 1994).

The routine screening of 9-year-old school children proved not to be cost-effective, due to non-attendance or disagreement with treatment (Hiles, 1985), therefore preventive and interceptive orthodontic treatment (Ackerman & Profitt, 1979) is advised for public dentistry practices. Public dental health professionals must be able to identify malocclusions and provide a sliding scale for priority treatment depending on the manpower and material resources available (Zietsman, 1979).

A longitudinal study indicated that 12.1 % of the children studied presented with a malocclusion after two years previously with an acceptable occlusion. A re-examination on

children after two years, indicated that 97% of the children examined earlier now presented with malocclusion of whom only 32.4 % received treatment during this period. Only 3.3 % of the children was treated at state clinics. Bi-annual orthodontic screening of 7-12-year-old children and the introduction of preventive and interceptive orthodontic treatment are suggested for state clinics to achieve the Primary Health Care objectives for South Africa (De Mûelenaere, 1997).

The purpose of establishing the prevalence of malocclusion was:

- To establish the need for treatment
- To compare the data in this survey with previous studies undertaken in South Africa
- To create the necessary baseline data for this region of the Eastern Cape Province to determine current trends and possible future predictions on resources, like human, budget, etc. for the treatment needs

ORAL MUCOSAL LESIONS

The causative virus of Acquired Immunodeficiency Syndrome (AIDS) is the Human Immunodeficiency Virus (HIV). HIV is carried in the blood and body fluids of infected individuals. The virus has three main routes of transmission namely: blood, sexual and peri-natal transmission. HIV has been found in blood, semen, cervial and vaginal secretions, tears, saliva, urine, breast milk, cell free plasma and cerebrospinal fluid (Martin, 1999). The World Health Organization (WHO) estimated that 33 million people are living with HIV/AIDS in the world, of whom 70% are residing in Sub-Saharan Africa. India, Asia and South Africa

have explosive HIV epidemics (Martin, 1999). During 1998, 70% of the people who became HIV-infected resided on the African continent. In South Africa, 1 in 3 pregnant women are HIV seropositive and 8 out of 10 HIV infected women in the world live in Africa (Naidoo & Chikte, 1999). HIV was first reported in South Africa in 1982 and since then had an impact on every sector and community in the country. Daily 1 500 people become infected with HIV in South Africa (Martin, 1999). India currently has the most and South Africa the second most HIV infected people per country in the world (Rudolph & Ogunbodede, 1999). In South Africa roughly 1 out of every 10 people harbor the HIV infection (Martin, 1999). In the South African population this means that 1 out of every 4 adults carries the virus and 1 in every 7 new infections on the African continent will be in South Africa (Schmidt, 1999).

Several factors fuel this pandemic, like poverty, malnutrition, gender inequality, sexual and cultural practices. The spread of HIV in sub-Saharan Africa are influenced by poverty, malnutrition, social migration, unemployment, migrant labour systems, gender inequality, civil upheavals and war (Naidoo & Chikte, 1999). The appearances of HIV/AIDS are strikingly different in Africa than in the developed world. The epidemiology, virology, immunology, clinical aspects, mode of transmission and oral manifestations are different in Africa (Naidoo & Chikte, 1999).

HIV infection ranges from asymptomatic clinical features to severe clinical illness (AIDS). The onset of HIV infection symptoms varies and can be between 5-6 months till 9 years, depending on other factors, such as gender, age, drug habits, immunogenesis, etc. Opportunistic infections such as Tuberculosis (TB), mucocutaneous disorders and sexually

transmitted diseases (STD) relate to the HIV/AIDS pandemic. STD`s fuel this pandemic. Untreated STD conditions increase the risk of HIV infection by 300-400%. A quarter of all syphilis cases occur in HIV-positive patients. In Africa, the opportunistic infection most commonly related to HIV/AIDS is TB. Kaposi`s sarcoma (KS) is an AIDS-defining condition in Africans. The oral cavity is the first or only site of this lesion, most commonly seen on the palate (Naidoo & Chikte, 1999).

The increasing number of HIV-infected patients presenting for routine treatment may present with oral manifestations of HIV infection or with symptoms or/and signs (Arendorf *et al.*, 1999). Oral lesions are useful in the staging and classifying of the disease. Oral mucosa has unique features, which are extremely sensitive to any local and systemic influences, thus a wide spectrum of lesions manifests in the oral mucosa. Oral mucosal lesions (OML) are divided into three groups, namely the OML predominantly of local origin, the OML predominantly of systemic origin and those OML`s direct/indirect response to therapeutic measures/procedures applied to combat other diseases. The morphology of the OML can be divided into ulcerative, white, red, combined white and red, pigmented, vesicles, bullae, exophytic (inflammatory) or infiltrative (neoplastic) lesions (Maresky, 1996). Oral manifestations of HIV infection can be divided into three groups namely fungal, viral or bacterial infections (Naidoo & Chikte, 1999). Oral lesions are relevant and important in HIV infection, for they can describe the initial presenting signs of HIV infection, early clinical features, predictors of progression of disease and can be useful in the staging and classification. Oral HIV lesions are used as indicators in HIV/AIDS therapy, vaccine trials, anti-HIV and anti-opportunistic therapy (Naidoo & Chikte, 1999). Oral examinations are

inexpensive, non-invasive, simple and quick to perform to screen patients at risk such as pregnant women and patients attending genito-urinary medicine clinics. Oral lesions may be the initial sign or clinical feature of HIV infection, therefore oral examinations can play a vital role in the early detection, diagnose and management of HIV infection. Health care workers need training to understand the diagnoses, management and research of oral manifestations, for erythematous candidiasis is often ignored by physicians and is one of the most common manifestations (Naidoo & Chikte, 1999). Erythematous candidiasis, as an oral manifestation, was most likely the result from HIV transmission through blood transmission (Ramirez-Amador *et al,* 1998). Prompt intervention of early diagnosis of HIV/AIDS oral lesions will reduces morbidity and improves the quality of life of people during the progression of HIV infection (Schmidt, 1999).

Cumulative incidence studies stated that during the course of the disease between 20% and 50% of HIV-infected patients have oral lesions. The prevalence of lesions varies in the different study groups (Itin *et al.,* 1993). Prevalence and incidence studies indicated that 70% to 90% of persons with HIV infection present with at least one oral manifestation during the infection. The most common oral manifestation seen by oral health personnel in a recent study in South Africa indicated that candidiasis, acute necrotising ulcerative gingivitis (ANUG), hairy leukoplakia and Kaposi`s sarcoma was seen the most frequently. HIV-infected patients presented with one or more lesions in 74.4% of cases, of whom 30.4% were symptomatic and 6% with oral complaints led to the diagnoses of HIV infection (Rudolph & Ogunbodede, 1999). Candidal lesions are the most commonly HIV-associated oral diseases

seen in South Africa. Oral hairy leukoplakia, gingival/periodontal lesions, oral ulcerations and Kaposi`s sarcoma occurring less frequently (Arendorf *et al.,* 1998)

Studies on oral manifestations in South Africa are mostly done on samples conveniently (self-elected and hospital based) selected (Naidoo & Chikte, 1999). South African studies indicate that 3.3% of the 600 HIV-positive patients presented initially with oral soft-tissue manifestations (Arendorf *et al,* 1998). A study done at the University of the Western Cape over a period of 34 months indicated that 40 patients (0.35% of patients) presented for treatment for oral lesions. These lesions were oral signs and symptoms prompting to test for HIV infection. The signs and symptoms for a specific lesion were not always the same. Some lesions were asymptomatic. Painful gingivas were reported for 66.6% of these patients (Arendorf *et al.,* 1999). Candidiasis was the most prevalent oral infection in HIV/AIDS patients in Southern Africa (Blignaut *et al.,* 1999).

The above studies and numerous other studies globally indicate that oral lesions are commoner in HIV-infected patients, than healthy patients. The prevalence and the different types of lesions have been described in the literature. In the literature different classifications of the oral manifestations of HIV infections are found. The classification of oral manifestations was found in 6 documents (Arendorf *et al.,* 1996, Pinborg, 1992, Scully *et al.,* 1991, Greenspan *et al.,* 1992, Jordan & Main, 1991, Haring, 1990, Sirois, 1998 & Smith & Croser, 1990). Different associations between the oral manifestations and HIV infection were found in the literature. The oral lesions were also classified into three categories, namely the oral lesions strongly associated with HIV infection, those less commonly associated and that

lesion which may be seen in HIV infection. The classification of Arendorf et al, 1996 will be used for this study will be conducted in South Africa and this classification was developed for South Africa (Appendix 2: Table IX).

In South Africa very little has been published on the oral manifestations seen in children, therefore no meaningful comparisons or comments can be made. The group to be studied in the Eastern Cape Province of South Africa is the 4-15-year-old children. Children older than 13 years are considered to have the disease pattern similar to those seen in adults and therefore can be compared to findings in the adult cohort (Leggott, 1992). Oral manifestations of HIV infection in African countries were found in 29 studies. The prevalence and three most commonly found lesions present in the South African studies were summarized (Appendix 2: Table X).

The African studies indicated that the most common route of HIV infection transmission was heterosexual. Heterosexual transmission of HIV infection ranged between 70% (Arendorf *et al.,* 1997) and 100% (Naidoo *et al.,* 1994). The three most common oral manifestations indicated in the South African studies were candidiasis, periodontal disease and hairy leukoplakia. Some of the studies indicated the prevalence of Kaposi`s sarcoma, angular cheilitis and ulcers. The less common manifestations were herpes zoster and salivary gland disease. The oral manifestations most suspectable in 15-year-old children will be candidiasis, periodontal disease, hairy leukoplakia, Kaposi`s sarcoma, angular cheilitis and ulcers.

The general medical status of all patients should be taken into consideration during examinations, but oral examinations are required to assess the prevalence of oral

manifestations of HIV infection. Fungal infections are very common in HIV-Infected patients. Tinae or yeast infections may present as individual infections or contribute to other skin infections. Seborrheic dermatitis develops in about 80% of HIV-infections and can be complicated by yeast infection. Fungal disease of the nails may be an early symptom of HIV infection. Tinae affects the nail bed and presents as opaque thickening. Lesions can be seen on the palms, soles and groins or intertriginous regions.

Bacterial infections, mostly Staphylococcus aureus, are seen in HIV infected patients presenting as impetigo, bulbous impetigo, ecthyma or folliculitis. A rise in the incidence of syphilis has accompanied the rise in HIV infection. Syphilitic eruptions may be exaggerated in HIV-infected patients. Kaposi`s sarcoma is the most common neoplasm of the skin associated with HIV infections and presents as a thin, oval, red-to-brown plaque. Kaposi`s sarcoma were seen in the beginning of the AIDS epidemic in 60% of the homosexual men on their skin, whereas only 2% of women whom have been sexually active with bisexual men presented this lesion (Jewell & Sweet, 1994).

Candidiasis was the most common oral manifestation of HIV ranging from 24% to 72%, till as high as 94% (Blignaut and Glick, 1997, Maresky, 1996 & Arendorf *et al.,* 1996). The high prevalence in the Maresky study may be due to the late stage of the disease present at the time of the examinations. Oral candidiasis is a useful marker in disease progression (Itin *et al.,* 1993). The average prevalence for candidiasis is 43% in Africa. The most common candidal lesions seen in South Africa are the pseudomembranous and erythematous candidiasis. The erythematous is the precursor of the pseudomembranous variety and early

recognition can lead to earlier identification of HIV-infected persons (Holmes & Arendorf, 1999). Several variants of candidiasis exist and the clinical presentation varies. Candidiasis features as pseudomembranous, erythematous, hyperplastic candidiasis and angular cheilitis.

- Pseudomembranous candidiasis (also known as "thrush") presents as creamy white or yellow plaques on a coloured or normal mucosa. The plaques can be removed revealing a bleeding or red surface. These lesions most commonly affect the palate, buccal (cheeks) and labial (lip) mucosa and the dorsum of the tongue.
- Erythematous candidiasis appears as red lesions, commonly on the palate, dorsum of the tongue and the buccal mucosa. Median rhomboid glossitis with a pseudomembranous element can be seen with a matching palatal lesion.
- Hyperplastic candidiasis (candidal leukoplakia) is white patch, which cannot be mechanically removed by scraping, mostly found on the buccal mucosa. Hyperplastic candidiasis is the least common variant associated with HIV-infection. Candidal leukoplakia is caused by factors such as smoking, dentures and diet.
- Angular cheilitis is characterised by red fissures radiating from the corners of the mouth and is often seen with white plaques. Angular cheilitis appears as cracks, fissures or ulcers in the corners of the mouth (Greenspan & Greenspan, 1991). Angular cheilitis may also be caused by an "over closed" bite in denture wearing patients or nutritional deficiencies.

Early treatment of candidiasis is indicated not only for the discomfort, but it may spread to the pharynx and oesophagus (Naidoo & Chikte, 1999).

HIV-associated periodontal conditions, with a 7.8% prevalence (Arendorf *et al.,* 1996) is classified into four conditions, namely erythematous gingival banding/linear gingival erythema-HIV-gingivitis, necrotising ulcerative gingivitis – HIV-necrotizing gingivitis (AIDS-NUG), necrotising ulcerative periodontitis (HIV-periodontitis) and necrotising stomatitis.

- Erythematous gingival banding presents as a 2-3mm distinct fiery red band along the gingival margin. No correlation between the amount of plague and erythema. Evidence of a candidal infection with spontaneously gingival bleeding and patchy appearances may be present.
- Necrotising ulcerative gingivitis presents as a painful, swollen, deeper pink to fiery red gingival with destruction and necrosis of the interdental papillae. Spontaneous bleeding and halitosis is evident. A whitish pseudomembrane outlines the effect. These conditions can aggress to cancrum oris.
- Necrotising ulcerative periodontitis is characterised by rapid and progressive soft tissue loss, destruction of the alveolar bone, oedema and erythema of the affected gingival and sequestration of bone. Severe deep pain, halitosis, spontaneous bleeding and looseness of the affected teeth.
- Necrotising stomatitis may occur as a consequence of necrotising periodontitis. Ulcero-nerotic lesions can cause destruction, sequestration and exposure of bone, which leads to extension and penetration deeply into the contiguous tissue.

