Dental Treatment of Pre-school Paediatric Patients under General Anaesthesia in the Western Cape

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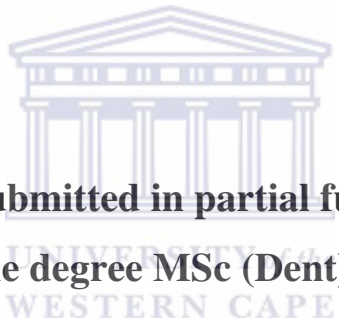

A mini-thesis submitted in partial fulfillment of the requirements for the degree MSc (Dent) in the Department of Community Dentistry, University of Western Cape.

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June 2009

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KEYWORDS

Early Childhood Caries (ECC)
Caries prevalence
Multifactoral aetiology
Behaviour modification
Pharmaco-therapeutic interventions
Dental General Anaesthesia
Conscious sedation
Quality of life (QOL)
Evidence-based dentistry
Preventive interventions

ABSTRACT

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AIM

The aim of this study was to review the data available from the Department of Health (DOH), on pre-school paediatric patients treated under Dental General Anaesthesia (DGA), at public health facilities in the Western Cape (WC) in order to ascertain the type and nature of treatment provided.

METHODOLOGY

This retrospective descriptive study reviewed the records on the Department of Health (DoH) Database of 16 732 pre-school patients treated under dental general anaesthesia in the period 1 January 2005 until 31 December 2007. A questionnaire was also completed telephonically with 22 dentists from the district dental health clinics. Summary descriptive statistics were calculated from data collected and comparisons were drawn between services available at the health districts and academic hospitals.

RESULTS

Of the 58 255 procedures recorded for pre-school patients in the district health clinics in the Western Cape, 99.94% were for extractions provided and 0.5% for restorations. The average number of teeth extracted was 10.4 (SD ±3.9).The average rate of DGA per 1000 of the population was 1.06. Only 9% (2) of dentists at district clinics reported that pre-DGA prevention was provided and 5% (1) reported including post-DGA prevention. The Academic Hospital at Tygerberg Oral Health Centre was the only facility in the Western Cape that provided comprehensive dental treatment for pre-school patients which included restorations, extractions, pre and post DGA prevention. Red Cross Children's Hospital provided treatment for pre-school patients

under DGA that included extractions, pre- and post DGA, but no restorative treatment.

CONCLUSION

The demand for DGA in pre-school patients in the WC was high. The lack of prevention associated with DGA in the public health service is the most likely reason the retreatment rate under DGA was reported by dentists as being 77%. There was an absence of protocol regarding DGA for pre-school patients in the public health service.

RECOMMENDATIONS

Guidelines formulated were recommended for use in the public service for pre-school patients being treated under DGA and includes the provision of preventive interventions such as regular topical fluoride applications, oral hygiene instruction and dietary advice.

Declaration

I declare that Dental treatment of Pre-school Paediatric Patients under General Anaesthesia in the Western Cape is my own work, and that it has not been submitted for any degrees or examination in any other university, and that all sources I have used or quoted have been indicated and acknowledged as complete references.

Fathima Bibi Mahomed Peerbhay

Signed: _____

June 2009

I dedicate this thesis to my family, my loving husband Anwar and my two precious children Uzair and Ammaarah. Their love and support was the key to the successful completion of this thesis. I am truly grateful to be blessed with such an amazing family

Acknowledgements

I would firstly like to thank my supervisor Dr Rob Barrie for his dedication and commitment in helping me complete this thesis.

I would also like to thank my co-supervisor and colleague Dr Nadia Mohamed for her valuable input and assistance.

Finally, I would like to thank my colleagues in the Paediatric Dentistry Department for the support in allowing me the time to complete my degree.

CONTENTS

CHAPTER 1

INTRODUCTION

BACKGROUND TO THE PROBLEM

The experience of the Paediatric Dentistry Department with regard to Dental General Anaesthesia (DGA) services that are offered at the University of Western Cape (UWC) Dental Faculty are that:-

1. The demand for DGA at the facility surpasses the resources.
2. There are a large number of referrals received (from private practitioners and primary dental facilities) for comprehensive restorative treatment under DGA. This is possibly due to the fact that the UWC Dental Faculty is the only public facility in the Western Cape Metropole that offers comprehensive restorative treatment under DGA.
3. A waiting list for DGA exists and the estimated waiting period between the initial treatment planning and treatment under DGA is approximately 6 months.
4. The protocol for DGA specified by the Department of Paediatric Dentistry at the University of Western Cape requires that the patient receive pre- and post- DGA prevention which includes dental health education, dietary analysis, fluoride applications and post-DGA follow up appointments.
5. Despite this stringent preventive protocol, the department still has a percentage of patients returning for retreatment under DGA.

In light of the above, the questions that arise are whether:-

1. There is an adequate and appropriate distribution of DGA resources in the public service in the Western Cape, to address the burden of dental disease in paediatric patients
2. The type and nature of treatment offered at DGA facilities are appropriate and evidence based
3. The DGA services available in the WC meet the demand for DGA

The information that has been published on Dental General Anaesthesia of paediatric patients in the Western Cape is minimal, and hence the motivation for the research to review DGA of pre-school paediatric patients in the Western Cape.

AIM AND OBJECTIVES

AIM

The aim of this study was to review the data available from the Department of Health (DoH), on pre-school paediatric patients treated under Dental General Anaesthesia (DGA), at public health facilities in the Western Cape (WC).

OBJECTIVES

1. To examine the type and nature of the treatment being provided under DGA
2. To ascertain the nature of the policy guidelines for DGA being instituted at these facilities
3. To critically analyze the information gathered in order to assist in the evidence based planning of future GA services in Paediatric Dentistry in the Western Cape

POSSIBLE IMPACT OF FINDINGS

The information gathered from this research was critically analyzed to:-

- Assist in the evidence based planning of future GA services in Paediatric Dentistry in the Western Cape
- Develop policy guidelines for DGA in the public service in the Western Cape.

CHAPTER 2

LITERATURE REVIEW

Early childhood caries (ECC) refers to a unique pattern of caries in infants, toddlers and pre-school children (Tinanoff, 1998).

This less specific term (ECC) was coined at a conference in 1994 to succeed the specific term "nursing caries" because it was the consensus that the link between bottle habits and caries was not absolute (Tinanoff, 1998). The rationale behind this consensus was drawn from the fact that several studies have reported that sleeping with the bottle does not always cause caries and may not be the most important factor in caries development (Kaste, 1995; Sullivan and Tinanoff, 1993; as cited by Tinanoff).

The treatment of ECC poses a challenge as the children that present with the condition are young and can sometimes be uncooperative, fearful, anxious or non-communicative (Savanheimo *et al*, 2005). Behaviour modification techniques such as Tell-Show-Do, modelling and desensitisation are required to effectively treat these children who present with these special needs. However, the children who do not respond positively to these techniques, and children who are medically compromised require pharmacotherapeutic interventions to complete their treatment. When the options such as oral pre-medication, nitrous oxide sedation and intravenous sedation are inadequate to facilitate comprehensive dental care, general anaesthesia (DGA) may be required (Scheult, 1993).

> In assessing the needs of the individual patient, due regard should be given to all aspects of behaviour management and anxiety control before deciding to proceed with general anaesthesia (Royal College of Anaesthetists, Dental Anaesthesia Committee, 1999).

General anaesthesia is a procedure which is never without risk (Royal College of Anaesthetists, Dental Anaesthesia Committee, 1999). The most important risks associated with Dental General Anaesthesia (DGA) are the life-threatening complications such as bronchospasms and allergic reactions which can lead to death (Enger *et al*, 1985). Coplans and Curson (1993) reported that the number of deaths associated with DGA was on the decrease in England and Wales. They found that during the period between 1980 and 1989, the number of deaths had decreased to 42 deaths from 100 in the previous decade.

Despite the decrease in deaths reported, the ongoing mortality in the United Kingdom (UK) was still cause for concern. A working committee led by Professor Poswillo was set up in 1989 to examine the need for DGA and sedation and to develop guidelines for the safe use of these modalities. These guidelines have achieved the goal of providing a framework to improve the standards of care, yet have failed to prevent mortality altogether, as approximately two deaths a year still occur in the UK (Worthington *et al*, 1998).

Mortality of an otherwise healthy person as a result of DGA is indeed a disturbing event and it is even more disturbing when it occurs in a child. It is therefore imperative that the individual patient's needs are thoroughly assessed and DGA is prescribed only when absolutely indicated. The use of DGA as prescribed in the Standards and guidelines for General Anaesthesia for Dentistry (UK) recommend that it's use should be limited to :-

- Clinical situations in which it would be impossible to achieve adequate local anaesthesia and so complete treatment
- Patients who because of problems related to age/ maturity or physical/ mental disability, are unlikely to allow safe completion of treatment. The Royal College of Anaesthetists recommends that only specialist paediatric anaesthetists should administer general anaesthesia to very young children.
- Patients in whom long term dental phobia will be induced or prolonged. The long term aim in such patients should be the graduated introduction of treatment under local anaesthesia, if necessary, an

intermediate stage of employing conscious sedation techniques (Royal College of Anaesthetists, Dental Anaesthesia Committee; 1999).

Several studies have acknowledged that the use of DGA for the treatment of paediatric patients presenting with ECC, is an effective and convenient modality that has several benefits (Acs *et al*, 1999; Acs *et al*, 2001; Anderson *et al*, 2004; Malden *et al*, 2008).

Malden *et al* (2008) reported that children treated under DGA exhibited substantial and highly significant improvement of their oral health related quality of life (OHRQoL). The OHRQoL refers to the impact oral health or oral disease has on an individual's daily functioning, well-being or quality of life (Malden *et al*, 2008). OHRQoL has been defined as "a multidimensional construct comprised of domains such as the impact of disease on physical oral functions associated with chewing, swallowing and speaking; the absence of discomfort and pain; psychosocial issues such as social discomfort in conversations, or concerns about appearance and social functioning associated with performance of normal roles; self perceived oral health status and treatment need" (Malden *et al*, 2008).

From their study to determine the effect of comprehensive dental rehabilitation on the percentile weight and percentile growth velocity of children who underwent DGA, Acs *et al* (1999) concluded that it resulted in the "phenomenon of catch up growth" with the comparison group that did not have ECC. Acs *et al* (2001) went on to further investigate the parents' perception of the child's quality of life (QOL) following dental treatment under DGA. They found that there was "a hierarchy of improvement noted". Improvement was noted in the pain experience, followed by improved abilities to eat and sleep and hence an overall improvement in the child's QOL (Acs *et al*, 2001).

This improvement in QOL was further corroborated by Anderson *et al* (2004), when they investigated the treatment associated change in aspects of QOL. They concluded that the improvement in QOL following treatment under DGA was immediate for the children and their families. More recently, Malden *et al* (2008) found that two thirds

of children who had dental treatment under general anaesthesia, presented with considerable improvement in their oral health-related quality of life.

Although the literature presented thus far shows that restorative treatment rendered under DGA for children presenting with ECC has a positive impact, there is a point of caution: the reduction in the salivary mutans streptococcus following extensive treatment is transient, as levels returned to baseline within five to seven months after treatment under DGA (Wright *et al*, 1992; Gregory *et al*, 1998).