Viral infections associated with HIV-infections are oral hairy leukoplakia (OHL/HL), herpes simplex and varicella zoster infections. Herpes oral hairy leukoplakia (OHL/HL) presents as

asymptomatic, white, vertically corrugated projections on the lateral borders of the tongue. It may spread to the dorsum of the tongue and to the ventral part of the mouth floor. The lesions cannot be mechanically wiped of. Oral hairy leukoplakia can be seen in other immuno-compromised states e.g. in renal transplant patients. Herpes simplex and varicella zoster infections in HIV patients are seen as recurrent herpes labialis and recurrent intraoral herpes infections. Intraoral herpes presents as clusters of small vesicles on the hard palate or gingiva, which becomes ulcerated and covered with a yellow pseudomembrane. An erythematous, well-circumscribed lesion with a white rim can also be present. Herpes labialis is seen as vesicles on the lips or adjacent skin, which ulcerates and crusts. Varicella zoster is not commonly seen, but presents as unilateral vesicles and ulcers in the area innervated by the affected nerve (Arendorf *et al.,* 1993).

Oral ulcerations are fairly common in HIV-infection. They are recurrent, painful, have no obvious cause, do not heal spontaneously and are an indication of immuno-suppression. Some present as recurrent aphthous or herpetiform-type ulcers while others are larger and more extensive (more than 2mm in diameters with irregular borders), which is classified as atypical oral ulcerations.

The prevalence of Kaposi`s sarcoma is 2.2% of oral manifestations seen, therefore the most common malignancy in HIV/AIDS patients (Arendorf *et al.,* 1996). The lesions are reddish, blue or purple, single or multiple macules or nodules. They are typically seen on the palate and gingiva and may be ulcerated.

Salivary gland disease (SGD) was associated with paediatric HIV infection, but has recently also been associated with HIV infection in adults. The cause of SGD is unknown, and presents as salivary gland enlargement, or xerostomia, or both. One or both parotid glands are affected, but seldom the other salivary glands. Xerostomia may occur without gland enlargement. The enlarged gland feels soft and the swelling is diffused. The gland enlarges slowly and the enlargement can result in removal of the gland for aesthetic reasons (Greenspan & Greenspan, 1991).

The criteria to diagnose HIV-related oral lesions in the adult population are well established, but not in the paediatric population. In 1999 it was estimated that three million children worldwide are infected with HIV and 800 000 children will develop HIV in the year 2 000. The majority of infants born with HIV are in developing countries like South Africa. Children develop disease manifestations early in life. Oral manifestations are commonly found in asymptomatic HIV-positive paediatric patients (Ramos-Gomez *et al.,* 1999). In a study in South Africa, 48% of HIV-infected paediatric patients presents with oral lesions and 20% having more than one lesion (Yasin-Harnekar *et al.,* 1999). The most common infection in paediatric patients in South Africa is oral candidiase, which is similar to the adult population (Behardien, 1999). The classification of the oral lesions associated with HIV-infection of Arendorf et al, 1996 will be used in this survey (Appendix 2: Table XI).

The main aim of this study is to determine the prevalence of oral mucosal lesions in healthy 4-15-year-old children, because HIV infection in South Africa is becoming a major health problem (Schmidt, 1999). The diagnosis and treatment of oral manifestations of HIV infections is becoming an important oral health issue for dentists in this country will be

confronted with more HIV positive patients in the future. The majority of the respondents to a questionnaire by the oral health workers indicated that additional education on HIV/AIDS in South Africa is needed, like added knowledge of issues concerning and relevant education of HIV/AIDS infection, infection control, legal and ethical aspects, enhanced personal skills and improved application of universal precautions (Rudolph & Ogunbodede, 1999). The feasibility and necessity for oral health research in this country is also highlighted (Schmidt, 1999 & Arendorf *et al.,* 1999).

CHAPTER III

Materials and Methods

Descriptive epidemiology, using the prevalence parameter, was used to quantify the dental status of the children (Jong, 1996). The survey was conducted on 822 schoolchildren between the ages of 4 –15 years in the Western Region of the Eastern Cape Province. The Western Region consists of the Port Elizabeth, Uitenhage, Humansdorp and Graaff-Reinet Magisterial Districts. The 1996 Census indicated a total population of 1 204 241 for this region.

The protocol was submitted to the ethical committee of the University of Stellenbosch and to the Research Unit of the Department of Health in the Eastern Cape Province for approval.

The oral hygienists employed in the Port Elizabeth and Uitenhage Health Districts by the Department of Health and the author, a principal dentist at the Department, were calibrated and trained from the 28 August 2000 to the 1 September 2000, during a workshop in Port Elizabeth. The examiners were trained and calibrated on the following conditions:

CONDITION	CALIBRATORS
Dental Caries	Prof. JB du Plessis
Periodontal diseases	Dr AJ Louw
Malocclusion	Dr R Drummond
Dental fluorosis	Prof. JB du Plessis
Oral mucosa lesions	Dr. S. Naidoo

The sample consisted of 210 children in all four age groups, namely 4-5-, 6-, 12- and 15-years. A total of 840 children in 28 schools were selected (Appendix 3: Schools selected for the western region of the Eastern Cape Province). The survey was conducted during September to November 2000. The sample consisted of 209, 210, 209 and 194 children in the 4-5-, 6-, 12- and 15-year age groups. 27 of the 28 schools were visited. Only one secondary school in Klipplaat (± 190 km from Port Elizabeth) was not visited due to transport problems during the time frame of the collection of data, therefore only 194 and not 210, 15-years-olds were examined.

The examiner identified the defined population at every school according to the sample size required. The defined population was numbered consecutively and randomly selected using a table of random numbers. Stratified two-stage sampling was used.

Consent for examination of the schoolchildren was obtained from:

- The National, Provincial and Regional Department of Health
- The National Department of Education and education authorities
- The parents or legal guardian of every child before the examination

The completed consent and health questionnaire for every child was obtained from the parent or legal guardian before the examination. A health questionnaire (medical history) accompanied every child's consent form for the parent or legal guardian to complete. The main aim of the health questionnaire was to identify the children to whom a periodontal examination might pose a health risk. Medically compromised children were excluded on

selecting the random sample, thus none were examined. After the examination parents or guardians were notified of the need for treatment for their children by the relevant examiner.

The author supervised and carried out the main survey with the help of the five oral hygienists, using the WHO methods with regard to the dental caries, periodontal diseases, dental fluorosis, malocclusion and oral mucosal lesions ("ORAL HEALTH SURVEYS, BASIC METHODS", fourth edition, 1997, WHO).

Two survey forms were used to collect data.

- The first form was used to record the demographic data, dental caries data, periodontal disease profiles, dental fluorosis and malocclusion assessments. This form was compiled by the various WHO versions.
- The second form was the WHO version for oral mucosal lesion recording.

The following instrumentation and consumables were used for data collection under natural light:

- A WHO periodontal probes and mouth mirrors (No 4). Clipboards, pencils, sharpeners and erasers were used to write up the data collected.
- Hibiscrub, paper towels, rubber gloves, facemasks, portable dental chairs, suitable receptacles for used instruments and autoclave for sterilization were used after examinations. In the rural areas, the single use of pre-autoclaved instruments, cleansed in Cidex was used if no electrical supply for a portable autoclave could be used.

- The use of disposable gloves and masks was compulsory for the survey.

The training and calibrating sessions for all the different dental diseases were done in two stages.

- Stage 1: The WHO guidelines were used to train the examiners. These guidelines were used during the training session and during the survey. Study models, slides, demonstrations and presentations were used to calibrate the examiners. Demonstrations on capturing the data on the survey data forms were used to train and calibrate the examiners. Uniform interpretation, understanding and utilisation were achieved before the next stage was attempted.
- Stage 2: Examiners in this stage examined schoolchildren in age groups in a natural setting, at schools, simulating the main survey. Survey instruments, a mouth mirror and periodontal probe, and data capturing forms for calibration were used to train and calibrate the examiners. Examiners completed both forms per child. Ten percent duplications were preformed. Inter- and intra-reliability was tested between the examiners and the instructor.

The author checked and captured the data. Microsoft Excel 2000 was used to process and analyze all the data, except the data on oral mucosal lesions was analyzed by the instructor, Prof. Sudeshni Naidoo, on the FREQ Procedure of the SAS Computer System and handed to the author.

DENTAL CARIES

Examiners were familiarised with the dentition status and treatment needs of the decayed, missing and filled teeth (DMFT) index, the instruments and techniques to be used during examinations. The training session was divided into two stages:

- Stage 1: The criteria for diagnosis and coding of the dental status of the crowns of primary and permanent teeth were reviewed using the written guidelines of the WHO ("Oral Health Survey, Basic Methods" fourth edition, 1997).
- Stage 2: All examiners achieved a Kappa value higher than 0.81, which indicated an almost perfect agreement in the school examinations.

The DMFT and dmft for the permanent and primary teeth for every child was calculated by adding the decayed (D/d), missing (M/m) and filled (F/f) teeth, thus D+M+F Teeth = DMFT or the d+m+f teeth = dmft. The mean DMFT or dmft per age group was calculated by the sum of the DMFT or dmft of all the children, divided by the number of children in the group. The percentage of caries free children was calculated as the number of free children divided by the total number of children, multiplied by 100. The treatment needs for the permanent and primary teeth were also calculated indicating the percentage of children in need of no treatment, fissure sealants, preventative treatment, one- and/or two-surface fillings and extractions.

The inter-examiner reliability for the different age groups were respectively per examiner:

- 4-5 year - 98.75%, 98.34%, 100%, 100% and 100%
- 6 year – 93.75%, 97.4%, 98.44%, 100% and 100%
- 12 year - 75%, 99.22%, 99.22%, 100% and 100%
- 15 year – 96.88%, 100%, 100%, 100% and 100%

The intra-examiner reliability was tested in the 12-year-old age group and was 76.6%.

PERIODONTAL TREATMENT NEEDS

Examiners were familiarised with the Community Periodontal Index (CPI) of Treatment Needs (CPITN), its instruments and techniques. The training session was divided into two stages:

- Stage 1: The criteria of the CPI were reviewed using the written guidelines of the WHO, 1997.
- Stage 2: Examiners in this stage examined 12-year old children in natural settings. All examiners achieved the level of significance, which was predetermined at the five per cent level of confidence.

The Community Periodontal Index (CPI) for every subject was determined based on the following:

0= Healthy

1= Bleeding

2= Calculus

3= Pocket 4-5mm (black band on probe partially visible)

4= Pocket 6 mm or more (black band on probe not visible)

X= Excluded sextant

9= Not recorded

The Community Periodontal Index of Treatment Needs (CPITN) was determined on the highest score for every sample. The total amount of samples for the different scores was calculated as percentage in need of treatment. Score 0 indicated healthy periodontiums in need of no periodontal treatment. Score 1 indicated bleeding in need of dental education, oral hygiene instructions and polishing. Score 2 indicated the presents of calculus and in need of dental education, oral hygiene instructions, scaling and polishing. Score 3 indicated periodontal diseases in need of dental education, oral hygiene instructions, scaling and polishing. Score 0 indicated the percentage of healthy individuals. Score 1 + 2 + 3 indicated the prevalence of periodontal disease. Score 2 + 3 indicated the need for dental education, oral hygiene instructions, professional scaling and polishing.

DENTAL FLUOROSIS

Examiners were familiarised with the Deans Fluorosis Index (DFI) as stipulated in the protocol of the National Oral Health Survey for South Africa 1998/99, classifying the affected teeth and recording the results. The training session included the following:

- Classifying Dental Fluorosis: The criteria of the Dental Fluorosis using Deans Fluorosis Index was reviewed using the written guidelines of the WHO, 1997. The

instructor presented slides of affected teeth to train the examiners to recognise the severity of the fluorosis. The survey form was also studied to correctly record the dental fluorosis classification. The identification of dental fluorosis conditions was repeated several times to correctly identify the degree of the conditions. The slide identification presentation was repeated three times giving the examiner the chance to familiarize them with the clinical presentation of lesions.

- Training and calibrating: The guidelines were used during the training session and during the survey. Slide presentations on identifying the teeth affected by dental fluorosis and classifying them on the data capturing form were used to train and calibrate the examiners. All examiners achieved the five per cent level of confidence.

Dean's Classification for Dental Fluorosis:

0= Normal

1= Questionable

2= Very mild

3= Mild

4= Moderate

5= Severe

9= Not recorded

The recording was made on the two permanent teeth most affected. The teeth were not cleaned or dried and were examined under natural light. Dental fluorosis was given as percentage of the children studied. Fluorosis scores were combined to indicate normal (Code

0 + 1) and affected (Code 2 + 3 + 4 + 5) children. The affected percentages were divided into mild (Code 2 + 3) or severely (Code 4 + 5) affected children.

MALOCCLUSION

Examiners were familiarised with the Dental Aesthetic Index (DAI), its instruments and techniques. The training session was divided into two stages:

- Stage 1: The criteria of the DAI were reviewed using the written guidelines of the WHO, 1997. Study models and copies of the data capturing form were used to train and calibrate the examiners.
- Stage 2: Examiners in this stage examined 12-year-old children in a natural setting. All examiners achieved the level of significance, which was predetermined at the five per cent level of confidence.

The DAI score for every subject was determined based on the following counts:

DENTITION

136=Missing incisors, canine and premolar maxillary teeth

137= Missing incisors, canine and premolar mandibular teeth

SPACE

138=Crowding in the incisal segment

139=Spacing in the incisal segment

140=Diastema in millimeters

141=Largest anterior maxillary irregularity in mm

142= Largest anterior mandibular irregularity in mm

OCCLUSION

143=Anterior maxillary overjet in mm

144= Anterior mandibular overjet in mm

145=Vertical anterior overbite in mm

146= Antero-posterior molar relation
(Codes 136-146 as in the WHO guidelines)

The total of all the scales were added (136-146) to give the DAI score per subject. A DAI scores of 25 and less indicate a sample has normal of minor malocclusions in need of no or slight treatment, a score of 26-30 indicate a definite malocclusion in need of elective treatment and a DAI score of 30-35 indicates severe malocclusion in need of definite orthodontic treatment.