One of the main recommendations from the studies of Wright *et al* (1992) and Gregory *et al* (1998) is that consideration should be given to aggressive versus conservative treatment of the primary dentition. Aggressive treatment includes full coverage restorations (e.g. stainless steel crowns), pulp treatments as well as extractions whereas conservative treatment refers to conservative restorative techniques avoiding pulp treatments and extractions wherever possible (Wright *et al*, 1992). The importance of this kind of approach and its potential for long term benefits however, needs further confirmation in long term trials.

The findings that the reduction in salivary mutans returned to baseline (Wright *et al*, 1992; Gregory *et al*, 1998), raises the issue that patients who have had treatment under DGA are "vulnerable to future caries attacks" (Peretz *et al*, 2000). This increases the risk of patients presenting with relapse and returning for retreatment under DGA. Several studies have investigated the relapse rate following DGA and have reported a retreatment rate of between 10.8 to 45.5%. (Clewett *et al*, 2004; Kakounaki *et al*, 2006; Albadri *et al*, 2006). The repeat DGA rate is cause for concern and it is the responsibility of the service provider to prevent the possibility of repeat DGA due to the risk and cost factors associated with it (Albadri *et al*, 2006).

The interventions that have been recommended in the literature to attempt to address the repeat DGA rate revolve primarily around preventive interventions. The preventive interventions that have been suggested include:-

- Application of topical fluorides and chemotherapeutic agents
- Provision of oral hygiene instruction to the patient and caregiver

- Dietary analysis, a pre-GA assessment appointment
- One week post-GA assessment
- Regular follow-up appointments at three-monthly intervals

(Sheehy *et al*, 1994; Harrison *et al*, 2000; Kakaonaki *et al*, 2006; Albadri *et al*, 2006)

Preventive interventions have primarily been directed at mothers and caregivers of the children who present with ECC (Ismail, 1998). These interventions require that mothers/ caregivers change their behaviour related to nursing, dietary and oral hygiene practices so that it can have a positive impact on the child's oral health status (Reisine *et al*, 1998). The concept of primary socialisation infers that the mother exerts the key influence on these practices (Ismail, 1998). The information provided to parents/ caregivers about the benefits of changing parenting practices and the norms of behaviour help some to be open to the possibility of changing their behaviour (Weinstein, 1998). The other areas of behavioural concern are related to the knowledge and skills of the mother about her own oral health, use of the dental care system and proper care of her child (Milgrom, 1998).

The science of health behaviour change consists of a multitude of complex dynamics. Various models exist to explain health behaviour and include the theoretical models of the Theory of Planned Behaviour, Health Belief Model and Health locus of control (Pine *et al*, 2004). These models are used to explain the beliefs and attitudes associated with tooth brushing and snacking (Pine *et al*, 2004).

The psychosocial risk factors associated with caries are related to two major demographic variables mainly race/ ethnicity and socio-economic status (SES). Several epidemiological studies allude to social class being an influence in caries risk (Reisine *et al*, 1998; Hobdell *et al*, 2003; Peres *et al*, 2006). Social class may influence caries risk in numerous ways. The financial, social and material disadvantages impact on individuals from lower socio-economic status by compromising their ability to care for themselves; seek professional health care services and live in a healthy environment (Holm, 1990).

Petersen (2003) reported that caries is still rife in disadvantaged and socially marginalised populations, thus confirming the impact of social class on caries. The

prevalence of caries in developed countries such as the USA and UK is however declining (Petersen, 2003).

In the South African context, the high level of caries in children under 15 has placed an enormous responsibility on the public health system (Van Wyk, 2003). Van Wyk (2003) concluded that "If the current backlog of caries is to be treated, it would imply that unrealistically high numbers of personnel and a substantial amount of person treatment hours would be required to do the conservative work". He stated further that "a massive and unrealistic allocation of resources would be required if such a public oral health programme was to be implemented, a cost that South Africa certainly cannot afford" (Van Wyk, 2003).

The caries prevalence relevant to this study is that of the pre-school group (4-5 yr group). Van Wyk's report stated that the weighted national mean dmft for this particular age group was 2.44. In addition, he found that the dmft of the 4-5 year olds in the Western Cape was 4.81, the highest in the country. Furthermore, he reported that the dental caries attack is more severe in the primary dentition than in the permanent dentition. He concluded that "the greatest need was recorded in the Western Cape Province" where almost 80 per cent of children needed care (Van Wyk, 2003).

ECC is a public health problem, since public health systems have the responsibility to control disease of the disadvantaged (Weinstein, 1998). The recommended public health strategies need to be examined in order to provide a framework for the prevention and treatment of ECC in the context of DGA.

The strategies that have been recommended for preventing ECC are based on targeted population approaches rather than individual, practice based approaches (Weintraub, 1998). Prevention and early intervention public health strategies for ECC that have been recommended are to:-

1. Promote water fluoridation

2. Evaluate the effectiveness of other public health oriented measures to prevent ECC

3. Develop a national ECC and rampant caries registry

4. Link Oral health screening and easily implemented, low-cost interventions with immunisation schedules and public health nursing activities.

5. Increase opportunities for community based interventions conducted by dental hygienists

6. Change insurance reimbursement schedules to provide incentives for dentists to prevent disease

7. Include dentistry in new child health insurance legislation for children as well as parents of infants and pre-school children

A review of studies of the prevention of ECC revealed a lack of well-designed clinical trials (Ismail, 1998). Preventive interventions should be based on scientific studies that have tested their efficacy and effectiveness. The adopted interventions should also target the problem and be based on a comprehensive rather than restricted understanding of the condition (Ismail, 1998).

A review done by Ismail (1998), of the current methods available to prevent ECC, reported that three general approaches have been used to prevent ECC:-

> The first is a community-based strategy that relies on educating mothers in the hope of influencing their dietary habits as well as those of their infants. This approach also includes fluoridating the water supply and personal and community preventive programs in high risk communities.
>
> The second approach is based on the provision of examination and prevention in dental care clinics.
>
> The third involves the development of appropriate dietary and self-care habits at home.

The community-based strategy of dental health education (DHE) to influence positive oral health behaviours and dietary habits of mothers and caregivers produces moderate change (Ismail, 1998). However, the current knowledge available on the disease underscores the need to continue with the promotion of healthy feeding

practices especially as there is evidence to support the link between positive oral health behaviours and dietary practices related to infants (Ismail, 1998). The community-based strategy of water fluoridation was found to be highly effective in preventing dental caries in the primary dentition (Evans et al, 1996 as cited by Ismail, 1998).

Ismail (1998) concluded that, DHE combined with early screening of ECC should be promoted from the first year of life to identify infants and toddlers at risk so that parents could be empowered as to how to promote oral health. He further elaborates that these high risk children should be targeted with a professional preventive programme that includes fluoride varnish application, fluoridated dentifrices, fluoride supplements, sealants and diet counselling.

A more recent systematic review on the prevention of ECC from the period 1998-2007 reported that the literature published during the last decade demonstrated an increasing number of well-conducted randomised trials that were controlled on subject or cluster/ group level (Twetman, 2008). Twetman concluded that the current evidence advocates the use of potentially effective interventions in the first 2 years of a child's life. He further elucidates that DHE interventions based on an early start, outreach activities and novel motivational interactive techniques, seemed to be more effective than those that used more traditional counselling. Strong scientific evidence was established to support the daily use of fluoridated toothpaste as the most cost-effective means to prevent caries (Twetman, 2008). Two other systematic reviews (Gussy *et al*, 2006; Ammaari *et al*, 2007) corroborated the fact that fluoride-based interventions were the most effective methods of preventing ECC (Twetman, 2008). According to the Swedish Council on Health Technology and Assessment and the American Dental Association, strong evidence exists to support the use of regular topical varnish applications (Petersson *et al*, 2004; ADA, 2006 as cited by Twetman, 2008). The evidence for antimicrobials and mother-child intervention are still inconclusive and further well-designed clinical trials are advocated in order to establish the effectiveness of these preventive interventions in ECC (Twetman, 2008).

The literature presented thus far demonstrates that dental treatment of children under general anaesthesia effectively treats the disease. It however, does not address the

primary symptom of the child's dental fear or the complex aetiology of ECC. The child therefore still lacks the ability to cooperate during normal dental appointments and may also present for retreatment under DGA (Savanheimo *et al*, 2005). The recommendation is that the child's behaviour be modified using preventive appointments subsequent to DGA so that the child can accept treatment in the normal way (Savanheimo *et al*, 2005).

The central theme that emerges from the literature regarding the treatment of children with ECC is that it is a disease of multifactorial aetiology and needs to be addressed with an integrated approach taking cognisance of the psychosocial and behavioural causative mechanisms. The treatment of a child with ECC under DGA is not without risk and is expensive. It should therefore be used in a multifocal context. This includes a combination of preventive measures, restorative procedures and/ or extractions. Hopefully, in this way, the problem of retreatment under DGA which consequently results in a burden on the health service will be alleviated.

CHAPTER 3

MATERIALS AND METHODS

DATA COLLECTION

Data used in this study was drawn from the following sources:

- Computer database (for the DoH facilities)
- General Anaesthesia records (for the facilities not on the database) e.g. Tygerberg Oral Health Centre and Red Cross Hospital
- Data gathered from a questionnaire

The research approach adopted included a combination of quantitative and qualitative methodologies. The reason this type of research approach was used was in order to firstly quantify the procedures being researched, and then qualify the former to obtain a broader understanding of the research question. The researcher acknowledges that qualitative methods do not permit statistical estimates to be made with any calculable accuracy, particularly in reference to the sample size. However, given the complex nature of DGA, a qualitative method was deemed appropriate in order to contextualize the quantitative data and understand the phenomena from a contrasting perspective (Bower *et al,* 2007). "The greatest value of qualitative research is it's ability to address questions of relevance to Dental Public Health (DPH) knowledge and practice which are difficult to answer satisfactorily using quantitative methods alone" (Bower *et al*, 2007). Qualitative research "refers to a range of methodological approaches which aim to generate an in depth and interpreted understanding of the social world, by learning about people's social and material circumstances, their experiences, perspectives and histories" (Bower *et al*, 2007). The qualitative data in this research was obtained from the questionnaire responses and was used to explore how the dentists working in the facilities in the sample, perceived the social phenomena related to dental treatment of paediatric patients under general anaesthesia. This qualitative data assisted the researcher to generate possible explanations for the social phenomena that could not be explained by the quantitative data alone.

1. STUDY SAMPLE

1.1 Quantitative data collected from records

This cross-sectional, retrospective descriptive study was carried out through a review of the Department of Health (DoH) Database in the Western Cape, South Africa, of pre-school patients who received treatment under dental general anaesthesia (DGA), between 1 January 2005 and 31 December 2007. This database contains records of all treatment at public dental clinics, but excludes those from Tygerberg Oral Health Centre and Red Cross Children's Hospital. General Anaesthesia theatre records of the facilities not on this database were also reviewed i.e. Tygerberg Oral Health Centre and Red Cross Children's Hospital. Ethics approval for the study was obtained from the University of Western Cape Senate Research Committee (Project number 08/5/19) and the University of Stellenbosch's ethics committee (Appendix A).