ORAL MUCOSAL LESIONS

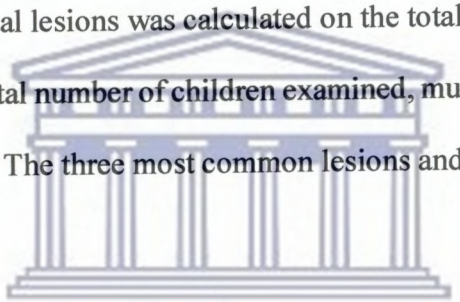
Examiners were familiarised with the WHO guidelines for classification of oral mucosal lesions. The training session consisted of:

- Lesion identification: The WHO guidelines for classification of oral mucosal lesions, relevant articles on oral manifestations of HIV/AIDS and the booklet of Arendorf et al, 1996 " Guidelines for the diagnosis and management of the oral manifestations of HIV infection and AIDS" were studied. Lesions on CD-Rom were presented to train the examiners to recognise conditions and lesions. The survey form was also studied to record correctly the classification of the condition and location of oral mucosa

lesions. The clinical identification of lesions was repeated several times highlighting the clinical features to identify the conditions. The Power point presentation was repeated three times, familiarizing the examiner to the clinical presentation of lesions.

- Training and calibrating: The guidelines were used during the training session and during the survey. A Power point presentation on identifying the oral mucosa lesions and completing the data capturing form was used to train and calibrate the examiners. All examiners achieved the five per cent level of confidence.

The prevalence of oral mucosal lesions was calculated on the total of the children presenting with lesions divided by the total number of children examined, multiplied by 100 to calculate the percentage of prevalence. The three most common lesions and sites were also identified.



CHAPTER IV

Results

DENTAL CARIES

The dental caries status of 822 4-15-year-old children was determined by using a mirror, a blunt probe and a periodontal probe under natural light (Table 1). Six calibrated examiners used the WHO (1997) criteria to determine the prevalence of caries in this region. The inter-examiner reliability was 99.04%, 92.19%, 99.81%, 99.22%, 100% and 99.22% for caries. The intra-examiner reliability was 97.66%. The mean age of the 822 children was 9.2 years.

The prevalence of caries in primary teeth was 63.48% recorded on 419 4-6 year old children. The mean dmft score was 3.65. The dmft were recorded on dt (73.6%); mt (24%) and ft (2.4%), in need of prevention (23%), extractions (26%), one (31%) and two surface fillings (16%). Only two primary teeth needed sealants on 0.5% of the children. The mean age was 6,5 years. Primary teeth examined were 36.52% caries free. The caries free 3-, 4-, 5- and 6-year-olds were 100%, 42.72%, 40% & 30% respectively.

The prevalence of caries in permanent teeth was 41.3% recorded on 443, 5 - 15 year old children. The mean DMFT scores were 1,2 .The DMFT count was recorded on DT (84%); MT (10%) & FT (6%) in need of prevention (11%), fissure sealants (2%), extractions (8%), one (11%) and two surface fillings (14%). Permanent teeth examined were 58.7% caries free.

Table 1: Dental Caries Status: 4-15-year-olds

DATA SUMMARY: 4-15 YEAR OLDS IN THE WESTERN REGION OF THE ECP					
AGE GROUP	4-5	6 (Primary teeth)	6 (Permanent teeth)	12	15
SAMPLE SIZE	209	210	186	209	194
AVERAGE AGE	4.43	5.88	5.88	11.98	14.94
DMFT			0.05	1.2	2.06
% Permanent teeth Caries free			95.24	53.95	32.08
DT			100	51.4	54.25
MT			0	29.32	32
FT			0	19.28	13.75
Dmft	3.6	3.73			
Dt	75.54	77.51			
Mt	22.31	18.08			
Ft	2.15	4.41			
% Primary teeth Caries free	40.29	32.56			
% MALES	50.24	51.43	51.43	48.33	42.78
% FEMALES	49.76	48.57	48.57	51.67	57.22
ASIAN	0.96	1.9	1.9	0.48	2.06
BLACK	52.15	50.48	43.81	56.94	54.64
COLOURED	27.75	26.67	33.34	22.01	23.71
WHITE	19.14	20.95	20.95	20.57	19.59
% FISSURE SEALANTS	0	0	1.43	5.74	5.51

A total of 1667 teeth needed treatment. 448, 61, 645 & 513 teeth needed preventative treatment, fissure sealants, fillings or extractions respectively. One-surface fillings were needed on 452 teeth and two-surface fillings on 193 teeth.

Data was collected at 27 of the 28 schools identified for the Western Region. The one school not examined was due to a lack of transport and the set time frame for the data collection. Significant differences in dental caries status were recorded between the schools.

Dental caries status of 209, 4-5-year-old children indicate a prevalence of dental caries of 60%. The mean age is 4.43. The dmft was 3.56. Only 0.96% of the children had trauma to the anterior teeth. The dmft was recorded on 75.54% decayed (dt); 22.31% missing (mt) and 2.15% filled (ft) teeth. The percentage caries free 4-5- year-olds in the Black group varied between p = ±33-47%. In the Coloured group the percentage caries free children varied between p = ± 11-38%. In the White group the percentage caries free children varied between p = ± 43 –87%. In the 5-year-olds only White children had filled teeth. No gender differences were recorded in the Coloured children, but in Black and White children. Black and White males in the 5-year-olds were more affected by caries than the females. In the 4-year-olds the White males were significantly more affected by caries than the females. The Coloured children were most affected by dental caries.

In 4- and 5-year-old children significant difference in caries experience were recorded between the urban and rural data. The rural children had more caries free individuals (57.14%) than the urban (43.75%) or peri-urban areas (10%). The rural 5-year-olds had a dmft of 6.6 compared to the 2.85 of the 4-year-olds. Only 26.67% of the 5-year-olds and 51.85% of the 4-year-olds were caries free in the rural area, indicating that the 5-year-olds had higher caries prevalence. In 4-year-olds the Peri-urban children had a caries prevalence of 90%, compared to the urban (56%) and rural (48%) children. In 5-year-olds the rural (73%) children had the highest prevalence of dental caries. The peri- (60%) and urban (63%) areas had no significant difference in prevalence of caries.

In the 4-5-year-old group 46.89% of the children needed no dental treatment. Preventative treatment, fillings and extractions were needed in 22.97%, 47.37% and 21.53% respectively.

One- and two-surface fillings were needed in 32.54% and 14.83% of the children respectively.

Dental caries status of 210, 6-year-old children indicated the prevalence of dental caries was 67.44 % in the primary and 4.76% in the permanent teeth. The mean age was 5.88. The dmft was 3.73 and the DMFT 0.05. Only 1.43% of the children had fissure sealants. The DMFT was recorded on 100% Decayed (DT) teeth. The dmft was recorded on 77.51% decayed (dt); 18.08% missing (mt) and 4.41% filled (ft) teeth. Examinations were done on 48.57% females and 51.43% males. The population consisted of 1.9% Asians, 43.81% Blacks, 33.34% Coloureds and 20.95% Whites.

The prevalence of dental caries for 5- and 6-year-olds recorded significant differences in the primary teeth. The dmft for 5-year-olds was 1.25 compared to 4.06 for 6-year-olds. Five-year-olds had 50% caries free children, while 6-year-olds only recorded 30% caries free children. The treatment needs differed for 5- and 6-year-olds. The 5-year-olds need more preventative treatment, and the 6-year-olds more curative treatment for their primary dentition.

Gender differences within the age groups were recorded. Females were affected more by dental caries in their primary teeth than the males. No significant difference in the prevalence of dental caries between 6-year-old males and females were recorded. Locations recorded no gender differences in prevalence. Rural and urban differences were recorded. In the urban area the Coloured group were affect most and the White group the least by dental caries. In the rural area the Coloured children were still the most affected, but Blacks the least, thus

indicating a significant difference between the rural and urban Black children. Urban Black children had a dmft of 3.31-4.03 and 26.32-47.22% caries free individuals. Rural Black children had a dmft of 3.33 and 66.67% were caries free. Coloured children in the urban area had a dmft of 5.44-5.75 and 6.53-7.74 in the rural area. White children had a dmft of 1.63-1.73 in the urban area and 1.6-2.86 in the rural area. The rural Black children had a lower prevalence of caries than their urban counterparts. No significant prevalence differences were recorded in the Coloured children, but the White children indicated the rural children were slightly more affected than their urban counterparts.

The dental caries status of 209, 12-year-old schoolchildren indicated a dental caries prevalence of 46% and a DMFT of 1.2. The mean age of this group was 11.98. Only 5.74% of the children had fissure sealants. The DMFT was recorded on 51.4% Decayed (DT), 29.32% Missing (MT) and 19.28% Filled (FT) teeth. The sample consisted of 51.67% females and 48.33% females. The population consisted of 0.48% Asians, 56.94% Blacks, 22.41% Coloured and 20.57% Whites. No gender differences were recorded, but dental caries differed between the different population groups. The DMFT for Black, Coloured and White 12-year-olds were 1.48, 1.22 and 1.19 respectively. The caries free children were 38.95%, 28.26% and 36.84% for the Black, Coloured and White children. The prevalence of caries was the highest in the Coloured (55.56%) and the lowest in the White (33.48%) children.

Prevalence and gender differences were recorded between the different locations in the same population group. Urban Black males had a caries prevalence of 34.15% and a DMFT of

0.95. Urban Black females had a caries prevalence of 43.14% and a DMFT of 1.96. The urban Black males had less caries experience than their female counterparts. The Coloured urban females (71%) were more affected by caries than the males (50%). The urban White males had a caries prevalence of 46% and a DMFT of 0.54. Urban White females had a caries prevalence of 25% and a DMFT of 1.62. The urban females in all populations groups had a higher caries experience than the males, but not in the rural areas. The Coloured rural males (65%) were more affected than the rural females (50%). The White rural males (43%) were less affected than the rural females (60%). Significant differences were recorded between females in the different population groups. Black, Coloured and White females had a caries prevalence of 43%, 71% and 25% respectively. The DMFT was 1.96, 1.43 and 1.62 for the Black, Coloured and White females respectively. No significant male differences were recorded.

The prevalence of dental caries was 65% in 194 children, in the 15-year age group studied. The mean DMFT was 2.02 and 35% of the children were caries free. The prevalence of caries was slightly higher in the 14-year-olds (64.48%) than the 15-year-olds (72.73%). The DMFT for Black, Coloured and White 15-year-olds was 1.87, 2.41 and 1.89 respectively. Slight differences in caries prevalence were recorded between the population groups indicating that the caries prevalence was the highest in the Coloured group and the lowest in the White group. The caries free children were 38.95%, 28.26% and 36.84% for the Black, Coloured and White children. In the 15-year-old group no gender difference was recorded, but gender differences in the 14-year-olds and the same population group were recorded. Gender differences of significance were recorded between the males and females in the 14-

year-olds. The females had 100% caries prevalence and males only 72.73%. The DMFT was higher for females (2) than males (1.38). No significant difference between the status of 15-year-old males and females were recorded. The females only had a higher percentage of filled teeth and the males a higher percentage of missing teeth. Only rural Coloured children were examined. Coloured urban males (80%) had a slightly higher prevalence of caries than the rural males (71.43%). Coloured urban females (68.75%) had lower caries prevalence than the rural females (75%). The Black and Coloured males indicated a slightly higher prevalence of caries than their female counterparts. The White females (69.57%) had a significant higher prevalence of caries, than their male counterparts (53.33%). The percentage of missing and filled teeth differed between the urban and rural counterparts. Black children hardly had any fillings, while White children had hardly teeth missing.

PERIODONTAL DISEASE

The prevalence of periodontal disease in the Western Region of the Eastern Cape was 79.09% and only 20.91 % had healthy gingivas. Of the 373, 12-15-year-old children examined 4.02% presented with bleeding, 74.8% had calculus and 0.27% had periodontal pockets. The prevalence of periodontal disease was higher in the 15-year-olds than the 12-year-olds (Table 2).

Table 2: Prevalence of periodontal disease based on treatment needs

CPITN (%):					
AGE GROUP	SAMPLE SIZE	CODE 0	CODE 1	CODE 2	CODE 3
12	179	26.26	3.35	70.39	
15	194	15.98	4.64	78.86	0.52
TOTAL	373	78	15	279	1
AVERAGE		20.91	4.02	74.8	0.27

In the 12-year-old group only 26.26% of the children had healthy periodontiums, 3.35% needed oral hygiene instructions and polishing and 70.39% needed professional scaling and polishing. The prevalence of periodontal disease was 84.02% in 15-year-olds. The need for oral hygiene instructions was 84.02% and the majority (79.38%) of the group was in need of scaling and prophylaxis. The prevalence of healthy periodontiums was 15.98%. The 15-year-old group presented with bleeding in 4,64% and 78.86% with calculus. No significant differences in prevalence were recorded between males and females, but the females (18.75%) had healthier periodontiums than their male (12.2%) counterparts, despite differences in the different population groups.

Prevalence differences were recorded in the different locations, indicating that the need for scaling and polishing (Code 3) is far less in the rural (50%) than in the urban (76.47%) or peri-urban (77.78%) males. Only rural males (23.08%) presented with bleeding in need of oral hygiene instructions and polishing. Urban females (30.44%) had slightly more healthy periodontiums than the rural (27.78), but no healthy gingival was recorded in peri-urban females. The treatment needs of the females indicated that 100% of the peri-urban, 69.66% of urban and 72.22% of the rural females were in need of scaling and polishing (Code 2).

No significant differences were recorded in the need for treatment of the Black population, but in the Coloured and White population urge differences were recorded between males and females. The Coloured 12-year-old children 3.23% needed oral hygiene instructions and 83.87 % needed scaling and prophylaxis, thus a total of 87.1% were in need of treatment. 81.74% of the black 12-year-old children needed scaling and prophylaxis, thus only 18.26% had healthy periodontiums. In White 12-year-olds only 34.37% were in need of scaling and

prophylaxis for 65.63% had healthy periodontiums. Thus, the Coloured children were the most affected by periodontal disease in this survey.