Data on dental procedures received by children under the age of 6 years (pre-school) at all dental public facilities in the Western Cape were accessed from the DoH Database (the Public Dental Evaluation System – PDE), as well as from the General Anaesthesia records at Tygerberg Oral Health Centre and Red Cross Children's hospital. The records of preschool patients who received DGA on an in-patient and out-patient basis were collected (see exclusion criteria below). Permission to access this data was obtained from the Department of Health (DoH) of the Western Cape Provincial Government (Appendix B). Data was collected for administrative purposes by hospital-employed dentists and recorded in standardized codes used in all public dental facilities in the Western Cape. Codes for general anaesthesia, extractions and restorations were included. The data collected from the general anaesthesia theatre records of Tygerberg Oral Health Centre and Red Cross Children's Hospital, was recorded as descriptions of the procedures rather than as codes i.e. number of extractions and/or restorations. The reason for this was that these procedures were recorded as descriptions and not as codes in the general anaesthesia theatre records.

The Department of Health keeps records of all dental treatment carried out at public health facilities in the Western Cape. These records are collected for statistical purposes. The computerized system used is a dBase application, the Public Dental

Evaluation (PDE) System and it records the patient category, treatment code, clinic where treated and the dentist/therapist/oral hygienist that performed the procedure, as well as the month, quarter and year of the treatment. Each treatment code constitutes a record in the database.

The records that were used for this study were all the records for treatment that was carried out under general anaesthesia in the Western Cape during the study period (2005 – 2007). A dBase program was developed to extract these records. One hundred and four thousand, eight hundred and sixty five records (104865) were obtained from the DoH database that met the above-mentioned criteria. This represented the treatment of 16732 individual pre-school children under GA in the public health facilities in the Western Cape.

This back-end database in dBase was analyzed using Pivot tables in Excel via Open Database Connectivity. All further calculations were performed using Excel, statistical tools and EpiInfo.

The data from the Tygerberg Oral Health Centre and Red Cross Children's Hospital theatre records was captured directly into Excel. A total of 1136 patients received treatment under GA between 1 January 2005 and 31 December 2007 in Tygerberg Oral Health Centre and Red Cross Children's Hospital.

The original total number of patients seen under GA in the public health facilities is reflected in Table 1 below:

Table 1: Original total number of patients seen under GA

Category	Description	Total	Included in study
1	Pre-School Child	15900	15900
2	Scholar	1796	
3	Mentally Handicapped Child	54	
4	Physic. Handicapped Child	41	
5	Mentally Handicapped Adult	60	
6	Physic. Handicapped Adult	8	
7	Old Age Home Resid.	1	

Category	Description	Total	Included in study
8	Hospitalized Child	832	832
9	Hospitalized Adult	10	
10	Prisoner	4	
11	Aged	4	
12	Adult	89	
13	Not Applicable		
14	Pregnant Woman	3	
	Total	18802	16732

Exclusion criteria

The following information was excluded from the data collection:-

1. DGA data for physically and mentally handicapped children were excluded, as it could not be determined whether they were in fact, pre-school children or not. Other, patient categories referred to patients other than pre-school children and were also excluded. The only exception was hospitalized children, who were included. The reason for this was that at certain hospitals in the rural areas all the pre-school children are routinely admitted to the ward prior to theatre.
2. Codes 8206, 8207 and 8208. The implication of the codes 8106, 8207 and 8208 was that six, seven and eight teeth respectively, were extracted per quadrant. However, the maximum number of teeth that could be extracted per quadrant in a preschool child is five. Hence, the use of these codes is obviously an error, and since it could not be determined whether and 8208 should have been an 8205, the codes 8206, 8207 and 8208 were excluded.
3. Treatment codes recorded as pre-school children receiving treatment at Pollsmoor prison
4. The codes recorded for post-extraction haemorrhage. This code was logically inconsistent with the description of the code and also recorded at only 2 clinics.

1.2 Qualitative data collected in the form of a Questionnaire

A questionnaire was prepared and piloted with a random sample of 5 dentists. The researcher adjusted the questionnaire accordingly.

A proportional, stratified random sample of public dental facilities was drawn. Ten percent of dental clinics in the 6 health districts in the Western Cape were included. The number of clinics from each of the 6 health districts is represented in Table 2. The facilities have not been identified to maintain the confidentiality of the dentists in order to allow them the opportunity to answer the questions freely.

A questionnaire (Appendix C), which included closed and open-ended questions, was completed by the researcher during telephonic interviews with a dentist at each of these 22 dental clinics in the 6 health districts. Informed consent was obtained from the dentists who were interviewed via facsimile (Appendix D).

Table 2: Clinics included in telephonic interviews

Health District	No. of clinics sampled
Cape Metropole	6
Cape Winelands	4
Central Karoo	1
Eden	4
Overberg	3
West Coast	4

2. Demographic Profile

Information for the demographic profile was obtained from the Western Cape Department of Health (WCDoH, 2008).

Data Analysis

1. The existing database from the DoH system was used.
2. The data from the general anaesthesia theatre records of Tygerberg Oral Health Centre and Red Cross Children's hospital were recorded separately, as these records were not available on the DoH database.
3. Summary descriptive statistics was then calculated from this data.
4. Comparisons were drawn between the services rendered at the clinics and those rendered at the Tygerberg and Red Cross hospitals.
5. Qualitative data collected in the form of a questionnaire was also subjected to summary descriptive analysis.
6. Associations were investigated between the questionnaire responses and services provided at the health district level.

CHAPTER 4

RESULTS

Analysis of Clinical Records

Number of patients who received dental treatment under GA per health district in the period 1 January 2005 until 31 December 2007

The total number of patients treated under DGA was 16732. The largest number of patients were treated in the Cape Metropole (6847), followed by the Cape Winelands (5403), Eden (2673), Overberg (871), Westcoast (601) and the Central Karoo (337). The number of patients treated under DGA, *per annum*, in each district is represented in Table 3.

Table 3: Number of preschool patients who received dental treatment under GA

DISTRICT	2005	2006	2007	Total
Cape Winelands	1,406	1,821	2176	5,403
Central Karoo	79	124	134	337
Eden	815	814	1,044	2,673
Metropole	2,357	2,332	2,158	6,847
Overberg	228	226	417	871
West Coast	165	205	231	601
Total	5,050	5,522	6,160	16,732

The difference in the number of pre-school patients who received dental treatment under GA in the separate districts per year is statistically significant (Chi-squared = 257.3262, $p<0.0001$)

Rates of DGA's provided in the Western Cape

Table 4 illustrates the trends in DGA treatment provided in the Western Cape with the relative frequency of DGA provided to paediatric patients in relation the population distribution.

Table 4: Rate of DGA treatment per population in the WC 2005 - 2007

DISTRICT	Population	Population Relative Frequency	No. of D.G.A.	D.G.A. Relative Frequency	DGA/1000 population per year
Cape Winelands	739,002	14%	5403	30%	2.44
Central Karoo	52,786	1%	337	2%	2.13
Eden	527,859	10%	2673	15%	1.69
Metropole	3,378,294	64%	7983*	45%	0.79
Overberg	263,929	5%	871	5%	1.10
West Coast	316,715	6%	601	3%	0.63
Total	5,278,585	100%	17868	100%	1.06

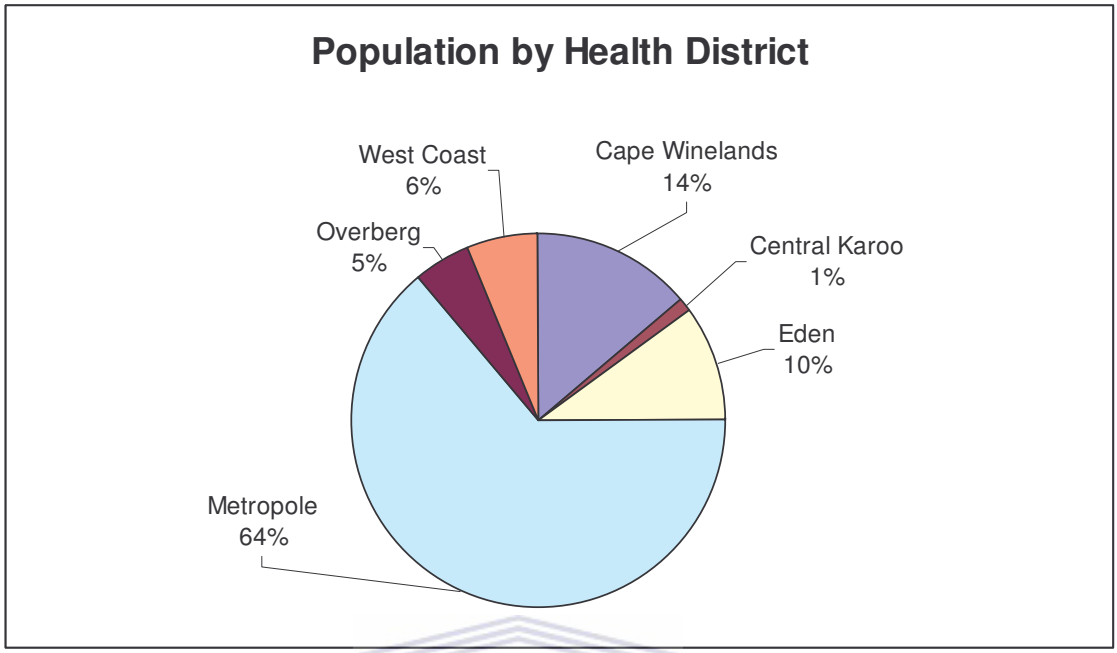
*DGA's provided at the Tygerberg Oral Health Centre and Red Cross Hospital (total of 1136) was included in the Metropole total.

*****The total population was used and hence the rates calculated are estimates

Population statistics from WCDoH, 2008

The distribution of the population in the Western Cape is illustrated in Fig 1.

Figure 1: Distribution of the population in the Western Cape per district



The distribution of DGA's in districts in the Western Cape is illustrated in Fig 2.

Figure 2: Distribution of DGA's in the Western Cape per district

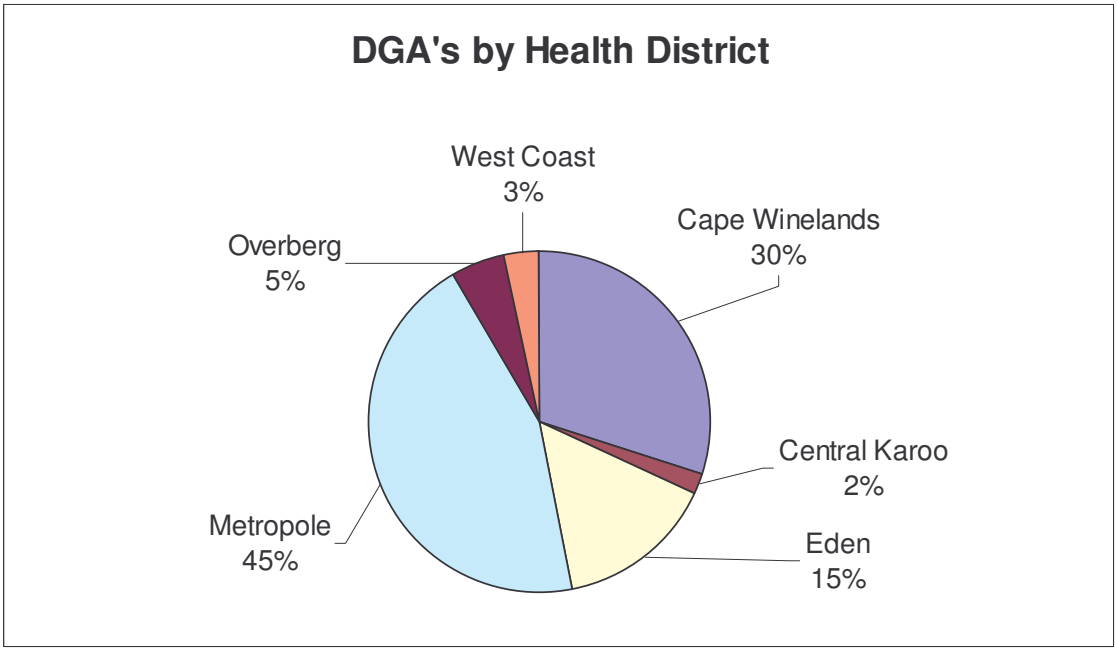
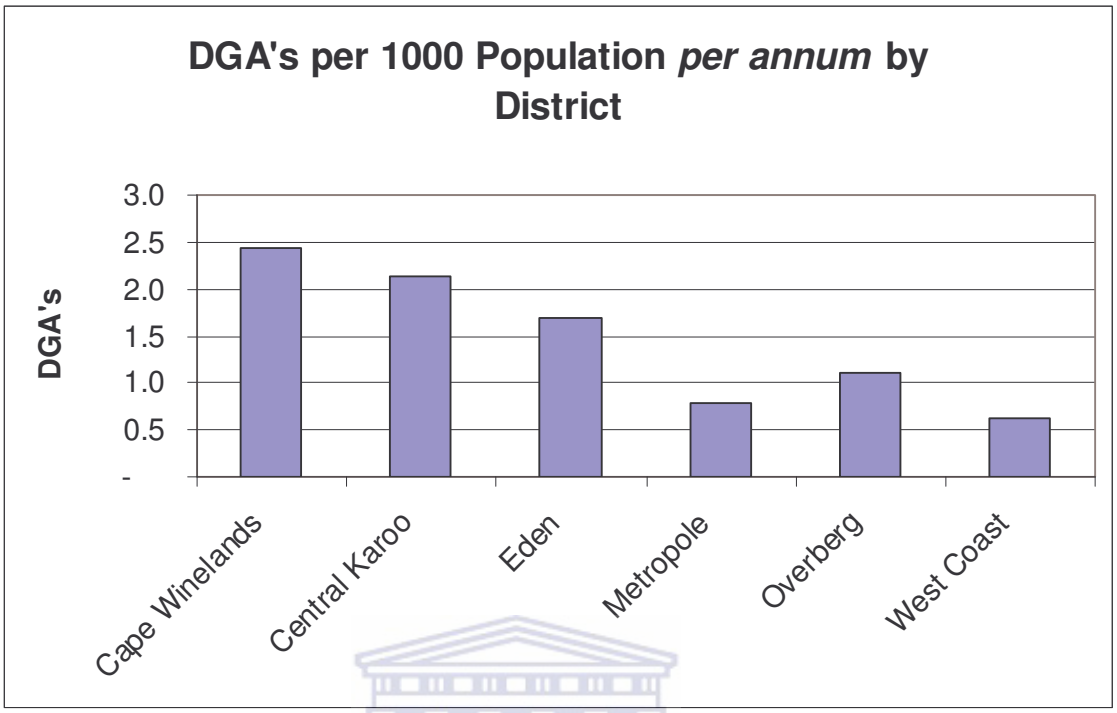


Figure 3: DGA's provided per 1000 of the population per year



Clinical procedures

The dental procedures recorded for pre-school patients under GA included in this study are reflected in Table 5.

Table 5:- Overview of number of clinical procedures performed on pre-school patients in the period 1 January 2005 until 31 December 2007

CODE	PROCEDURE	Total
8201	EXTRACT 1 TOOTH/QUADRANT	9,237
8202	EXTRACT 2 TEETH/QUADRANT	18,251
8203	EXTRACT 3 TEETH/QUADRANT	8,888
8204	EXTRACT 4 TEETH/QUADRANT	7,364
8205	EXTRACT 5 TEETH/QUADRANT	14,479
8209	SURGICAL REMOVAL OF A TOOTH	1
8220	PLACE SUTURES	6
8351	ACID ETCH 1 SURFACE (ANT. TOOTH)	6
8352	ACID ETCH 2 SURFACES (ANT. TOOTH)	2
8353	ACID ETCH 3 SURFACES (ANT. TOOTH)	12

CODE	PROCEDURE	Total
8367	ACID ETCH 1 SURFACE (PRE-M. & MOLARS)	2
8368	ACID ETCH 2 SURFACES (PRE-M. & MOLARS)	7
Total		**58,255**

Restorative treatment

Twenty nine restorations in total were recorded for pre-school patients. This only represents 0.05% of all treatment carried out on pre-school patients under DGA. This was insignificant compared to the large number of extractions provided under DGA.

Table 6 illustrates the number of restorations provided in each district. Only three districts out of the six in the Western Cape provided restorative treatment under DGA viz. Cape Winelands (9), Eden (5) and Cape Metropole (15). Furthermore, no restorations were recorded for any of the other districts for the year 2005.

Table 6: Number of restorations provided under DGA per district

DISTRICT	2005	2006	2007	TOTAL
Cape Winelands			9	9
Eden			5	5
Metropole		15		15
Grand Total	**0**	**15**	**14**	**29**

The number of restorations placed in 2006 and 2007 were only 15 and 14 respectively, showing no significant difference between the numbers of restorations provided in 2006 and 2007.

Extractions

Of the 58 255 treatment codes (see table 5) provided for these patients, 58 219 (99.94%) were recorded for extractions. These extraction codes were 8201, 8202, 8203, 8204 and 8205. Since these codes represent the number of teeth extracted per quadrant, the actual number of teeth extracted can be calculated. Over the 3 year period, 174 141 teeth were extracted (Table 7).

Table 7: Total number of teeth extracted per district per year

DISTRICT NAME	2005	2006	2007	Grand Total
Cape Winelands	14,468	18,674	22,697	55,839
Central Karoo	1,113	1,136	1,219	3,468
Eden	12,493	12,083	14,983	39,559
Metropole	20,776	20,357	18,305	59,438
Overberg	2,395	2,571	4,616	9,582
West Coast	1,566	2,225	2,578	6,369
Total	52,811	57,046	64,398	174,255

The average number of teeth extracted in each district (Table 8) is 10.4 per patient. The highest average of 14.8 (SD 5.7) was recorded in the health district of Eden, and the lowest average of 8.7 (SD 3.9) teeth extracted per patient was recorded in the Metropole.

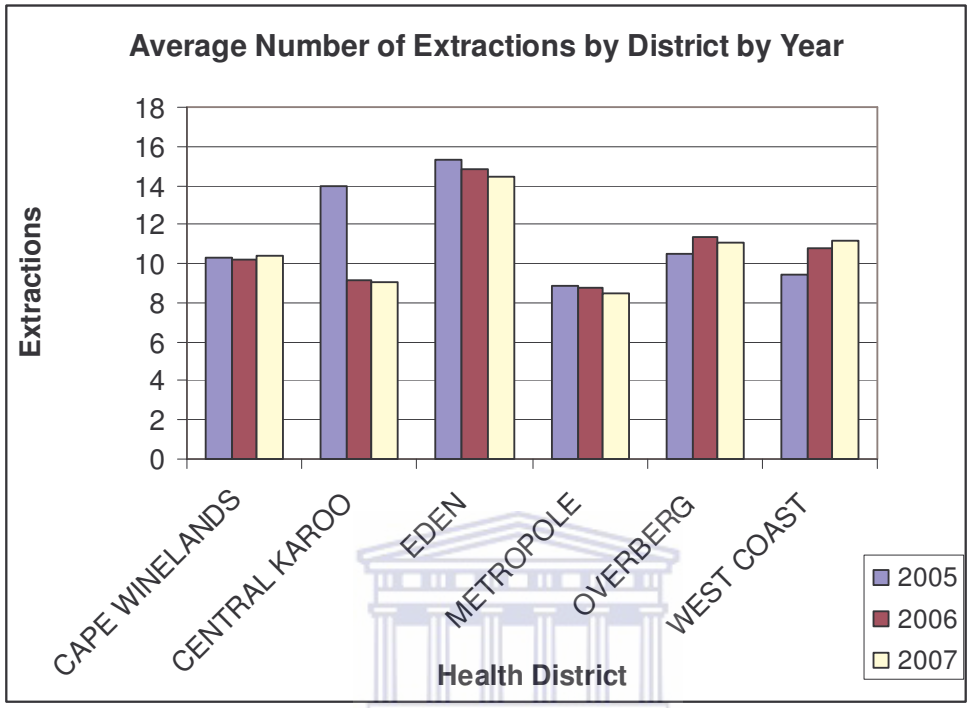
Table 8: Average number of teeth extracted per district

DISTRICT	2005	2006	2007	Total	Standard Deviation
Cape Winelands	10.3	10.2	10.4	10.3	4.2
Central Karoo	14.0	9.1	9.1	10.2	5.2
Eden	15.3	14.8	14.4	14.8	5.7
Metropole	8.8	8.7	8.5	8.7	3.9
Overberg	10.5	11.3	11.1	11.0	4.4
West Coast	9.4	10.8	11.1	10.6	4.4
Total	10.5	10.3	10.5	10.4	4.9

Trends of average teeth extracted

The trend in the average number of teeth extracted in the different health districts over the three-year period is graphically illustrated in Figure 4.

Figure 4:-Average number of teeth extracted per district per year



The Cape Winelands maintained a fairly constant average, with averages of 10.3 (SD± 4.3), 10.2 (SD ± 4.1) and 10.4 (SD ± 4.3) teeth extracted for the years 2005, 2006 and 2007 respectively (Fig 4).

The Central Karoo presented with an average of 14.0 (SD ± 5.0) teeth extracted in 2005, a sharp decline to 9.1 (SD ± 5.1) teeth on average being extracted in 2006 which remained constant at 9.1 (SD ± 4.2) in 2007 (Fig.4).

The district of Eden had an average of 14.8 (SD ± 5.7) teeth extracted per patient, the highest in the province. The only clinic in the whole sample that presented with an average above 15 teeth extracted per patient was situated in the district of Eden. This clinic had an average of 20 (SD ± 1) extractions per patient, which had a major impact on the average score for this district. The average number of teeth extracted in Eden in

2005 was 15.3 (SD ± 5.5). This decreased to an average of 14.8 (SD ± 5.8) in 2006, and decreased further to 14.4 (SD ± 5.6) in 2007.