In the 15-year-olds the urban males (86.67%) required less periodontal treatment than their rural (100%) counterparts. The opposite need was recorded for females for 81.73% urban and 75% rural females required treatment. Treatment differences are more significant between rural (p=±25%) males and females than their urban counterparts (p=±5%), indicating a higher need for treatment in the rural areas.

DENTAL FLOUROSIS

The prevalence of dental fluorosis of 450, 6-15-year-old children for the Western Region of the Eastern Cape was 13.56%. 0.44% was not recorded. The percentage of children not affected was respectively 91.8%, 80.13% & 86.95% for the 6-, 12- and 15-year-old age groups. The affected children were divided into mild fluorosis (Code 2 + 3) and moderate to severe fluorosis (Code 4 +5). Children affected mildly were 6.15%, 15.88% & 10.88% respectively for the 6-, 12- and 15-year-old age groups. Children moderately/severely affected by dental fluorosis were 1.02%, 3.99% & 2.17% respectively for the 6-, 12- and 15-year-old age groups (Table 3).

Table 3: Prevalence of dental fluorosis in the western region of the Eastern Cape Province.

DEANS FLUOROSIS INDEX								
AGE GROUP	SAMPLE SIZE	CODE 0	CODE 1	CODE 2	CODE 3	CODE 4	CODE 5	CODE 9
6	195	81.03	10.77	5.64	0.51	0.51	0.51	1.03
12	209	59.59	20.54	9.18	7.76	2.44	0.49	
15	46	82.61	4.34	8.71	2.17	2.17		
TOTAL:	450							
Average (%)		71.33	14.67	7.56	3.56	2	0.44	0.44

Gender differences of significance were only recorded in the 15-year age group. Males were affected by dental fluorosis (21.06%) more than their female counterparts (9.57%). Only males were affected with severe dental fluorosis (5.27%). Mild dental fluorosis in the 15-year-old age group indicated that males (15.79%) were nearly affected twice more than the females (7.4 %). All 15-year-olds resided in the urban area (Table 4).

Table 4: Prevalence of dental fluorosis in 15-year-old children

DEANS FLUOROSIS INDEX: 15-YEAR OLDS								
GENDER	SAMPLE SIZE	CODE 0	CODE 1	CODE 2	CODE 3	CODE 4	CODE 5	CODE 9
MALE	19	73.69	5.26	15.79		5.26		
FEMALE	27	88.9	3.7	3.7	3.7			
TOTAL	46	82.61	4.34	8.71	2.17	2.17		

The analysis of the samples to establish the fluoride content of the drinking water, collected at all school in the survey indicate a mean fluoride content of 1.07 ppm. No significant differences in the prevalence between urban (16.67%) and rural (16.66%) areas were recorded for the 6-year-old group. Prevalence differences between urban and rural areas were only significant in the 12-year age group. A rural prevalence of 43.2% was recorded. Urban and peri-urban prevalence were 14% & 6.66% respectively. Mild fluorosis was detected in 34.09% of rural and only 11.33% in urban children. Severe dental fluorosis was detected in

9.09% of rural and 2.67% of urban children. Peri-urban children affected by dental fluorosis were only classified as mild (6.67%). No significant gender differences in the group were recorded. Therefore, rural children were far more affected by dental fluorosis, especially severe fluorosis, than their peri- and urban counterparts.

MALOCCLUSIONS

The prevalence of malocclusion was 0.48% for the 12 year-olds in this survey. 95% of the 12-year-olds needed no treatment. Only 5% needed elective orthodontic treatment. Only one Coloured girl required elective orthodontic treatment with a DAI score of 29. The mean DAI score for the 210, 12-year-olds examined was 10.53 (Table 5).

Table 5: Mean of each component of DAI scale of 12-year-olds in the different population groups

	ASIAN	BLACK	COLOURED	WHITE	TOTAL
SAMPLE SIZE	2	119	46	43	210
136	1	0.26	0.24	0.21	0.25
137	1.5	0.19	0.33	0.15	0.23
138	1	0.63	0.59	1.02	0.70
139	0	0.33	0.30	0.19	0.29
140	0	0.31	0.33	0.21	0.29
141	2.5	2.34	2.37	2.4	2.36
142	2	1.33	1.24	1.58	1.37
143	3	3.48	3.57	4.95	3.8
144	0.5	0.25	0.2	0.09	0.21
145	0	0.23	0.43	0	0.22
146	0.5	0.74	1.09	0.72	0.81
Mean DAI score	12	10.08	10.67	11.53	10.53

DENTITION 136=Missing incisors, canine and premolar maxillary teeth; 137= Missing incisors, canine and premolar mandibular teeth; SPACE 138=Crowding in the incisal segment; 139=Spacing in the incisal segment; 140=Diastema in millimeters; 141=Largest anterior maxillary irregularity in mm; 142= Largest anterior mandibular irregularity in mm; OCCLUSION 143=Anterior maxillary overjet in mm; 144= Anterior mandibular overjet in mm; 145=Vertical anterior overbite in mm & 146= Antero-posterior molar relation

ORAL MUCOSAL LESIONS

The prevalence of oral mucosal lesions was 8.5% for the 817 scholars between the ages of 4-15 years. The one 16-year-old child was beyond the scope of this survey and the 14-year-olds were only presented by 0.86% of the total. The mean age of the scholars examined was 9.3 years. Gender was only recorded on 808 children, thus 9 survey forms did not indicate the sex of the child. 47.52 % males and 52.48% females participated in this study. The data presented the following populations groups: Asian (1.1%), Black (54.29%), Coloured (25.37%) and White (19.24%). Only one survey form did not indicate the race. All areas were presented of which the most resided in the urban area (74.91%) and far less in the peri-urban (24.97%) and very few in the rural (0.12 %) areas. Table 6 and 7 indicates the conditions and locations of the oral mucosal lesions recorded in this survey.

Table 6: Conditions recorded in the survey

CONDITION	FREQUENCY	PERCENTAGE
No abnormal	748	91.55
Angular cheilitis	5	0.61
Commisural pits	9	1.10
Traumatic lesions	16	1.96
Geographic tongue	3	0.37
Dentalveolar abscess	10	1.22
Herpes labialis	10	1.22
Fissured tongue	2	0.24
Ulcerations	0	
Herpetic gingivostomatitis	0	
ANUG	0	
Verruca Vulgaris	3	0.37
Papilloma	1	0.12
Focal Epithelial hyperplasia		
Melanotic hyperpigmentation	1	0.12
Candidiasis	0	
Other	9	1.10

Table 7: Location of the conditions recorded in the survey

LOCATION	FREQUENCY	PERCENTAGE
Upper lip	5	7.35
Lower lip	7	10.29
Mucosa of lower lip	3	4.41
Mucosa around the corner of the mouth R side	8	11.76
Mucosa around the corner of the mouth L side	6	8.82
Cheek mucosa on R side of the patient	5	7.35
Cheek mucosa on L side of the patient	6	8.82
Mucosa of upper jaw, bet lip/cheek & gums	2	2.94
Mucosa of gums of upper teeth	11	16.18
Mucosa of gums of lower teeth	5	7.35
Top surface of tongue	10	14.71

CHAPTER V

Discussion

DENTAL CARIES

Two urban primary schools had exceptionally low caries prevalence in all age groups, namely Bluewater Bay Primary and Mboniselo Public. The rural school, Elmor Primary, has the highest caries prevalence and the highest treatment need of all the primary school, indicating the need for dental service delivery in the most rural areas of this region. The fluoride content of the water at Elmor Primary was 1.02 ppm. Bluewater Bay Primary and Mboniselo Public had respectively 1.7 and 3 ppm, thus no significant differs between Elmor and Bluewater Bay Primary. In the 15-year-old age group the need for treatment is the lowest in Despatch, DDT Jabavu and Sakhizwe Secondary Schools. The prevalence of caries are high for the Despatch High School, but the treatment needs low due to almost 82.86% of the DMFT score are calculated on filled teeth. This school has an exceptionally high percentage of fillings compared to others schools. The DDT Jabavu and Sakhizwe Secondary Schools have high percentage of caries free children. The numbers of children in need of treatment are low ± 20-21% for the DMFT score was mainly calculated on missing teeth, in 70-80% of the children. The fluoride content of the drinking water of DDT Jabavu and Sakhizwe Secondary Schools was analyzed at 1.9 and 0.38 respectively, indicating no correlation between caries prevalence and the fluoride concentration in the water. The difference in the calculation on the components of DMFT, indicate the inequities existing in access and/or utilisation of oral health services. Firstly, the nearest dental clinic to the rural school, Elmor Primary, is in Graaff-Reinet, 198 kilometers away. Therefore, access to dental services in the

rural areas is a major problem for no public transport is operative and patients depend on the departmental support for transport or visits by the public dentist. Only one public dentist renders an oral health service in the rural area of Graaff-Reinet. Departmental transport for this dentist is very difficult due to budget constrains. Departmental regulations do not permit the transport of dental patients, except by ambulance services, which is extremely difficult due to emergency regulations of the department. Secondly, only an extraction service can be rendered at outreach clinic, due to the lack of restorative equipment or a mobile dental service.

The results of the 4-5-year-old children indicate a dental caries prevalence of 40% and a dmft of 3.56 for this region. South African data indicate a dmft of 8.2 and 39% caries free 4-5-year-olds (Graham *et al,* 1993). In this survey the dental caries severity of the disease has decreased (dmft) from 8.5 to 3.56, but the prevalence of the disease has slightly increased in this region if compared to South African data. In this survey the caries free percentages are calculated between 13.73-48.65% for the Black, 0-33.34% for the Coloured and 40-57.14% for the White 4-5-year-olds. The caries free percentage in the Black (56% to 19%), White (19% to 52%) and Coloured (25% to 15%) changed from 1976 to 1984, indicating an increase in caries prevalence for the Black and Coloured children. Only the White children have a decrease in caries prevalence from 81% to 48% (Richardson & Cleaton-Jones, 1986). The cariesfree percentage children in this survey indicate a further decrease in dental caries prevalence from 1984 to 2000 for the Black children from a mean of 19% to 30% and the White children from 52% to 66.67%. Only Coloured children indicate a slight increase in caries for only a mean of 14% of the 4-5-year-olds are caries free (15% in 1984). The rural

area has more caries free children than the urban or peri-urban areas. Urban areas indicate a higher ft (filled) and rural areas a higher dt (decayed) component of the dmft.

The prevalence of dental caries is 4.76% in the permanent teeth and a mean DMFT of 0.05 is recorded for 6-year-olds in the western region. The prevalence of dental caries is 67.44 % in the primary and a mean dmft of 3.73 was recorded. Significant differences between the two ages are recorded, for the dmft for 5-year-olds is 1.25 and for 6-year-olds 4.06. Five-year - olds has 50% caries free children, while 6-year-olds only records 30% caries free children. This survey indicates the increase in caries in primary teeth in preschool children, thus increasing with age (Holm, 1990). The NOHS 1988/89 indicate that for South Africa 27.9% of 6-year-olds are caries free in the primary dentition. A decrease in caries prevalence in this survey is recorded for 30% of the 6-year-old group is caries free. In the primary dentition 32.83% of the children are caries free. Children with permanent teeth are 91.22% caries free. The Coloured group is affected most and the White the least by dental caries. The NOHS 1988/89 indicates the same scenario for the Coloured group. The NOHS indicated that the dmft for the Black, Coloured and White population groups were 3.1, 4.1-9.51 and 2.5 respectively. The caries free percentages were respectively 32, 21 and 41 for the Black, Coloured and White children. In this survey the dmft for the Black, Coloured and White children are recorded as 3.12-4.27, 6.32 and 1.62 – 2.17 respectively. The dmft for the Black children increased and decreased for the White children. The dmft remained unchanged for the Coloured children. The caries free Black children increased from 32 to 35%. The Coloured children indicated a significant decrease in caries free children from 21% to 3.85-10%. The White children indicated an increase in caries free children from 41% to 47-50%.

Thus, the Coloured children had an increase in caries prevalence from 1988 till 2000. The fact that the NOHS was recorded only in urban areas and this survey in rural and urban areas may explain the differences (Reddy, 1992 & Van Wyk, 1994).

Equal amounts of females and males were examined indicating that the females (58%) have a higher prevalence of caries than the males (42%). In the 6-year-olds the females (76%) have a higher prevalence of caries than the males (±65%). Previous studies indicate the same gender findings (Chikte *et al.,* 1990).

This survey, as all South African studies, records differences in the caries prevalence between urban and rural areas (Carstens *et al.,* 1993 & Chikte *et al.,* 1991). In the urban area the Coloured group is affected the most and the White group the least by dental caries. In the rural area the Coloured children are still the most affected, but the Blacks the least, thus indicating a significant difference between the rural and urban Black children. Urban Black children are 26.32-47.22% caries free, with a dmft of 3.31-4.03. Rural Black children are 66.67% caries free; with a dmft of 3.33 and. Coloured children in the urban area have a dmft of 5.44-5.75 and 6.53-7.74 in the rural area. White children have a dmft of 1.63-1.73 in the urban area and 1.6-2.86 in the rural area. The rural Blacks have a lower prevalence of dental caries than their urban counterparts.

The prevalence in Coloured children indicates no significant difference and in White children the rural children are slightly more affected than their urban counterparts.

The rural studies in the Langkloof and Graaff-Reinet indicate that the dmft of 6-year-olds are 9.51±4.36 and 3.41 respectively (Carstens *et al.,* 1993 & Lambrecht, 1998). The dmft on the Langkloof can be compared to the dmft of the rural Coloured children for only Coloured children were studied in that survey, indicating a similar dmft in this survey. The dmft of the Graaff-Reinet (3.41) study also indicated a similar score as obtained by this survey (3.73).

The dental caries status of 6-year-olds remains unchanged for the past 10-12 years. The South African goal for 2000 of more than 50% cariesfree 6-year-olds has not been reached for this region. The Coloured children have been affected most by caries indicating an increase in dental caries prevalence. The rural children have been affected more by caries than the urban children. The non-availability or irregular dental services to rural areas, the lack of transport, or lack of finances results in a large number of teeth being extracted and large numbers of caries being left untreated (Carstens *et al.,* 1993 & Rudolph & Brand, 1989). Dental services focusing on the rural areas and race sensitive should be implemented to improve the caries prevalence in this Region, for the 5-year-olds need more preventative treatment, and the 6-year-olds more curative treatment for their primary teeth.