The Metropole had the lowest overall average in the three-year period compared to the rest of the districts, with 8.7 (SD ± 3.9) teeth extracted. The average number of teeth extracted in the Metropole remained constant from 2005 to 2007 (Fig 4). The 2 clinics in the entire data set that presented with an average of less than 5 extractions per patient were both situated in the Metropole, with an average of 4.5 (SD ± 2.6) and 4.9 (SD ± 4.7).

The Overberg showed an increase from 2005 to 2006, with an average of 10.5 (SD ± 4.8) and 11.3 (SD ± 4.4) teeth extracted respectively, and subsequently, a slight decrease to 11.1 (SD ± 4.2) teeth extracted in 2007.

The West-Coast Health district demonstrated a slight increase in the average of 9.4 (SD ± 4.3) teeth extracted in 2005, 10.8 (SD ± 4.4) in 2006 and 11.1 (SD ± 4.2) in 2007.

Dental treatment provided under GA at Tygerberg Oral Health Centre and Red Cross Children's Hospital (1 January 2005-31 December 2007)

Tygerberg Oral Health Centre

The Dental Faculty of the University of the Western Cape, Tygerberg Oral Health Centre, is located at Tygerberg Hospital. Dental treatment provided under GA by the Tygerberg Oral Health Centre is provided within a framework of evidence based dentistry as stipulated in the mission statement of the Faculty of Dentistry at the University of Western Cape. Dental treatment of paediatric patients under GA forms part of the undergraduate dental training curriculum. The dental treatment under GA was provided under the direction of a dentist and was completed by combinations of operators, usually the qualified dentist and a final year dental student.

The protocol for DGA specified by the Department of Paediatric Dentistry at the University of Western Cape requires that the patient receive pre- and post- DGA prevention. The DGA prevention is provided to the patient by the undergraduate dental students who are required to complete a comprehensive treatment plan for the patient at the initial consultation as well as provide dental health education. The patient is given a diet history chart to complete and return on the subsequent visit. The patient is then required to return for 2 subsequent visits so that a minimum of 2 fluoride applications can be completed prior to DGA. Once the fluoride applications have been completed; the diet chart returned; and the patient's oral hygiene has improved, a member of the full-time staff of the Paediatric Dentistry Department provides a DGA consultation to confirm whether the patient fits the criteria for DGA and qualifies to be placed on the waiting list.

Once the patient is treated under DGA, the caregiver is advised to return for follow-up appointments at one-week and three-months post DGA so that fluoride applications can be provided for the patient and dental health education can be reinforced.

Red Cross Hospital

Red Cross Hospital's dental clinic is coordinated by the University of Western Cape's Dental Faculty. No undergraduate clinical training is carried out at this dental facility at Red Cross Hospital. This facility consists of one dental room which houses two dental chairs which are used by the dentist and oral hygienist who provide treatment for the patients of Red Cross Hospital. The resources of this dental facilty at Red Cross Hospital are inadequate for undergraduate paediatric dentistry training. However, the DGA protocol which is used at Tygerberg Oral Health Centre is also followed at Red Cross Hospital.

Table 9 illustrates the number of DGA's provided at Tygerberg and Red Cross Hospitals for the period 1 January 2005 until 31 December 2007

Table 9:- Number of patients who received dental treatment under GA at Red Cross Hospital and Tygerberg Oral Health Centre

Hospital	2005	2006	2007	Total
RXH	139	134	100	373
TYG	301	251	211	763
Total	440	385	311	1136

It is evident that about twice as many DGA's are done at Tygerberg than at Red Cross. However, the differences are not statistically significant.

Restorations

Table 10 illustrates the total number of restorations provided at Tygerberg and Red Cross Hospitals.

Table 10: Total number of restorations provided at Red Cross Hospital and Tygerberg Oral Health Centre

Hospital	2005	2006	2007	Total
Red Cross Children's Hospital	0	0	0	0
Tygerberg Oral Health Centre	356	664	572	1592

It is clear that no restorations are placed during DGA at Red Cross Hospital.

Table 11 illustrates the number of patients who received restorations at Tygerberg Oral Health Centre and Red Cross Hospital.

Table 11: Total number of patients who received restorations at Red Cross Hospital and Tygerberg Oral Health Centre

Hospital	2005	2006	2007	Total
Red Cross Children's Hospital	0	0	0	0
Tygerberg Oral Health Centre	117	132	115	364
Total	117	132	115	364

The trend of restorations provided at Tygerberg Oral Health Centre over the three-year period reveals that 117 patients were provided with restorations under DGA in 2005 (Table11). This increased to 132 patients receiving restorations in 2006 and decreased to 115 in 2007. No restorations were provided at Red Cross Hospital.

The average number of restorations provided at these 2 hospitals from 2005 until 2007 is illustrated in Table 12.

Table 12: Average number of restorations provided at Red Cross Hospital and Tygerberg Oral Health Centre

Hospital	2005	2006	2007	Total
Red Cross Children's Hospital	0	0	0	0
Tygerberg Oral Health Centre	3.0	5.0	5.0	4.4 (±3.6)

Extractions

Table 13 illustrates the average number of extractions provided per paediatric patient under DGA at Tygerberg Oral Health Centre and Red Cross Hospital.

Table 13: Average number of extractions per patient provided at Red Cross Hospital and Tygerberg Oral Health Centre

Hospital	2005	2006	2007	Total
Red Cross Children's Hospital	11.2	11.5	11.3	11.3(±4.8)
Tygerberg Oral Health Centre	9.2	8.4	8.5	8.7 (±5.5)
Grand Total	9.8	9.5	9.4	9.6 (±5.4)

Questionnaire responses

The results obtained from the telephonic interviews conducted with dentists at the 22 facilities sampled are illustrated in Table 14.

Table 14: Questionnaire responses of Dentists in district clinics

Questionnaire	YES(n)	YES (%)
Are there guidelines for DGA?	19	86
Guidelines for Patient Selection Criteria?	17	77
Guidelines for pre-DGA prevention?	2	9
Guidelines for post-DGA prevention	1	5
Is topical fluoride applied pre and post DGA?	3	14
Is oral hygiene instruction provided?	7	32
Is dietary analysis performed?	1	5
Is a pre-DGA assessment appointment done?	2	9
Is post-DGA prevention provided?	1	5
Is there a waiting list at the facility?	20	91
Is there enough time for DGA?	2	9
Are all patients intubated?	11	58
Do patients return for re-treatment?	17	77
Is there conscious sedation?	0	0

Policy Guidelines

Eighty six percent (86%) of respondents reported that they followed a guideline at the facility for DGA. Seventy-seven percent confirmed that the protocol included details regarding the criteria for selecting patients for DGA. However, only 9% reported that the protocol included details with regards to pre-DGA prevention (Table 14, Fig 5). Five percent (Table 14, Fig 6) reported having post- DGA prevention included in the protocol at the facility.

Preventive protocol

Nine percent of dentists reported having pre-preventive details included in the facility protocol, 14% included topical fluoride application as part of the pre-preventive treatment plan, 32% included oral hygiene instruction and 5% claimed to providing dietary advice (Table 14). This 5% of respondents acknowledged that no formal dietary chart was filled in by the caregivers or dietary analysis conducted, but that general dietary advice was provided to the caregiver. Nine percent (Figure 5) of dentists reported including a pre-DGA assessment appointment to evaluate compliance of the caregiver regarding oral hygiene, feeding and dietary practices.

Figure 5: - Percentage of facilities reported by dentists to providing pre-DGA prevention in the Western Cape

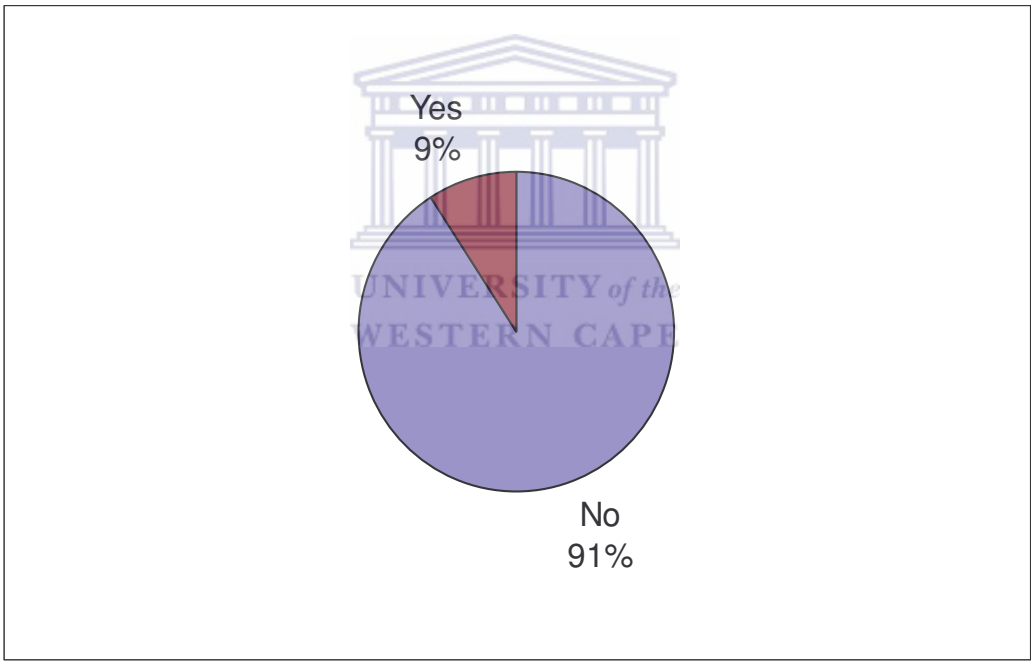
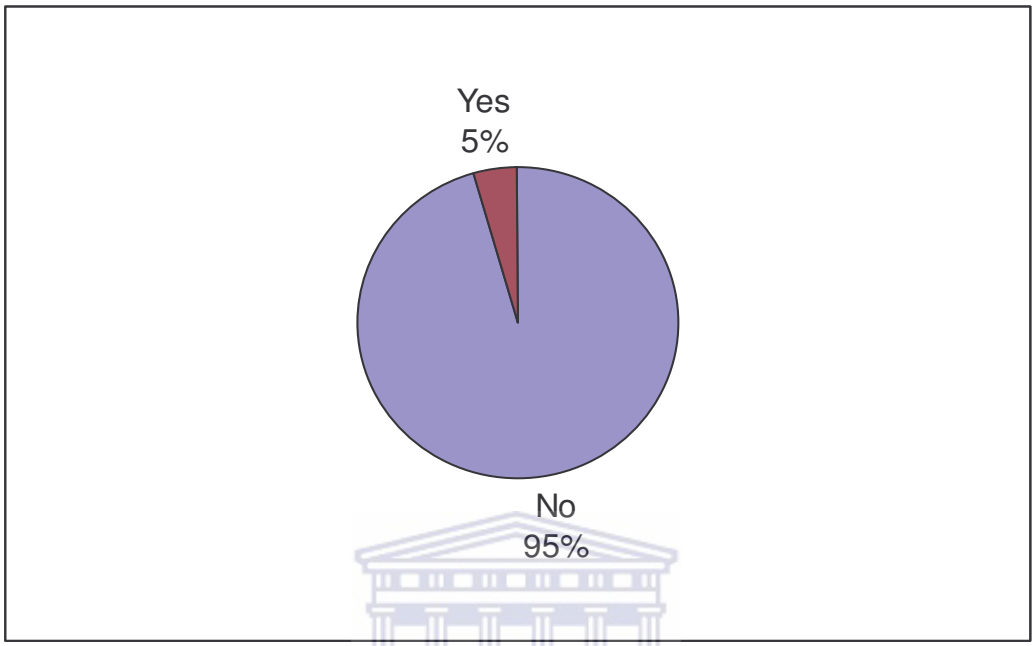


Figure 6 illustrates the percentage of facilities that were reported by dentists to providing post-DGA prevention in the WC. The dentist at only one clinic (5%) in the sample reported that post-DGA prevention was provided to paediatric patients who had undergone treatment under DGA.

Figure 6: Percentage of facilities reported by dentists to providing post-DGA prevention in the WC



Nature of treatment provided

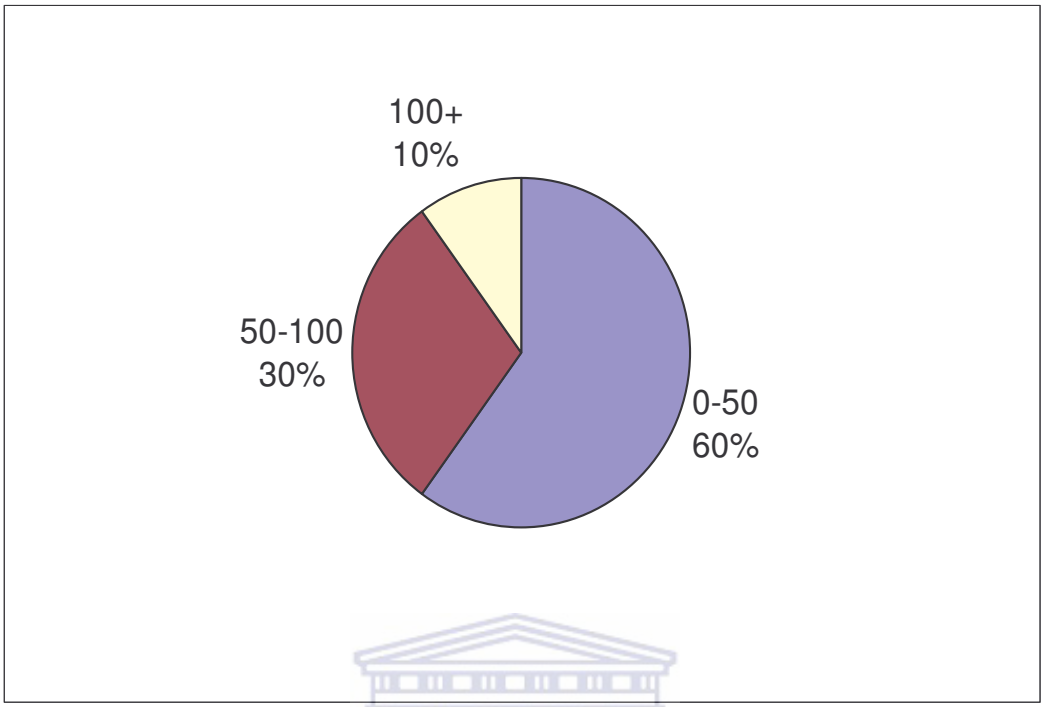
One-hundred percent (22) of dentists at all the facilities in the sample described the nature of the treatment provided for paediatric patients under DGA as "extractions only". This corroborates the results of the quantitative data, which showed that 99.94% of treatment provided for pre-school paediatric patients under DGA in the district clinics were extractions.

Waiting lists

The dentists at 20 clinics (91%) reported that a waiting list for DGA existed at the facility, whilst the dentists at 2 clinics (9%) reported that there was no waiting list for DGA at the facility (Fig 7).

The majority of dentists estimated that the waiting list had fewer than 50 patients.

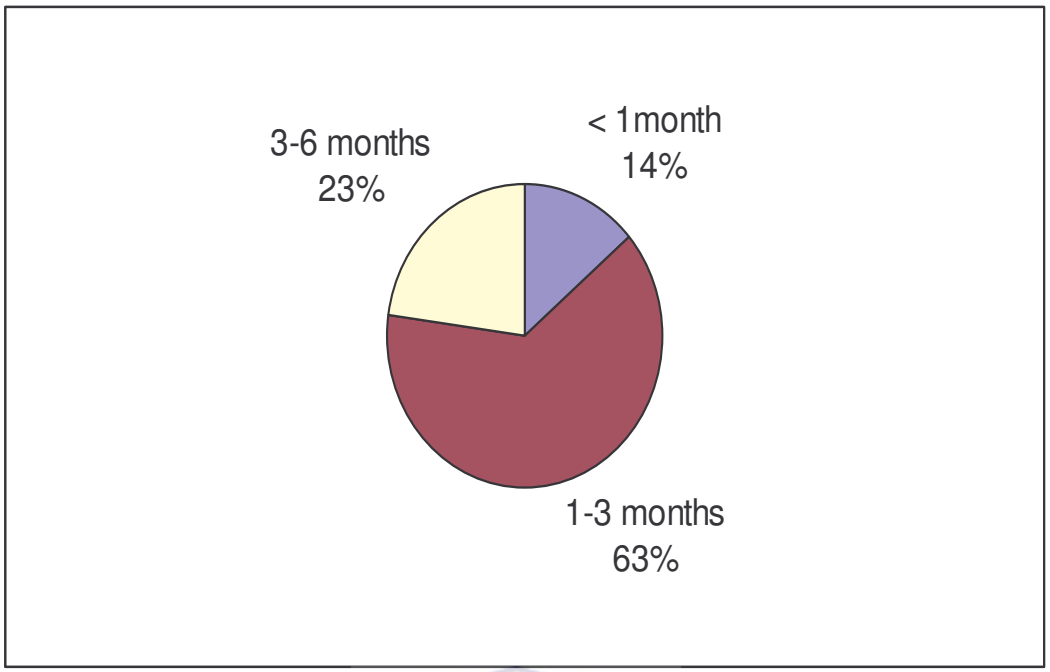
Figure 7: Dentists estimate of the number of patients on the waiting list



Waiting period

The majority of dentists at the 22 clinics sampled, estimated that paediatric patients had to wait 1-3 months before treatment under DGA was provided, after the initial consultation (Fig 8). Five dentists estimated that this waiting period was between 3-6 months and 3 dentists estimated that this waiting period was less than a month.

Figure 8:-Estimate of the time period between initial consultation and actual treatment under DGA



Theatre time

The dentists at 20 clinics (91%) reported that it was their perception that there was not enough theatre time allocated for DGA (Table 13). Furthermore, the dentists at these 20 clinics were of the opinion that the demand for DGA of paediatric patients was not adequately being met. The amount of time allocated for DGA per month at 18 of the clinics is illustrated in Table 15.

Table 15:-Time allocated for DGA at different clinics in the WC

Clinic	Theatre Time available per month(hrs/month)
Church St	16
Zwelenthemba	8
Nduli	16
Hope Street	60
Gustrow	4
Idas Valley	3
Paarl	4

Clinic	Theatre Time available per month(hrs/month)
Saldhana	0
Hermanus	10
Riversdale	4
Oudtshoorn	12
George	8
Porterville Hospital	8
Beaufort West	10
Mossel Bay Hospital	6
Red Cross Hospital	8
Breede River	8
Swellendam	8

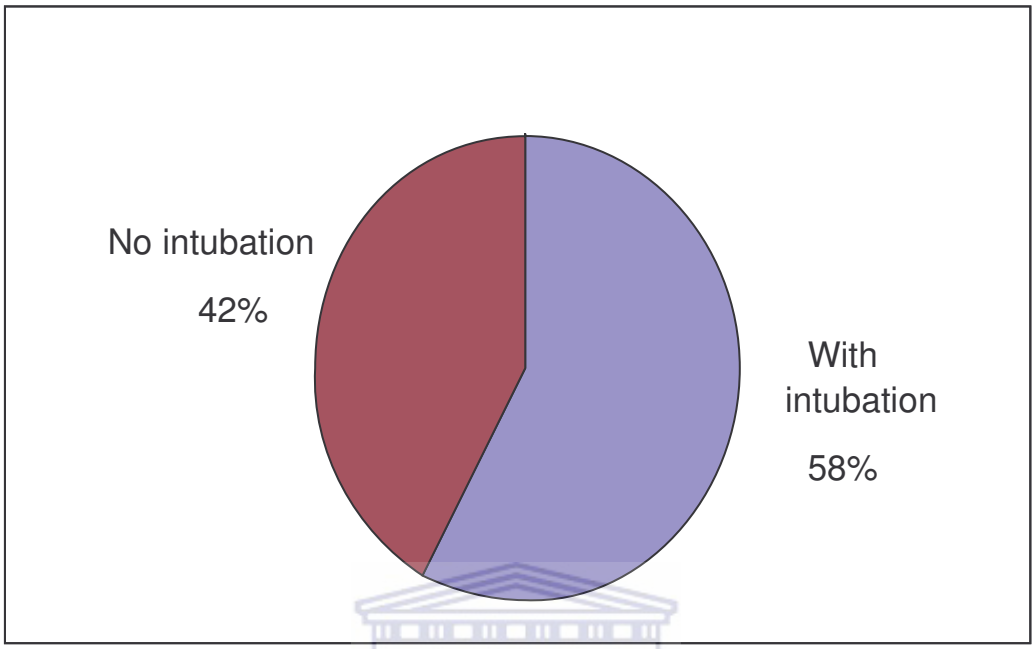
Site of DGA

Of the 22 clinics sampled, 5 clinics (23%) provided DGA at the facility, and 17 (77%) clinics provided DGA at another site (referral centre), usually the district hospital.

Intubation

Figure 9 illustrates the percentage of dentists who reported whether or not patients are intubated when treated under DGA. Fifty eight percent of dentists indicated that all patients treated under DGA were intubated, whereas 42% of dentists indicated that not all patients treated under DGA were intubated.