The WHO dental data bank in 1982 indicates that over the last twenty years the dental caries in 12-year-olds increased in undeveloped countries (DMFT = <1 to 4.1). Eighty percent of the world's children reside in undeveloped countries (Sheiham, 1984). The data on 12-year-olds in South Africa (NOHS 1988/89) indicate different results for the ethnic groups (Reddy, 1992 & Van Wyk, 1994), Black (DMFT = 1.7), Coloured (DMFT = 2.1), Indian (DMFT = 1.3) & White (DMFT = 1.8) children. The mean DMFT for 12-year-olds are 1.7. The

percentage of caries free 12-year-old South African children in 1988/89 (van Wyk, 1994), are respectively 46%, 39.5%, 49.5% & 43.2 % for Black, Coloured, Indian and White children (Reddy, 1992). This study indicates that the mean DMFT has decreased from the NOHS 1988/89 of 1.7 to 1.25. In this survey 57.58% of the children are caries free. The results of this survey (urban, peri-urban & rural) is similar to the studies in Engcobo, Transkei and Port Elizabeth/Despatch (Chikte *et al,* 1990 & Du Plessis *et al.,* 1997), but far less than the rural study conducted in the Langkloof, which indicated a mean DMFT = 4.72 for 12-year-old children of whom only 13.84% were caries free (Carstens *et al.,* 1993). The difference can indicate the prevalence increase of dental caries in the rural areas. Compared to DMFT data (1-4.1) of developing countries the DMFT for this region is not very high and the South African goal of a DMFT of 3 or less has been reached in this region. No scientific data exists to state that oral health prevention or promotion had attributed to this low dental caries prevalence or if this goal was reached purely by change.

The prevalence of dental caries is 65% in the 15-year-old age group. The mean DMFT is 2.02 and 35% of the children are caries free. The prevalence of caries was slightly higher in the 14-year-olds (64.48%) than the 15-year-olds (72.73%). The caries prevalence in this Region was significantly lower than previous studies in the Eastern Cape Province, indicating prevalence of 83.1% in 13-20-year-olds in Transkei (Rudoph & Brand, 1989). The DMFT recorded is also significantly lower than in Port Elizabeth & Despatch, 1997 (2.5-3.6) and Transkei (5.8) in 1989 (Du Plessis, 1997 & Rudolph & Brand, 1989). The mean DMFT for 15-year Olds in the NOHS 1988/89 are 3.3, thus indicating a decrease in caries prevalence (Van Wyk, 1994).

The DMFT for Black, Coloured and White 15-year-olds are 1.87, 2.41 and 1.89 respectively. The cariesfree children are 38.95%, 28.26% and 36.84% for the Black, Coloured and White children. All the age groups indicate a decrease in caries prevalence if compared to the results of the NOHS 1988/89. The DMFT for Blacks decreased from 3 to 1.87, Coloured 4.2 to 2.41 and for Whites from 4 to 1.89. The Coloured group remains the most affected by dental caries. The prevalence of dental caries in Blacks decreased from 70.7% to 61.05%; Coloured 78.2% to 71.74% and in Whites 80.1% to 63.16%, indicating the decrease in caries prevalence from 1989 to 2000. The White group indicates the highest decrease per group over the last twenty years. The Black and Coloured males indicate a slightly higher prevalence of caries than their female counterparts. The White females (69.57%) have a significant higher prevalence of caries, than their male counterparts (53.33%). Significant differences in the percentage of filled and missing teeth recorded in the components of the DMFT score, have been recorded between the Black and White children. Black children hardly have any fillings, while White children hardly have teeth missing, indicating the preference or/and access to treatment differences between these two groups.

Gender differences in the population groups were recorded. The Black and Coloured males indicate a slightly higher prevalence of caries than their female counterparts. The White females (69.57%) have a significant higher prevalence of caries, than their male counterparts (53.33%).

In the rural area only Coloured children are examined indicating that urban males (80%) have a slightly higher prevalence of caries than the rural males (71.43%). Urban females (68.75%) have lower caries prevalence than the rural females (75%). The percentage of missing and filled teeth differed between the urban and rural counterparts, indicating the need for curative dental treatment in the rural areas.

OCCUPATIONAL CLASS

The majority (37%) of the children are coded in the occupational class of mine and quarry workers, production foremen and supervisors, operators, production workers and related workers (Code 7). Unemployment (Code 8+9) has been coded for 26% of the children. Professional, semi-professional and technical occupations (Code 0) have been recorded for 11% of the children.

The prevalence of caries is the lowest in Classes 0, 2 and 7. The prevalence of dental caries is the highest in Classes 3, 4 and 6. In 4-5-year-olds all the classes indicates a higher dmft score for the males than the females. In 6-year-olds gender difference in and between all classes is recorded. In 12-year-old females dental caries status differences are recorded in all classes except Class 9 (Unemployed persons – not looking for work).

No correlation between the prevalence of caries and occupational classes could be established.

PERIODONTAL STATUS

Periodontal disease in developing countries, like South Africa, is prevalent at an early age (Chikte *et al.,* 1989). A prevalence of 79.09% is recorded for 373, 12-15-year-old children of whom 4.20% present with bleeding in need of oral hygiene instructions and polishing, 74.8% have calculus and 0.27% have periodontal pockets, all in need of scaling and polishing. Only 21.91 % have healthy gingivas. The need for periodontal treatment is high (79.09%). This unusual need for periodontal treatment, such as oral health and hygiene education, was clearly indicated in this study (79.09%) as indicated in previous studies (Gugushe *et al.,* 1993).

In the 12-year-olds only 26.26% have a healthy periodontium. Treatment needs differed between the different population groups and between males and females in these groups. The Black population needs treatment the most. The White population has the healthiest periodontiums. The NOHS indicate only the urban results of the different population groups. The data indicate that in 12-year-olds the need for periodontal treatment in the Black children is by far the most unmet. In the NOHS only 4.8%, 5.6% & 19.7% respectively of the Black, Coloured and White children are in need of no periodontal treatment. The need for no treatment in this survey is 18.26%, 12.9% and 65.63% respectively of the Black, Coloured and White children. Asian children cannot be compared for in this survey for only one 12-year-old Asian child was examined, which cannot present the population group. In contrast with the NOHS the Coloured (87.1%) 12-year-old children have the most unmet need for periodontal treatment, exceeding the need of the Black (81.74%) children. In the NOHS the

need for treatment is 95.5% for Black and 94.4% for Coloured children. The need for treatment in the White children decreased from 80.3% in the NOHS 1988/89 to 34.37% in this survey. The difference in the need for treatment can be contributed to the fact that in the NOHS only urban 12-year-old children were examined, while in this survey peri-urban and rural children are included (van Wyk, 1992). Data on 12-year-olds in Engcobo in the Eastern Cape Province, indicates a healthy periodontium in 5.7 %, with gingival bleeding in 23.2% and calculus in 71.3 %. This group needs oral health instructions in 94.5 % and prophylaxis in 71.3 % (Chikte *et al.,* 1989). In KwaZulu data on 11-year-olds indicate a healthy periodontium in ± 50 %, with gingival bleeding in 19 – 25 % and calculus in 23 - 31%. This group needs no treatment in ± 50 %, oral health instructions in ± 50 % and prophylaxis in 23 – 31 % (Hargreaves *et al.,* 1990 & Mackeown *et al.,* 1995). The results in Kwazulu are significantly healthy than their counterparts in Engcobo. A selected population in Transkei, aged 13-20-years, indicate that 100 % is in need of oral hygiene instructions and only 14-20% presents with healthy periodontiums, 77-86 % with bleeding and in 3 % calculus are present (Rudolph & Brand, 1989). Thus, the CPITN recorded in this survey compares with the previous study in Transkei and indicates the desperate treatment needs for this region and the rest of the Eastern Cape Province.

The prevalence of periodontal disease is 84.02% in 15-year-olds. The need for oral hygiene instructions is 84.02% and the majority (79.38%) of the group is in need of scaling and prophylaxis. The prevalence of healthy periodontiums are 15.98%, 4.64% with bleeding and 78.86% with calculus. The NOHS1988/89 data on 15-year-old children indicate 98.1 % needs oral hygiene instructions and 86.9 % needs scaling and prophylaxis. Prevalence

indicate that only 1.8 % has healthy periodontiums, 11.3 % presents with bleeding and 85.4 % with calculus. Therefore, the results of this survey indicate a slighter healthier periodontium in this region, but the fact that only urban population in the NOHS was studied the data of this study must only be compared to the urban data, indicating that 13.33% of urban males and 18.27% females has healthy periodontiums. Urban males and females presents with bleeding in 2.67% and 6.73% of samples. Calculus is present in 82.67% of urban males and 75% of the females. The urban results indicate a decrease in the prevalence of periodontal disease if compared to the NOHS 1988/89 from 98.2% to 83.8% (van Wyk, 1992).

In the 15-year age group females (18.75%) have a slightly healthier periodontiums than males (12.2%) despite differences in the different population groups. Treatment differences are more significant between rural (±25%) males and females than their urban counterparts (±5%). The high prevalence of periodontal disease in the rural area and the fact that the population of the Eastern Cape Province is 76.7% ethnically Black, the desperate dental treatment needs are once more highlighted.

DENTAL FLUOROSIS

The prevalence of dental fluorosis is 7.17% for 6-year-olds in this survey of whom 6.15% is mildly and 1.02% severely affected by dental fluorosis. The prevalence of dental fluorosis in 6-year-old children in this survey is far less than recorded in earlier studies. In Fraserburg the prevalence is recorded as 73.33% (Carstens *et al.,* 1995), more than 80% in KwaNdele

(Lewis & Chikte, 1991) and 73% in Graaff-Reinet. In the Graaff-Reinet survey 48% have mild and 25 % moderate to severe dental fluorosis (Lambrecht, 1998). No significant gender and location differences are recorded in this survey (Szpunar & Burt, 1988). The study in Graaff-Reinet indicated a difference between children affected by fluorosis between the urban (82%) and rural (37%) areas, with a slight difference in the fluoride content of the drinking water (0.85mg/L towards 0.71 mg/L). The difference in the results can be explained by the fact that the mean fluoride content of the drinking water is 0.79mg/L the estimated fluoride content of the water based on literature of this region must be in the region of 0.05 – 0.62 mg/L (Du Plessis *et al,* 1993). The results of the water analysis stated a fluoride content ranged from 0.3-3 mg/L with a mean of 1.07 mg/L for this region, which is much higher than the literature indicated.

The percentage of 12-year-old children not affected is respectively 80.13% of whom 15.88% are mildly and 3.99% severely affected by dental fluorosis. Literature reviews indicated a prevalence of 15.9 – 91.9% in South Africa. Thus, the prevalence of 19.87% recorded in this survey does not differ from previous studies. No significant gender differences are recorded between the males and females. Prevalence differences between urban and rural areas are only significant in the 12-year age group. Rural children are affected far more by dental fluorosis than their urban and peri-urban counterparts. A rural prevalence of 43.2% is recorded. Urban and peri-urban prevalence are 14% & 6.66% respectively. Mild fluorosis is detected in 34.09% of rural and only 11.33% in urban children. Severe dental fluorosis is detected in 9.09% of rural and 2.67% of urban children. Peri-urban children affected by dental fluorosis are only classified as mild (6.67%).

The prevalence of dental fluorosis in 46, 15-year-old children is 13.05%. 10.88% is mildly and 2.17% severely affected by dental fluorosis. South African studies indicate a prevalence of dental fluorosis in 15-year-old children is 13.05%, thus similar results obtain in this survey. All 15-year-olds resides in the urban area, thus a gender difference is recorded in this study, in contrast with other studies (Szpunar & Burt, 1988). Males are affected by dental fluorosis (21.06%) more than their female counterparts (7.4%). Only males are affected with severe dental fluorosis (5.27%). Mild dental fluorosis indicate that males (15.79%) are nearly affected twice more than the female counterparts (7.4 %).

MALOCCULSIONS

The prevalence of malocclusion in 210, 12-year-old children in the Western Region of the Eastern Cape Province is very low. The prevalence of malocclusion is 0.48%, in need of only elective treatment. According to the DAI scale 99.52 % of the samples have a normal or minor malocclusion with no or a slight need for treatment. The NOHS of 1988/1989 indicates a prevalence of 18.9% and 53.6 % of all 12-year-olds in South Africa have a good occlusion. No treatment is needed in 71.1%. Treatment is needed in 29% of which 1.8% is urgent (Van Wyk, 1992). The treatment needs in this survey was totally different and far less than the results of the NOHS 1988/1989. Although the Occlusal Index (OI) of Summer was used in the NOHS, this survey indicated the need for no treatment in 61.1% in the Black 12-year-old children. This regional survey indicated that 100% of the Black children required no treatment. The NOHS indicate the need for no treatment in 70.9 % of the 1363, Coloured 12-year-old children. This regional survey indicates that 95% of the Coloured children required

no treatment and 5% elective treatment. Only 46 Coloured children were examined in this survey.

In previous studies the best occlusion was found in Blacks (Van Wyk, 1992 & Zietsman 1979). In this survey the same conclusion can be made, but differs from the fact that the White population had the highest need for treatment. Only one Coloured girl required elective orthodontic treatment with a DAI score of 29 and a need of elective treatment. The NOHS indicated that 51% of the 592 Asian and 37% of the 1451 White children were in need of no treatment. In this regional survey 100% of the 3 Asian and 100% of the 43 White children needed no orthodontic treatment. The sample size of the NOHS was 1457 in the metropolitan areas and this Regional survey 119 samples in urban, peri-urban and rural areas. Studies indicated a difference in the need for treatment between rural and urban areas. In a previous study the need for treatment in 83% of the rural and 72% urban subjects, with urgent treatment required by 12% and 5% respectively in the rural and urban areas (De Mûelenaere *et al.,* 1992). The NOHS 1988/89 only included urban children were examined, but it was believed that more urban than rural children need orthodontic treatment (van Wyk, 1992).

Malocclusion is not a public oral health concern in this region, but bi-annual orthodontic screening of 7-12-year-old children is advisable (De Mûelenaere *et al.,* 1992).