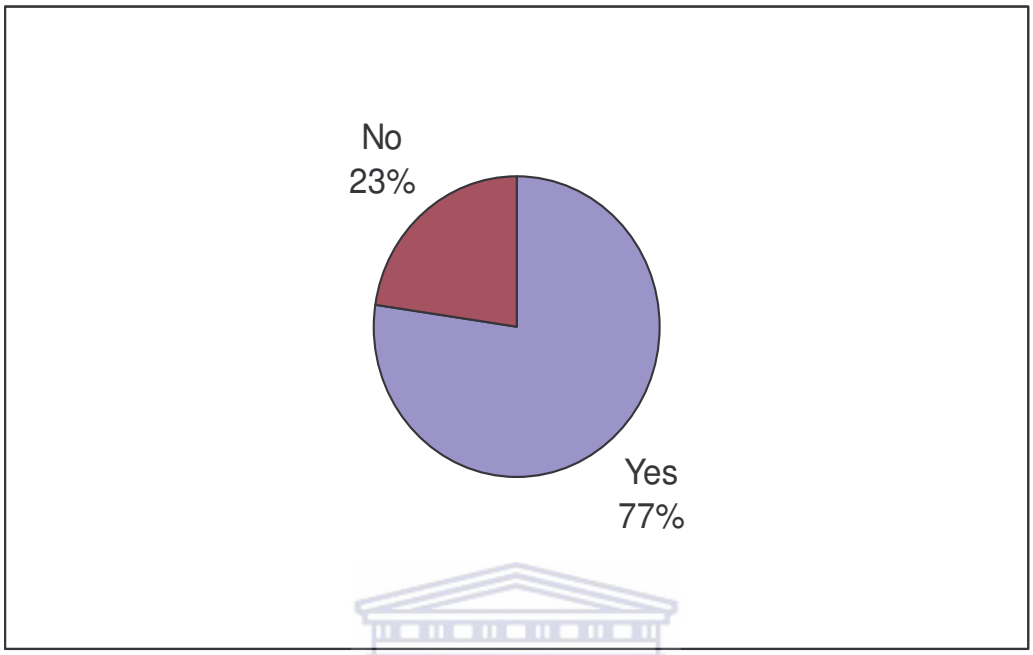
Figure 9: Percentage of dentists who reported whether or not patients are intubated when treated under DGA



Retreatment

17 dentists were of the opinion (based on their experience of paediatric DGA) that patients returned for retreatment under DGA (Table 14, fig 10).

Figure 10: Percentage of paediatric patients reported by dentists as returning for retreatment.



All 22 dentists were of the opinion that the patients come for the initial DGA to extract the 4 anterior teeth which are carious and later present for retreatment for the posterior teeth that have subsequently decayed due to non-compliance with preventive practices (Oral hygiene, diet etc). Fourteen of the 17 dentists were also of the opinion that there was not adequate prevention afforded to patients at the clinic level.

Sedation

All 22 dentists reported that there was no conscious sedation facility available for dental procedures at the clinic they worked in.

The data was further analysed to determine if the responses differed, based on whether the clinic was in the Metropole or one of the Rural Health Districts. However, none of the differences were found to be statistically different.

Table 16 illustrates the general comments provided by the dentists in the clinics.

Table 16:- General comments provided by dentists

Aspect	Comment	Number
PERSONNEL CONSIDERATIONS	Only one **Oral Hygienist** services a wide area which is inadequate for the preventive needs of the community being serviced	**8**
PREVENTIVE STRATEGIES	There is difficulty in obtaining anaesthetists for DGA as **specialist anaesthetists** receive better remuneration in Private Practice	**3**
	Ideally, **mothers** should be advised on **prevention** and feeding practices early on at well baby clinics	**9**
TRAINING/ EDUCATION	**Preventive strategies** in the public service needs to be more vigorous and should be the responsibility of the **oral hygienist** as the dentist has other responsibilities	**6**
	There is a **lack of preventive information** in the form of pamphlets etc that are pitched at the level of the communities serviced by public clinics. Also, pamphlets should be simple to understand and be available in different languages i.e. English, Afrikaans and Xhosa	**1**
	Preventive strategies such as **rinsing and tooth brushing programs** should be actively integrated into schools as only OH advice alone is inadequate and not that successful	**1**
	Children should be **screened at crèches** and the government should **subsidise toothpastes** and toothbrushes for disadvantaged communities	**1**
	Dental educators should be trained at a **lower level** than oral hygienists in order to educate the public on prevention at the baby clinics	**1**
REASON FOR TREATMENT	Patients come for dental consultation only when they have **pain and sepsis** and hence no other treatment but extractions is feasible	**12**
TYPE OF TREATMENT UNDER DGA	Due to poor compliance, more radical treatment options like extractions are favoured to prevent patients from returning for retreatment under DGA.	**4**
CONSCIOUS SEDATION	**Conscious sedation** should be considered as an option. Medical practitioners at the facilities can be utilised for this instead of employing private medical practitioner	**1**
POLICY	The **National Dental policy** targets prevention in 6 year olds by prescribing FS for permanent first molars,BUT children under 6 are side-lined in this National Policy	**1**
	Formal guidelines for DGA are required so all clinics follow the same protocol	**1**

CHAPTER 5

DISCUSSION

The primary goal of this study was to ascertain the type and nature of treatment provided for pre-school patients under DGA in the public service in the WC as well as to determine the extent of policy guidelines that exist in this arena.

The majority of the patients treated under DGA were recorded in the Cape Metropole and the smallest number in the Central Karoo (Table 3). The number of DGA's in each district reflects a reasonable distribution of DGA's relative to the population, except for the Cape Metropole and Cape Winelands (Table 4). Despite the fact that the population of the Cape Metropole makes up 64% of the total population, only 45% of DGA's provided were recorded in this district. The Cape Winelands however, provided 30% of the total number of cases treated under DGA although it represents only 14% of the total population.

The DGA rates in the different districts in the WC vary from 0.63 per 1000 of the population recorded in the West-coast to 2.44 in the Cape Winelands (Table 4). The West-coast reveals the lowest DGA rate. The reason cited by the dentist was that there was a lack of DGA services in this area due to the difficulty in obtaining anaesthetists (Table 16).

It is interesting to note that except for the West-coast, the rate of DGA per 1000 of the population in the Cape Metropole (0.79) is the lowest of all the districts (Table 4). The fact that this rate is one-third that of the Cape Winelands (2.44) challenges the perception that the urban districts are better serviced than the rural districts, at least as far as DGA's are concerned.

The Cape Winelands appears to be over-serviced with regard to DGA for pre-school patients relative to its population; however, this assumption cannot be made as there are various confounding factors that influence the prescription and subsequent provision of DGA. Some of these factors include the prescription for DGA being

controlled by the clinician, caries prevalence, patients' clinical needs, parent's needs, socio-economic status of the population, medical history and behavioural considerations (Wong *et al*, 1997; Tyrer, 1999; Bohaty *et al*, 1992).

The prescription of DGA came under scrutiny in the United Kingdom (UK) following the mortality of pre-school patients treated under DGA (Hastings *et al*, 1994). The "Poswillo" report called for the reduction in the use of DGA (Department of Health, 1990 as cited by Hastings *et al*, 1994). It was suggested that DGA only be used where there is clinical justification (Department of Health, 1990 as cited by Hastings *et al*, 1994). Furthermore, it was recommended that "A clear distinction has to be made between the demands for DGA and need. Demand in the absence of objective clinical need, should not be considered sufficient reason to proceed with DGA" (Clinical Standards Advisory Board, 1995 as cited by Tyrer, 1999).

Hastings *et al* (1994) undertook a study to determine the influence that dentists and parents had on deciding to treat a child under DGA. They also sought to identify the factors that influence that decision. These authors concluded that the dentist was the stronger influence and that their views primarily determined the type of treatment that was carried out. They further reported that the dentist's decision to recommend DGA was largely influenced by non-clinical factors such as the norms and benefits for the patient and dentist. These non-clinical factors may possibly have had an influence on the DGA rate in the WC and more specifically in the Cape Winelands. Non-clinical factors together with the minimal resources available in Public Health have an impact on the provision of DGA service.

In order to ascertain whether the DGA resources allocated in the Cape Winelands relative to its population was in fact warranted, it is appropriate to examine the context of oral health in the public service as recommended in the National Oral Health Strategy of South Africa. The guidelines state that there is a need to:-

1. Assess the oral health condition of the community
2. Prioritize the problems identified according to their prevalence, severity and social impact
3. Identify the resources available
4. Select the most appropriate interventions

5. Implement, monitor and evaluate the selected strategies

The overall DGA rate of pre-school patients of 1.06 per 1000 in the WC was surprisingly low when compared to the DGA trend in Australian children (Jamieson *et al*, 2006). The DGA rate of the WC refers to that in the public service. The DGA rate could possibly appear to be low as the DGA rate was taken per 1000 of the total population as opposed to the population that attends these public health facilities. The Cape Winelands (where the DGA rate was the highest) had a relatively low DGA rate when compared with pre-school children in Australia. Jamieson *et al* reported DGA rates ranging from 2.15 per 1000 in 1993/1994, to a rate of 7.31 per 1000 in 2003/2004, for children in the 0-4 year age group. These authors concluded that the DGA rate among Australian children was increasing. Furthermore, they found that pre-school, male, indigenous and rural children were at higher risk of receiving such care. They also cited that the DGA rates in indigenous children were higher than that in non-indigenous children due to the greater prevalence and severity of dental diseases (Gracey, 2000 as cited by Jamieson *et al*, 2006). The higher prevalence of dental caries was attributed to the impact of historical, political, societal and economic factors (Altman, 2003 as cited by Jamieson *et al*, 2006). The role of socio-behavioural and environmental factors in oral diseases and health has also been firmly established by several epidemiological surveys (Petersen, 2003a; Petersen, 2005).

Numerous retrospective reviews on DGA were completed in several different countries; however, none of these studies reported the DGA rate for these countries (Legault *et al*, 1972; Enger *et al*, 1985; Bohaty *et al*, 1992; Bello, 2000; Jamjoom *et al*, 2001; Kwok-Tung *et al*, 2006). Although the DGA rates were not reported on, several studies in the UK do report an increase in the number of teeth treated in pre-school patients under DGA, despite reports of a national decrease in dental caries (Wong *et al*, 1997; Nunn *et al*, 1995; Bohaty *et* al, 1992). Landes *et al* (1996) reported in the UK that young patients from poor social backgrounds were at greater risk of requiring DGA for extractions. This confirms the global trend that socio-economic status impacts negatively on caries (Petersen, 2003).

The Western Cape has a socio-economic profile which reflects a high concentration of multiple deprivations (Department of Health, 2008). The provincial indices for

multiple deprivations developed by the University of Oxford, STATS SA and the Human Science Research Council included the five domains of deprivation namely: Income and material deprivation, Employment deprivation, Health deprivation, Education deprivation and Living environment deprivation (Western Cape Department of Health, 2008). Approximately 73% of the population of the Western Cape is uninsured and thus dependant on the Public Health Sector (Western Cape Department of Health, 2008). In view of the evidence that populations that are socio-economically deprived experience higher caries prevalence, it is safe to assume that a similar tendency would apply to the Western Cape. In fact, the South African National Oral Health Survey confirms this tendency and illustrated that the Western Cape demonstrated the highest prevalence of caries (77.1%) in pre-school children in South Africa (Van Wyk, 2003).

An equitable distribution of theatre time and resources allocated for DGA should be applied across the province. The DGA rate in the Cape Metropole is low and perhaps the DoH needs to allocate more resources for DGA in this district. The DGA rate in the West-coast also needs to be addressed but perhaps to a lesser degree.

Clinical procedures

An overview of the number of clinical procedures performed on pre-school patients in the period 1 January 2005 until 31 December 2007 illustrates that of the 58 255 procedures recorded, 29 (0.05%) restorative procedures, 1 surgical removal and 58219 (99.94%) extraction codes were documented (Table 5).