ORAL MUCOSAL LESIONS

The Epidemiological notes of October 1999 of the Department of Health, Bisho, indicates that in the 1998 Antenatal Survey of the Eastern Cape Province, the prevalence of HIV infection in Western region (Region A) was 21.8%. The estimated percentage of HIV positive adult females are 24.06%, HIV positive adult males are 29.08% and HIV born infants are 15.69% for this region. The Eastern Cape Province has one of the fastest growth rates of HIV in the world (Meidany & Puchert, 1999).

The survey conducted on 817 healthy children between the ages of 4-16 years records a prevalence of oral mucosa lesions of 8.5. Oral mucosal lesions are only seen in 20-50% of patients with HIV infection. 70-80% of patients present with at least one lesion during the span of the infection Adendorf et al, 1998 indicated that 3.3% of 600 HIV positive adults had oral manifestations. Only 0.35% presented for treatment. It is therefore understandable that a prevalence of 8.55% lesions is seen in a healthy population. The literature indicates the most commonly seen conditions associated with HIV-infection in South Africa was candidal lesions, of which Oral Hairy Leukoplakia (OHL) is the most common, followed by gingival/ periodontal lesions, oral ulcerations and Kaposi sarcoma (Arendorf *et al*, 1998). The conditions recorded in this study indicated that traumatic lesions (1.96%), dento-alveolar abscess (1.22%) and herpes labialis (1.22%) were the most commonly seen oral mucosal lesions. These lesions were most frequently located on the mucosa of the gums of the upper

teeth (16.18%), the mucosa around the corner of the mouth right side (11.76%) and the lower lip (10.29%).

Arendorf et al, 1996 classified the oral manifestations of HIV/AIDS for adults (13 years and older) into groups. The lesions seen in this study all represent Group II, namely those lesions less commonly associated with HIV/AIDS. If the classification of Ramos-Gomez et al, 1999, for paediatric patients is used, the oral mucosal lesions recorded are in Group I and II, namely those lesions commonly and less commonly associated with HIV infection. Due to no definite division of data for samples older than 13 years and those younger than 13 years, the group must be seen as such, with an average age of 9,3 years and the fact that the data was collected in South Africa the most appropriate classification is that of Arendorf et al, 1996. The oral mucosal lesions seen in this study is less commonly associated with HIV infection and presents no major oral health problem in this region.

CHAPTER VI

Conclusion

DENTAL CARIES

Dental caries will remain a major public problem in most countries for the future, although four major strategies for caries prevention have been developed over the years, namely fluorides, fissures sealing, dietary choices and plaque control (O` Mullane, 1995). The decline in caries prevalence is due to the wide exposure to fluorides (Bowen, 1995 & Diesendorf, 1986). Administration of fluoride in sugar is likely to be more successful than other routes (Bowen, 1995). Currently, we are only controlling caries not preventing this public problem (Bowen, 1995). The whole population strategy with emphasis on oral hygiene must be maintained (Fejerskov, 1995). Dental caries remains the predominant cause of tooth loss throughout the world and more appropriate and cost-effective ways of controlling caries must be considered (Fejerskov, 1995). The direction of public dental health for the future must be based on the evaluation of the current situation (Niessen, 1990). The trends of dentistry and public health must be taken into consideration in dental public activities, which include administration of dental health programs, service delivery, research, prevention, dental education and promotion (Niessen, 1990). Currently the following preventative programs, like school brushing programs, school fluoride programs, etc. is done in this region. The efficiency and feasibility of these preventative programs is a concern to me for a scientific basis, evaluation tools and recordings of the programs practiced, is absent. The question arises what past direction in dental health were we taking in this region if the situation was unknown till date. What goal did we want to achieve in dental health? What

aims do we have? Who do we target? How do we predict future trends in dentistry? The conclusion can be made that in the absence of answers to the question asked what have we been trying to prevent in this region? The need for experimental epidemiological studies is indicated to determine the effectiveness of a program of prevention or therapy (Jong, 1996). The findings of this survey can be the basis on which we can predict future trends and direct dentistry in this region towards the goals we wish to achieve. Future efficiency and feasibility of programs can be measure against these findings, by experimental epidemiology. Appropriate preventative dental programs and cost-effective curative dental services can now be planned for the region.

The survey results concludes that dental caries in 4-15-year-old children in the Western Region of the Eastern Cape Province has been decreasing since 1989, if compared to previous studies in South Africa, but still remains a major oral health problem for the majority of the children are in need of preventative and curative dental treatments.

The target groups in children can now be identified for the prevalence of dental caries is high in the preschool children. The South African goal and WHO target for the year 2000, that 50% of 6-year-olds must be cariesfree, remains unmet for only 36.52% are cariesfree in this region. The 12-year-olds had a DMFT below 3, the South African goal for the year 2000, in this region. The DMFT of 1.19 in 12-year-olds can possible chance or could be the result of dental programs, but due to the absence of scientific data this cannot be explained. The dental status of 12-year-olds may differ totally in the next ten years. Therefore, dental programs for the future can be evaluated on the findings in this survey. The future focus on dental caries

prevention must be directed to children younger than 6-years. New preventative programs, focusing on decrease caries experiences in children from birth till school going age and their mothers, must be developed and implemented to reach the future WHO goal for 6-year-olds.

Dental caries prevalence has only been studied in a few districts or towns in the Eastern Cape Province. Therefore, the urgent need for oral research throughout the Province exists to establish baseline data to promote, plan and implement oral health programs and service delivery more efficiently.

PERIODONTAL STATUS

The results obtained in this study showed the desperate need for periodontal treatment in this region. The prevalence of periodontal disease was 79.09%. Prevalence differences in gender, ethnic groups, and rural and urban areas were recorded. Males were more affected than females. The Black children had the highest need for treatment and the rural children were more affected than the urban children.

Periodontal disease is a mayor public oral health concern for the Western Region for 75.07% of the children need professional cleaning and calculus removal. Only 4.02% need dental education, oral hygiene instructions and polishing.

Very little data on the prevalence of periodontal disease is available for the Eastern Cape Province, but the data available clearly indicates the high need for professional periodontal

treatments. Improved planning of human resources to deliver an equitable dental care services, focusing on preventative and curative treatment, must be planned for the future to address this need for treatment.

DENTAL FLUOROSIS

The prevalence of dental fluorosis is 13.56%. Dental fluorosis recorded is 11.22% for mild and 2.44% for severe fluorosis. In 15-year-olds males are more affected than females. In 12-year-olds the rural children are more affected than the urban children.

The study indicates that 86% of the children examined had not been affected by dental fluorosis, thus indicating that fluorosis is not a dental public problem in this region. The study in Graaff-Reinet indicated very high dental fluorosis prevalence, thus more intensified studies for affected health district or towns must be planned to establish the prevalence of dental fluorosis in the Eastern Cape Province (Lambrecht, 1998).

MALOCCLUSION

The prevalence of malocclusion and the treatment needs required in the Eastern Cape Province is unknown. No previous studies on malocclusion have been done in this Province, except during the National Oral Health Survey for South Africa in 1988/1989, but the urban results for the 12-year-old scholars in Port Elizabeth is not separate, but included in the results for the country.

The prevalence of malocclusion in 12-year-old children in the western region is 0.48%. A definite malocclusion in need of elective orthodontic treatment was recorded in only 0.48%. No or minor malocclusions are recorded in 99.52% of the children in need of no or slight treatment.

Results indicate that malocclusion is not a public oral health issue for this region. The question remains whether this is the trend throughout the Eastern Cape Province. The fact that longitudinal studies indicated a malocclusion after two years, indicate the need for bi-annual screening of 7-12-year-old children. In planning orthodontic delivery services the cultural differences and the increasing need in groups, which traditionally would not address the need for orthodontic treatment, must also be taken into consideration. Although malocclusions is not a public oral health concern in this region, the need exists to identify children presenting with malocclusion. The need for preventive orthodontic initiatives and orthodontic treatment in public dental services should be addressed in future.

ORAL MUCOSA LESIONS

No study on the oral manifestations of HIV infection in the Eastern Cape Province has yet been done, therefore no prevalence of manifestations of HIV infection is known. In South Africa, HIV infection is a major health problem (Schmidt, 1999). Dentists in this country are confronted with more HIV positive patients and therefore the diagnosis and treatment of oral manifestations of HIV infections has become an important oral health issue. Research

regarding the oral manifestations of HIV infection should be a high priority in the fight against HIV/AIDS (Schmidt, 1999 & Arendorf *et al.*, 1999).

The prevalence of oral mucosal lesions in this region is not a public oral health issue for 91,55% of the children presented with no lesions. The important role of dental professionals in the recognition of oral manifestations of HIV infections can be important in the fight against HIV/AIDS and regular screenings are advisable to identify possible seropositive patients and contribute to the HIV/AIDS fight in South Africa.

We can conclude to say that only 13% of the dentists in South Africa are in the public service. They are responsible for serving between 65-80% of the population. In rural areas dental clinics are non-existent. In urban areas, clinics are not necessarily accessible to the community. These clinics are also under-staffed and unserviceable when available. Therefore the present demand for dental services are very based and consists mainly of emergency care for pain and sepsis. The overall oral health picture in South Africa is one of deprivation in terms of oral health education, unmet needs for oral health care service by the population and the affordability of care (Rossouw, 1985).

CHAPTER VII

Recommendations

In Natal the prevalence of priority health problems in young children indicated that dental caries affected ninety per cent of Indian children (Jinabhai *et al.,* 1983). The global picture indicates a similar trend in the primary dentition (Holm, 1990). The prevalence of dental caries in the primary dentition (63.48%) is higher than the permanent dentition (41.3%) in this study and the WHO goal for six year-old-children was not reached for the year 2 000. Nearly eighty percent of the children in this study are in need of periodontal treatment. The lack of rural dental data in South Africa requires more extended epidemiological studies. Rural areas should be included. Longitudinal studies on the prevalence of dental caries and periodontal disease, for all age groups, must be conducted to give a clear picture of dental status and trends of dental diseases in the Eastern Cape Province. Therefore, the following recommendations are made to improve future dental service delivery in the Western Region of the Eastern Cape Province.

1) An oral health policy for the Eastern Cape Province must be developed to direct management and health personnel in the province to improve oral health services (Songpaisan, 1985).

2) Human resources: Currently only six dentists and nine oral hygienists are employed by the Department of Health in this region, of whom only one full-time, three part-time dentists and a part-time oral hygienist delivery a service to the rural community.

A more suitable dentist: population ratio and oral hygienist: population ratio will be needed for this region. The distances and distribution of the population must be considered in establishing this ratio. Auxiliary dental personnel, such as dental therapists (extractions and one or two surface fillings) or oral hygienists (oral hygiene information, instructions, scaling and polishing) can do the treatment needs identified in this study. The new scope of the duties of the oral hygienists will also enable them to do the treatment needed by the children in this survey. The implementation of rural incentives in the public service can decrease the shortage of dental staff in the rural areas. Although the remuneration of dentists and oral hygienists in public services cannot be compared to private practice, performance can be enhanced by bonuses, increases and incentives based on service delivery (Rossouw, 1995 & Songpaisan, 1985).

3) The rural area in this study indicated the lack of restorative treatment available to this population. Access to dental treatment is one of the PHC principles; therefore in planning dental services delivery considerations to the citing of dental services, transport facilities or mobile dental services for greater availability of services to this community must be given (Rossouw, 1985 & Carstens *et al.,* 1993).

4) Access and utilization of available dental services must be promoted to the population, for the services are only utilized for pain and sepsis. Mainly an extraction service is rendered. Routine dental check-ups and restorative services are seldom utilised. The population needs to be encouraged to use these dental services. Cultural

differences should be considered and respected in oral health education and promotion (Chikte *et al.,* 1990). Oral health education is of primary importance in the prevention of dental diseases (Schou & Locker, 1997).

5) Prevention strategies in this community must be directed firstly on education and promotion of oral health for preschool children, secondly on the need for curative treatment and lastly on the prevention of caries in permanent teeth (fissure sealant). Due to the shortage of manpower and lack of finances currently, proper planning of resources is essential. International experience has shown that a preventative approach rather than a curative approach was able to improve community dental health (Lalloo & Solanki, 1994, Ripa, 1985, Ismail, 1996, & Sheiham, 1984). A preventative program from birth to childhood (Farrington, 1977), in collaboration with the mother and child program of the district health system based on the Primary Health Care approach, is highly recommended for this region.

6) The poor results obtained on the periodontal status indicated the extensive need for periodontal treatment. The need for professional periodontal treatment required by the children in this survey highlighted the need for more oral hygienists. The oral hygienists: population ratio should be given more attention to promote better periodontal status. The effectiveness of the school-based brushing program should be emphasized for this program is highly advocated, cost-effective and relatively easy compared to treatment (Lambrecht, 1998 & Gilbert *et al.,* 1993).

7) Water fluoridation is advisable for the Nelson Mandela Metropolitan area (Port Elizabeth, Uitenhage and Despatch) for literature indicated a low fluoride content in the drinking water in this area (Spencer, 1996). Water fluoridation in the other towns is not feasible due to drinking water supplied by boreholes and not by piped water. In-depth studies of the drinking water of each town must be done to: firstly, establish the fluoride content of the water and secondly, to implement de-fluoridation methods in towns with high fluoride levels, such as Graaff-Reinet (Lambrecht, 1998) or fluoridation in towns with low fluoride levels, such as fluoride rinsing programs in schools.

8) Community participation is one of the principles of the Primary Oral Health Care (Gilbert *et al*, 1994). The participation of the community is essential in any program we plan for the success depends on their ability and enthusiasm (Sheiham, 1995).

9) The urgent need for dental research in the Eastern Cape Province is highlighted in this survey. The lack of dental data over the past twenty years recommends the inclusion of a dental researcher in the Research Unit for the Eastern Cape Province. Dental research should be an ongoing process in the Province.

10) Continued professional development is advisable and must be supplied by the Department to improve the knowledge and skills of the public dentists responsible for the public dental disease monitoring, treatment and evaluation. All dental personnel are in need of improving their skills and knowledge in particular field, like oral health

education, child management (Brand *et al.,* 1994) and the oral manifestations of HIV/AIDS (Schmidt, 1999 & Arendorf *et al.,* 1997).

11) Although malocclusion and oral mucosal lesions in this study are not indicated as public oral health problems, they should remain a priority for future changes can occur. Bi-annual orthodontic screening of 7-12-year-old children and the introduction of preventive and interceptive orthodontic treatment are suggested for state clinics to achieve the Primary Health Care objectives for South Africa (De Mûelenaere, 1997).

12) The findings in this study must be interpreted in the light of financial resources and human resources currently available. The need for preventative treatments, extractions, one-and two-surface restorations, oral hygiene instructions, professional scaling and polishing can be used to budget for future oral health service delivery and human resource planning (Hobdell, 1997).

13) The lack of dental equipment and instruments, the repair of broken or replacement of dental equipment and the maintenance of dental equipment in the dental clinics in this region must become a departmental responsibility and commitment. The upgrading and functionality of all dental clinics should be revised. The Department of Health must be responsible to supply the appropriate human and other resources to cope with the increasing demand for dental treatment in this region (Ismail, 1996). Oral health promotions must include advocacy to educate politicians, community leaders and other influential individuals (Schou & Locker, 1997).

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APPENDIX 1

The health assessment of the Eastern Cape Province

GEOGRAPHY	
Name of Province	EASTERN CAPE PROVINCE
Area	13,9% of RSA =169 600 km 2
Size of Province in RSA	Second largest province after NCP
Highest peak	3 001 meters above sea level
Rivers	gamtoos, Sondags, Groot-Vis and Groot-Kei
Capital	Bisho
Most important cities	Bisho, East London, Port Elizabeth, Umtata
Infrastructure	Poor, especially in the former Transkei and Ciskei
DEMOGRAPHY	
Distribution of population	Mainly rural
Population size	6 302 525 (Third largest population/ province, after KZN & Gauteng)
Population percentage	15,5% of total of RSA
Population density	38 people/ km 2
Proportion of people < 15 years	1245063 of 6302525 = 19.75%
Proportion of people > 60 years	582353 of 6302525 = 9.24%
Proportion of men and women	Men = 46%; Women = 54%
Ethnicity – mixed (1996)	White = 10.9% Coloured = 8.9% Asian = 2.6% Black = 76.7%
SOCIO-ECONOMICAL STATUS	
Level of status	Low, unemployment is severe (48,5% unemployment rate).
Universities	5
Technikons	3
Technical	20
Type of activity	5 % cultivated land Agriculture: corn, pineapples, fruit and chicory Industry: Forestry, motor and textile

Per capita income per year	R 1358/household of 5,2 (1991) R 988/household of 4,6 (1996)
Literacy levels (%)	45,3% (1995) 59% (1998)
%of households with tap water in dwellings	24,7%
%of households which use electricity	23,2%
%of households with sanitation facilities	29,1%
Language	Xhosa = 82,6% Afrikaans = 9,6% English = 4,2%
HEALTH STATUS	
Health regions	5
Health districts	21
The 5 most prevalent communicable diseases	1. HIV/AIDS (12,6%) 1997 2. STD (SYPHILLIS 10,7%) 3.TB (232/100 000 in 1997) 4. HEPATITIS (1,8/100 000 - 1997) 5. MEASLES (1,4/100 000 – 1997)
The 5 most prevalent non-communicable diseases	1. DENTAL DISEASES 2. DISABILITY 3. MALNUTRITION 4. HYPERTENSION 5. HEART DISEASE
The infant mortality rate (per 1000 hospital deliveries)	56,3 (1991-1996)
Crude birth rate (per 1000 population)	17,3 (1994)
Crude death rate	5,7 (1994) 6,7 (1996)
% of deaths due to diarrhea in children <5 years 1990	20,4%
% Stunting children 6-71 months 1994	28.8%
Top 5 causes of death	HIV/AIDS TB MVA DIARRHOEA NON-COMMUNICABLE DISEASES
Maternal mortality rate (per 100 000 live births)	63 (1996)
Life expectancy at birth	63,7 (61M/68F) (1991 - 1996) 60.7 (1998)
Prevalence of noma	No statistics

Prevalence of oral cancer	No statistics
Prevalence of fluorosis	73% in 6-7 year Olds in Graaff-Reinet
HEALTH SERVICES	
Access to PHC = 5 km radius (medical care)	61,2% households
Per capita provincial budget for health	18% (1996/7) 23% (2000/1)
Number of district, secondary & tertiary hospitals	Unknown
Hospital bed ratio	3,5: 1 000
Proportion of doctors in public service	11,32% (ratio of 1,8:10 000) 18% Foreigners
Proportion of dental personnel in public service	Dentists = 9,94% (ratio of 0,06:10 000 for 1998 to the ratio of 0,1: 10 000 in 1994/5
Number of fixed dental clinics (PHC centers)	32 clinics & 33 dental rooms
Proportion of these offering a dental services	49,45% urban & 40% rural hospital have dental clinics linked
Proportion of public dental care that is curative	±< 5%
Per capita public health expenditure (rands)	R 227 (1992/3)

The health concepts		
Author:	Implications for health and health services:	Implications for dental health and services:
McKeown (1976-1980)	1) He concluded that ½to ¾ of deaths in infant & young children, was attributed by a combination of malnutrition and infection 2) Information he gathered indicated that very little of the decline in mortality rates can be attributed to medical intervention or improvement of medical care 3) No impact on life expectancy, although the following attributes to medical/health services: • Reform in hygienic conditions in hospital indicated a decline in cross-infections and contracting diseases from other patients • Advances in surgery by developing anesthetics 4) In the improvement in disease mortality it is difficult to distinguish between introduction of treatment by drugs and immunization or improving social and economic conditions, for example • The use of antibiotics in bacterial infections indicated a decline in mortality • Prophylactic immunization against polio & whooping cough was a medical breakthrough 5) His emphasis on the need to reform health care and excludes the wider issues of social changes, because: • Diseases is caused by the environment and therefore can be prevented if the focus is on the teaching, research and practice of prevention rather than dealing with disease when it occurs, thus also reducing infective conditions • Health care resource & energy has become to focused on high technology and hospital-based acute medicine to the expense of prevention and community resources. • Medicine care should shift from cure to care. 6) He concluded that medical sciences and services of the bio-mechanical model are misdirected towards health and the society's investment in health is not used, because the approach is indifferent to the determinants of health, namely: external influences and personal behavior.	McKeown`s implications for health and health services implies that dental health and services should be: a) The determinants or the combination of determinants of dental health must be clear identified. b) The intervention of dental health care and services must be questioned to establish if it is improving dental health or if the services is appropriate. We should also question the use of drugs in dental health. Is drugs intervention effective? c) We need to reform dental health services to focus on prevention rather than cure. In this process we must acknowledge factors, such as environment, social, behavior and lifestyle, which may or may not influence dental health and dental health services. d) Lastly, we should ask ourselves as dental health professionals if we acknowledged the needs and investments of the society in their dental health. Are our dental health services currently directed on the Primary Health Care Approach (PHCA) principles of community participation and inter-sectoral collaboration?

Cochrane (1972)	Cochrane indicated that a more scientific approach - and not a medical opinion- must be introduced with new forms of medical treatment to identify the merits or risks of the different medical procedures and practices. He indicated that to few medical procedures have been evaluated for their effectiveness, in contrast to Mckeown and Powles comment that drugs (except for antibiotics and immunization) has little improvement in health, but rather a breakthrough in laboratory medicine	Cochrane`s implications for health and health services implies that dental health and services should be: In dental health and dental health services, including dental health education and promotion, we as public dental health professionals must adapt a more scientific approach when dealing with public dental health issues. Scientific approach to problem solving in dental health must be implemented to enable us to evaluate dental health issues/problems/care/programs/etc.
Descartes (17th century)	Descrates embarked on the mind/body dualism based on social morality in the seventeenth century. In this era study of the human body was constrained by a religious embargo. He thus paved the way for medical science by emphasizing the separation of physical and mental life.	Descrates`s implications for health and health services implies that dental health and services should be: The need to aknowledge mind/body dualism in health as well as dental health.
Zola (1975)	The perception of the role of medicine in the society has changed during the last hundred years. Zola described that the institution of medicine has a social control, which means medicine defines differences in behavior, thought, feeling and physical functioning, because medical problems require medical solutions	Zola`s implications for health and health services implies that dental health and services should be: Dental problems require dental solutions, by defining the differences in behavior, thought, feeling and physical functioning.
Kennedy (1981)	Kennedy underlined the proposition that "medicine is too important to be left to the doctors", which emphasis the legality of practices and the rights of patients.	Kennedy`s implications for health and health services implies that dental health and services should be: The PHCA principle of community participation, inter-sectorial collaboration and equity in dental health and dental health services is highlighted once more.
Navvaro (1975)	Navvaro states that ill health is a product of a capitalist economy and advocates political change in the society, to improve ill health. He disagreed with Illrich for he feels that the medical profession and a "gullible" public are wrongly blamed for ill health, which is caused by a capitalistic economy, which leads to unequal distribution of health and a inappropriate health care system. Navvaro argued on the control of medicine on a micro level, thus doctor-patient relation, due to financial capitalism, which invaded, transformed and dominated the medical/health care arena. He also drew the attention to the modern state in controlling medicine, which acts on behalf of capitalists but is not dominated by it.	Navvaro `s implications for health and health services implies that dental health and services should be: Public Dental Health and services are influenced by the economy. Public dental health is in State control. Public Dental Health is also influenced by politics and society.

Illrich (1974-1977)	Illrich stated that medicine had actually a negative effect and a very small role in improving health. He based this on the following: • "Wonder cures" are ineffective • Some problems are thought to be medical, which are not. • Medical produced illness (iatrogenesis), which included three types namely; clinical, social and structural. • Decreases the individuals coping skills of his own illness His solution is: To break down the medical monopoly in health-care and restore personal responsibility. His approach advocates alternative medicine and self- help. He argued that the macro control of medicine of society, in the form of an all-enveloping bureaucracy, was caused by industrialization. On the roll of societal control he agreed with Navvaro, whom argued on the control of medicine on a micro level, thus doctor-patient relation, due to financial capitalism.	Illrich`s implications for health and health services implies that dental health and services should be: Directed to improve self-help and restore personal responsibility. Dental health and services must allow these to important humane functions to decrease dental diseases in a population. Once more we must address the needs of the community we service and break down the dental monopoly in dental health care. Public and private dental practitioners must form a liaison and work together in the interest of the public.

APPENDIX 2

Review of the Literature

Table I: South African Review: Dental Caries of 4-5-year-old children

AUTHOR	JOURNAL	REGION	SAMPLE SIZE	AGE	INDEX	dmft	% CARIES FREE
Chosack et al	Community Dent. Oral Epidemiol. (1988), 16, 289 –291	RSA	82 77	4 5	WHO (1977)	3.42-6.33 dmft 2.09-9.83 dmft	
Graham et al	Community Dental Health (1993), 10 (4), 405-13	South Africa	248	4	WHO	8.2	39
Richardson & Cleaton-Jones	JDASA (1986), 41, 611-613	RSA Overview	Black -urban -rural Coloured -urban Indian -urban White -urban	4-5	1976/78 1980 1984 1976/78 1980 1984 1976/78 1980 1984 1976/78 1980 1984 1976/78 1980 1984		26 21 19 56 12 48 25 15 21 15 15 19 18 52

Table II: South African Review: Dental Caries in 6-7-year-old children

AUTHOR	JOURNAL	REGION	SAMPLE SIZE	AGE (yr)	INDEX	DMFT	% CARIES FREE
Carstens et al	JDASA 1993; 48: 617-622	Langkloof	147	6	WHO (1987)	1.37 (9.51 dmft)	1.36
Du Plessis	JDASA 1997; 52: 483-486	Port Elizabeth & Despatch	589	6	WHO (1987)	2.55-4.96 dmft	
Du Plessis et al	JDASA 1996; 51: 651-655	Port Elizabeth & Despatch	589 High F = 0.62ppm Low F = 0.05ppm	6	WHO (1987)	4.15 dmft 3.54 dmft	
Lambrecht	Unpublished Thesis	Graaff-Reinet	415	6-7	WHO (1997)	3.41 dmft 0.6 DMFT	20.72
Reddy	International Dental Journal 1992; 42: 150-156	RSA	Black Coloured Indian White	6 6 6 6	WHO (1978)	3.1 dmft 4.1dmft 4.1dmft 2.5dmft	32 21 24 41
Van Wyk	National Oral Health Survey 1988/89	RSA	5161 Urban -black -coloured -indian -white	6	WHO	 3.1dmft 4.1dmft 4.1dmft 2.5dmft	27.9

Table III: South African Review: Dental Caries in 12-year-old children

AUTHOR	JOURNAL	REGION	SAMPLE SIZE	AGE (yr)	INDEX	DMFT	% CARIES FREE
Carstens et al	JDASA 1993; 48: 617-622	Langkloof	159	12	WHO (1987)	4.72	13.84
Chikte et al	JDASA 1990; 45: 245-249	Engcobo, Transkei	349	12	WHO (1977)	1.7	47
Du Plessis et al	JDASA 1997; 52: 483-486	Port Elizabeth & Despatch	296 high Fl 282 low Fl	12	WHO (1987)	1.1-1.6 1.3-1.7	
Reddy	International Dental Journal 1992; 42: 150-156	RSA	Black Coloured Indian White	12 12 12 12	WHO (1978)	1.67 2.05 1.33 1.79	
Van Wyk	National Oral Health Survey 1988/89	RSA	5241 Urban -black -coloured -indian -white	12	WHO	1.7 mean 1.7 2.1 1.3 1.8	 46 39.5 49.5 43.2

Table IV: South African Review: Dental Caries in 15-year-old children

AUTHOR	JOURNAL	REGION	SAMPLE SIZE	AGE (yr)	INDEX	DMFT	% CARIES FREE
Du Plessis et al	JDASA 1997; 52: 483-486	Port Elizabeth & Despatch	234 high Fl 287 low Fl	15	WHO (1987)	2.6-3.6 2.5-3.6	
Rudolph & Brand	JDASA 1989; 44: 105-108	Transkei	71	13-20	WHO (1977)	5.8	16.9
Van Wyk	National Oral Health Survey 1988/89	RSA	5255 Urban -black -coloured -indian -white	15	WHO	3.3 mean 3.0 4.2 2.5 4.0	 29.3 21.8 31 19.9

Table V: South African Review: The prevalence of periodontal disease (CPITN):

AUTHOR	JOURNAL	REGION	SAMPLE SIZE	AGE	CPITN (% OF CHILDREN)			TREATMENT NEEDS (% OF CHILDREN)		
					H	B	C	TN 0	TN 1	TN 2
Cleaton-Jones et al	JDASA 1991; 46: 503-505	KwaZulu	395 -rural -urban	5	40 73	56 24	4 3			
Chikte et al	JDASA 1990; 45: 245-249	Engcobo, Transkei	348 138 = males 210 = females	12	5.7 6.5 5.2	23.2 19.6 25.7	71.3 73.9 69.9		94.5 93.9 95.3	71.3 73.9 69.6
Hargreaves et al	JDASA 1990; 45: 109-111	KwaZulu -rural -urban	156 152	11	50 52	19 25	31 23	50 52	50 48	31 23
Mackeown et al	Community Dental Oral Epidemiol. 1995; 23: 182-6	KwaZulu -rural -urban	83 77	11	50 41					
Rudolph & Brand	JDASA 1989; 44: 105-108	Transkei	139	13-20	14 - 20	77 - 86	3		100	
Van Wyk	National Oral Health Survey 1988/89	RSA	Urban 1573= Black 1471 = Coloured 649 Indian 1559 = White	12	2.7 44 21.5 36.4	15.9 33.6 32	81.2 44.4 31.6	 5.6 19.7 36.4	95.2 93.7 72.7 63.6	79.9 72.8 41.6 31.6
Van Wyk	National Oral Health Survey 1988/89	RSA	Urban 1486= Black 1546 = Coloured 774 Indian 1451 = White	15	1.8 21.5 24.6	11.3 33.6 27.6	85.4 44.4 47.2	 6.4 14.1 24.6	98.1 93.1 85.5 75.3	86.9 77 63.4 47.7

H = healthy periodontium; B = bleeding; C = calculus; TN0 = no treatment; TN1 = oral hygiene instructions and TN2 = scaling and prophylaxis.

Table VI: Dental fluorosis prevalence in South Africa

AUTHOR	JOURNAL	REGION	SAMPLE SIZE	AGE	INDEX	PREVALENCE OF FLUOROSIS (%)	FLUO-RIDE CONTENT OF THE WATER (mg/l)
Carstens et al	JDASA 1995; 50: 405-411	Fraserburg	39 51 30	6 12 15	Deans	73.33 91.9 100	0.68-0.78
Du Plessis et al	JDASA 1995; 50: 405-411	OFS Goldfields	280 White Black 307 White Black	12 15	Deans	 43.1 15.9 30.6 16.8	0.2-0.9
Lambrecht	Unpublished data	Graaff-Reinet	419	6	Deans	73.33	0.79
Lewis & Chikte	JDASA 1991; 50: 467-471	KwaNdele	262	6-18	Deans	80	8-9 0.6-1.6
Lewis et al	Community Dental Oral Epidemiol. 1992; 20: 53-54	KwaNdele	262	6-18	Deans	> 80	1- 9
Grobler et al	Caries Research 1986; 20: 284-288	Nourivier & Tweeriviere	33 & 34	12-13	Deans	57.6 97.1	0.62 3.7
Zietsman	JDASA 1991; 46: 11-15	Pretoria	3103	5-20	Deans	52,7	0.1-5.53

Table VII: Severity of Malocclusion (Angle)

AUTHOR	JOURNAL	AGE	SAMPLE SIZE	MAL-OCCLUSION	OCCLUSAL STATUS (%)		
					I	II	III
Harris et al	JDASA, 1994, 49, 121-126	8-12	102	100	67.9	29.3	2.8
Zietsman	JDASA, 1979, 34, 231-234	14	409	72.5	47	24.5	1.0
De Mûelenaere & Wiltshire	JDASA, 1995, 50, 113-118	8-9	936		66.5	10	7.4
Burger et al	JDASA, 1993, 48, 551-556	10-14	28			100	
Zietsman	JDASA, 1979, 689-690	14	Black 119 Coloured 51 Indian 51 White 490		33.6 52.9 58.8 47	7.6 3.9 13.7 24.5	4.2 3.9 3.9 1.0

Class I = Normal molar relationship
Class II = Distal molar relationship
Class III = Mesial molar relationship
(Unclassified not included)

Table VIII: Treatment needs of Malocclusion

AUTHOR	JOURNAL	AGE	SUMMERS' OCCLUSAL STATUS (%)				
			I	II	III	IV	V
Van Wyk	NOHS 1988/89	12	53,6	17.5	15.7	11.5	1.8
		Black	61.1	14.0	14.5	9.3	1.1
		Coloured	55.8	15.1	14.8	12.3	2.0
		Indian	47.6	20.5	14.5	15.1	2.4
		White	46.4	22.0	18.2	11.4	2.1
Van Wyk et al	JDASA, 1985, 64(4), 781	12-13		60	17	23	7
Mûelenaere et al	JDASA, 1992, 47, 517-520	13,2–15,7	46	26	16	12	0
Ackerman & Wiltshire	JDASA, 1994, 49, 447-451	381 Disabled	10.5	15	19	30.5	25
De Mûelenaere & Viljoen,	JDASA, 1987, 42, 143-146	Unknown	69	14	12	5	0

Class I = Good occlusion
Class II = No treatment needed
Class III = Minor treatment needed (Removable appliances)
Class IV = Definite treatment (Fixed appliances)
Class V = Urgent treatment

Table IX. Arendorf et al, 1996, classified the oral manifestations of HIV infection as follows:

Fungal infections	Oral candidiasis	Pseudomembranous candidiasis
		Erythematous candidiasis
		Hyperplastic candidiasis
		Angular cheilitis
Viral infections	Oral hairy leukoplakia	
	Herpes Simplex and Varicella Zoster	
Bacterial infections	HIV-associated periodontal conditions	Erythematous gingival banding/linear gingival erythema-HIV-gingivitis
		Necrotising ulcerative gingivitis – HIV gingivitis
		Necrotising ulcerative periodontitis – HIV periodontitis
		Necrotizing stomatitis
Oral ulcerations		
Xerostomia		
Malignancies	Kaposi`s sarcoma	
	Lymphomas	

Table X: The prevalence and the three most common oral manifestations of HIV infection in Africa:

Prevalence and types of HIV-related manifestations				
AUTHOR:	COUNTRY	STUDY SAMPLE	PREVALENCE (% OF LESIONS)	LESIONS
Blignaut et al, 1999	South Africa	Black heterosexual HIV/AIDS	30	
Blignaut & Glick, 1997	South Africa		56.5	23.9% Candidiasis 10.8% Pseudomembranous candidiasis 10.4% Erythematous candidiasis
Arendorf et al, 1998	South Africa	600 Adults (HIV+)	60.4	37.8% Combined candidal infections 19.7% Hairy leukoplakia 8.5% Combined gingival/periodontal disease
Arendorf et al, 1997	South Africa	Men (HIV)		11.9% HIV associated periodontal disease
Maresky, 1996	South Africa		90	
Maresky, 1994	South Africa			66% Periodontal disease 62% Candidiasis 18% HL
Todes et al, 1997	South Africa		50	39,9% Candidiasis 10.1% HL 10,1% Periodontal disease
Naidoo et al, 1994	South Africa		43	47,6% Candidiasis

Table XI: The classifications of oral lesions associated with HIV infection.

Author	LESIONS STRONGLY ASSOCIATED WITH HIV INFECTION:	LESIONS LESS COMMONLY ASSOCIATED WITH HIV INFECTION	LESIONS SEEN IN HIV INFECTION
Arendorf et al, 1996	GROUP I	GROUP II	GROUP III
	Candidiasis	Bacterial infections	Bacterial infections
	Erythematous	Mycobacterium avium-intracellulare	Actinomycosis Israeli
	Pseudomembranous	Mycobacterium tuberculosis	Esherichia coli
	Hairy leukoplakia	Melanotic hyperpigmentation	Klebsiella pneumoniae
	Kaposi`s sarcoma	Necrotising (ulcerative) stomatitis	Cat-scratch disease
	Non-Hodgkin's lymphoma	Salivary gland disease	Epithelioid angiomatosis
	Periodontal disease	Dry mouth due to decreased salivary flow rate	Drug reactions
	Linear gingival erythema	Unilateral or bilateral swelling of major salivary glands	Fungal infections other than candidiasis
	Necrotising (ulcerative) gingivitis	Thrombocytopenia purpura	Cryptococcus neoformans
	Necrotising (ulcerative) periodontitis	Ulceration NOS (not otherwise specified)	Geotrichum candidum
		Viral infections	Histoplasma capsulatum
		Herpes simplex virus	Mucoraceae
		Human papillomavirus (warty-like lesions)	Aspergillus flavis
		Condyloma acuminatum	Facial palsy
		Focal epithelial hyperplasia	Trigeminal neuralgia
		Verruca vulgaris	Recurrent aphthous stomatitis
		Varicella-zoster virus	
		Herpes zoster	
		Varicella	
		Viral infection	
		Cytomegalovirus	
		Molluscum contagiosum	

APPENDIX 3

Schools selected for survey

Table XII: Sample selected per age group per schools for the National Oral Health Survey: Western Region of the Eastern Cape Province

TOWN:	SCHOOL:	AGE 4-5	AGE 6	AGE 12	AGE 15	TOTAL:
KIRKWOOD	REITBERG	15	15	15		45
UITENHAGE	JOHN WALTON – ROSEDALE				15	15
	PHINDUBUYE PUBLIC – KWANOBUHLE	15	15	15		45
	LIMEKHAYA HIGH-LANGA				15	15
	DESPATCH HIGH – DESPATCH				15	15
	SONOP PRIMARY – DESPATCH	15	15	15		45
HUMANSDORP	STILTING PRIMARY	15	15	15		45
	HUMANSDORP SECONDARY				15	15
WILLOMORE	ELMOR PRIMARY	15	15	15		45
KLIPPLAAT	KLIPPLAAT SECONDARY				15	15
PORT ELIZABETH	ANDREW RABIE – ADOCKVALE				15	15
	DDT JABAVU SECONDARY				15	15
	MOREGROVE PRIMARY – COTSWOLD	15	15	15		45
	NTYANTYAMBO PRIMARY – ZWIDE	15	15	15		45
	NDONDELELO HIGH – ZWIDE				15	15
	SAKHISIZWE SS – ZWIDE				15	15
	KWAMAGXAKI HIGH – KWAMAGXAKI				15	15
	WINLATON FARM – GREENBUSHES	15	15	15		45
	BEN SINUKU PRIMARY – NEW BRIGHTON	15	15	15		45
	ST. TERESA`S – SCHAUDERVILLE	15	15	15		45
	DAVID LIVINGSTONE – SCHAUDERVILLE				15	15
	VUKANIBANTU PRIMARY - SWARTSKOP	15	15	15		45
	MZONTSUNDLI HIGH – KWAZAKELE				15	15
	KWAZAKEHLE HIGH				15	15
	IMBASA PUBLIC – MOTHERWELL	15	15	15		45
	MBONISELO PUBLIC – MOTHERWELL	15	15	15		45
	BLUEWATERBAY PRIMARY – BLUEWATERBAY	15	15	15		45
	TRINITY HIGH				15	15
TOTALS: TOWNS = 6	SCHOOLS = 28	210	210	210	210	840

The fluoride content of the drinking water per school

Table XIII: The analysis of the drinking water samples collected at every school participating in the survey of the Western Region of the Eastern Cape Province (Courtesy of Medunsa University).

TOWN:	SCHOOL:	MEDUNSA CODE	SURVEY CODE	FLUORIDE CONTENTS (ppm)
KIRKWOOD	RIETBERG	000355	2101	2.5
UITENHAGE	JOHN WALTON – ROSEDALE	000357	2105	0.8
	PHINDUBUYE PUBLIC – KWANOBUHLE	000349	2106	0.26
	LIMEKHAYA HIGH-LANGA	000363	2107	0.62
	DESPATCH HIGH – DESPATCH	000362	2108	2.2
	SONOP PRIMARY – DESPATCH	000371	2109	2.8
HUMANSDORP	STILTING PRIMARY	000365	2110	0.6
	HUMANSDORP SECONDARY	000358	2111	0.5
WILLOMORE	ELMOR PRIMARY	000356	2112	1.02
PORT ELIZABETH	ANDREW RABIE – ADOCKVALE	000359	2114	0.4
	DDT JABAVU SECONDARY	000350	2105	1.9
	MOREGROVE PRIMARY – COTSWOLD	000354	2116	0.44
	NTYANTYAMBO PRIMARY – ZWIDE	000353	2117	0.34
	NDONDELELO HIGH – ZWIDE	000361	2118	0.3
	SAKHISIZWE SS – ZWIDE	000370	2219	0.38
	KWAMAGXAKI HIGH – KWAMAGXAKI	000369	2120	0.7
	WINLATON FARM – GREENBUSHES	000368	2121	0.5
	BEN SINUKU PRIMARY – NEW BRIGHTON	000360	2122	0.4
	ST. TERESA`S – SCHAUDERVILLE	000367	2123	0.5
	DAVID LIVINGSTONE – SCHAUDERVILLE	000367	2124	0.5
	VUKANIBANTU PRIMARY - SWARTSKOP	000364	2125	2.5
	MZONTSUNDLI HIGH – KWAZAKELE	000351	2126	0.28
	KWAZAKEHLE HIGH	000374	2127	0.5
	IMBASA PUBLIC – MOTHERWELL	000373	2128	2.8
	MBONISELO PUBLIC – MOTHERWELL	000372	2129	3
	BLUEWATERBAY PRIMARY – BLUEWATERBAY	000352	2130	1.7
	TRINITY HIGH	000366	2131	0.56
TOTALS: TOWNS = 5	SCHOOLS = 27			
Average fluoride content of the drinking water for schools in the Western Region of the Eastern Cape				1.07