This study demonstrates that the type of care being provided for pre-school patients under DGA in all districts in the WC is mainly extractions. The dentists at all 22 clinics included in this study also confirmed the fact that nature of treatment provided under DGA was predominantly extractions. The restorations recorded represent a relatively insignificant percentage of the total number of procedures. This is contrary to the global trend where the concept of trying to conserve the primary teeth predominates (Legault *et al*, 1972; Nunn *et al*, 1995; Bello, 2000; Kwok-Tung *et al*, 2006). Another significant trend globally is that more extractions are being done and fewer restorative and preventive procedures are provided to children from socially-

deprived backgrounds than their more affluent counterparts (Hutch *et al*, 2002 and Whittle, 2000 as cited by Jamieson *et al*, 2006). The reasons for this trend are complex and are related to several factors. Some of these factors are related to:-

- The disparities in access to dental services
- Caregivers from this background tend to delay dental care for their children until severe pain and sepsis is experienced. This means that carious teeth that may have been treated conservatively in the early stages require more radical treatment such as extractions later on
- Provider's biases about racial and ethnic groups can lead to culturally offensive or even racist behaviour in the health care setting. As a result of some of their biases, these dentists often choose less expensive treatment options because they may believe their patients do not care about their oral health. As a result, a dentist may choose to extract instead of save teeth (Warren, 1999).

The above factors provide an understanding into some of the reasons why extractions are primarily provided to pre-school patients under DGA in the WC. Furthermore, an appraisal of the Norms, Standards and Practice Guidelines for Primary Oral Healthcare is necessary in order to contextualize and understand the type of treatment provided under DGA in the WC.

These guidelines state that:-

> All communities should be covered by a basic health unit which offers an essential package of care, including oral health care. This package of care defines minimum primary oral health services that will be common to the whole country.
>
> Furthermore, we have to strive to do better with minimal resources, which means that we must organize and manage the services and the resources more efficiently and effectively.
>
> ***In view of the resource constraints and due to the moral obligation to provide oral health services for the relief of pain and sepsis (emergency services), it is proposed that in addition to the promotive and preventive oral***

> ***health services, health authorities in the provinces should at this stage at least provide an emergency oral health service to all its inhabitants.***
>
> In provinces where it is possible to provide the emergency service and additional capacity exists, services should be expanded to include other services contained in the proposal. The National Policy for Oral Health should be used as a guideline in the implementation thereof.
>
> (Norms, Standards and Practice Guidelines for Primary Oral Healthcare, Department of Health, 2005)

The recommendation of the DoH makes it mandatory for the dentist in the Public Health Service to "prioritize" the treatment of pain and sepsis. The dentist's moral obligation coupled with the fact that patients from socially deprived communities only present for treatment when pain and sepsis arises, offers a framework for understanding why the type of treatment provided is mainly extractions. In fact, the majority of the dentists interviewed confirmed that "Patients come for dental consultation only when they have pain and sepsis and hence no other treatment but extractions is feasible" (Table 16).

The provider bias documented earlier may possibly also motivate the dentist to provide extractions as opposed to conservative treatment. Furthermore, the fact that the DoH recommends that "we have to strive to do better with minimal resources" contributes to an even more complex scenario. The implication of resource constraints in relation to the provision of DGA for pre-school patients could also influence the type of treatment provided. These "minimal resources" cited by the DoH impact on the utilization of theatre time allocated for DGA. The theatre time allocated is recommended by the DoH guidelines to be managed "efficiently and effectively".

It is likely that dentists in the Public Health Service concede to providing extractions in an attempt to manage the DGA service "efficiently and effectively". The fact that more theatre time is required to provide restorative treatment as opposed to extractions would imply that the number of patients treated under DGA would effectively decrease. A decrease in the number of patients treated denotes "poor performance" in the Public Service as one of the performance standards that a dentist's performance is measured against is the number of patients treated. The

quantitative measure used in the appraisal of performance in the Public Service may well be a barrier to restorative care as fewer patients in effect would be treated. The implication is that there is a lack of motivation to provide this type of care in the public service as it would affect the quantity of work provided and subsequently the productivity of the dentist.

A study conducted in the WC on the productivity of dentists in the public service confirmed that the productivity of dentists is primarily determined by the quantity of work done (Barrie, 2006). In this study, Relative Value Units (RVU's) were used to quantify the amount of work done and subsequently used as a measure of productivity.

There has been increasing interest in measuring the productive performance of health care services which led to the introduction of Performance Management Systems (PMS) into National Health Systems (Martinez, 2001). However, conflicting views exist within the paradigm of performance appraisals with regard to its effectiveness. Performance Management (PM) has been considered to be "a means to an end" as it assumes that organizational performance is closely related to the performance of its individual staff members (Martinez, 2001). Quite frequently, PMS are adopted from models used in industrialized countries that do not fit the contextual realities of developing health systems (Martinez, 2001). It was found that in most countries, performance management was made up of a set of disconnected policies and practices and often resulted in the staff appraisal counting against the staff being appraised (Martinez, 2001). This could be due to fact that most performance measures currently used are result-based and do not give any information on how the results were achieved (Bandaranayake, 2001). In the provision of health services, the process of providing the services could be as important as the results (Bandaranayake, 2001). Despite these drawbacks of PMS, it remains vitally important to measure and value staff performance, providing it utilizes a number of complementary measures that together provide both reward and development opportunities (Martinez, 2001).

In light of the drawbacks presented with regarding PMS and the negative impact it possibly has on the promotion of preventive and restorative services in the public health service, the DoH is urged to reassess the quantitative measure of PMS in South Africa to include incentives for oral health prevention and promotion.

Number of teeth extracted in health districts

The results show that a large number of teeth (Table 7) were extracted for the 16 732 pre-school patients under DGA. The average number of teeth extracted per district was 10.4 (SD±4.9). This is an indication that these pre-school children presented with rampant caries and would otherwise have needed to be managed with multiple appointments. The literature confirms that pre-school children with ECC can be fearful and extremely uncooperative and thus their inability to cooperate for extensive treatment under local anaesthesia makes it preferable for them to be treated in one visit under DGA (Vinkier *et al*, 2001; Jamjoom *et al*, 2001; Savenheimo *et al*, 2005).

The clinic that presented with the highest average number of teeth extracted (20, SD±1) was situated in the district of Eden. This implies that dentectomies were performed on almost all patients seen under DGA. A dentectomy is an aggressive form of treatment. The average number of teeth extracted in this clinic differed significantly from other clinics in Eden as well as the clinics in the other districts. The fact that this clinic does not present with any unique characteristic that is different from the other clinics in Eden as well as in the WC, indicates that "provider bias" could possibly contribute to this substantial difference. Furthermore, the fact that some dentists acknowledged that an aggressive approach i.e. extractions, was favoured as a "preventive" measure confirms that the dentists' views influence the nature of the treatment being provided under DGA (Table 16). The motivation provided by the dentists for this type of approach was that patients exhibited poor compliance with prevention; hence the aggressive treatment would prevent them from returning for re-treatment.

The literature in fact confirms that aggressive treatment of caries is recommended for children being treated under DGA (Harrison *et al*, 2000; Anupama *et al*, 2002; Sheller *et al*, 2002; Foster *et al*, 2006; Albadri *et al*, 2006). There is however a distinct difference in the aggressive treatment reported by the dentists in this study and those documented in the literature even though the rationale for both is to prevent re-treatment of patients under DGA. The aggressive treatment referred to by the dentists in this study refers purely to radical extraction treatment whereas the literature refers

to aggressive treatment as the provision of extractions and also includes the use of alternative restorative materials, stainless steel crowns, fluoride applications, oral hygiene instruction and dietary counseling (Foster *et al*, 2006). The rationale and concept of aggressive treatment according to the dentists in the study and that in literature are similar; however, the means to achieving the end result differs.

The fact that little or no prevention is offered regarding DGA at the district clinics in the WC implies that the symptoms of ECC are being treated under DGA, yet the causes are largely left unattended. This in turn creates a vicious cycle of more disease which is likely to prevail in the permanent dentition of these children. Thus, there is a need for all district clinics in the WC to adopt aggressive preventive interventions (pre-and post DGA) in an attempt to firstly, reduce the rate of re-treatment of pre-school patients under DGA, and secondly, reduce the prevalence of ECC in the WC.

Treatment provided under DGA at Tygerberg Oral Health Centre and Red Cross Children's Hospital

The UWC Dental Faculty at the Tygerberg Oral Health Centre provides comprehensive treatment for pre-school children under DGA which includes pre-prevention, post-prevention, restorative treatment as well as extractions. The dental facility at Red Cross Hospital operates with the same agenda as the Dental Faculty and provides the same type of comprehensive regime for pre-school children under DGA; however, no restorative treatment is provided here. Tygerberg Oral Health Centre also provided twice as many DGA's than Red Cross Hospital. Furthermore, there was a significant difference between the average number of extractions provided at these two institutions, with Tygerberg Oral Health Centre having provided fewer extractions on average.

Tygerberg Oral Health Centre and Red Cross Hospital should provide the same type of comprehensive treatment given the fact that these two institutions follow the same guidelines with regards to DGA; yet, Red Cross Children's Hospital does not provide restorative treatment under DGA. A personal interview with the manager of the dental clinic at Red Cross Children's Hospital revealed a dire aspiration of wanting to

provide restorative treatment for these medically compromised pre-school patients, however, the amount of theatre time allocated for DGA is inadequate to satisfy the need for restorative treatment that exists, according to Dr SYH Harnekar (personal communication, 6 November 2008). The obstacle to obtaining more theatre time for DGA appears to be the fact that the medical fraternity is given priority as medical needs are deemed to be more important than the dental needs of these medically compromised patients. This argument is rather contentious as it possibly implies that the oral health status of a patient is a separate entity from their general health status.

However, in light of the world renowned status of the Red Cross Children's Hospital, it is highly unlikely that the vision of the institution differs from the widely accepted and promulgated concept that oral health is an integral and critical component of general health and well-being. Furthermore, the dental clinic at the facility is employed within the multidisciplinary approach to health at the facility. The fact that theatre time is in fact allocated for dental treatment is encouraging. However, the oral health needs of the medically compromised children treated at this facility needs to be scrutinized more closely.

The reality is that few oral health problems are life-threatening. However, rampant caries does affect the quality of life (QOL) of a child quite significantly (as discussed in the literature review). The disease impacts on the physical oral functions associated with chewing, swallowing and speaking; psychosocial issues such as social discomfort in conversation; physical discomfort and pain or concerns about appearance and social functioning (Acs *et al*, 2001; Anderson *et al*, 2004; Malden *et al*, 2008). These symptoms are generally a burden to any child with ECC, however they would present as an added burden to a child who is already medically compromised. Although treating ECC with extractions would provide relief of pain and discomfort, it doesn't address the issue of restoring function and aesthetics. Furthermore, extractions of primary teeth result in the added burden of future orthodontic complications. The benefits of restorative treatment of the primary dentition cannot be disputed. The disadvantages of aggressive extractions however, are numerous and well documented. Therefore, there is an obligation in a health setting where the means are available to make provision for restorative care of children under DGA. Thus, Red Cross Children's Hospital needs to provide more

theatre time for medically compromised children being treated under DGA in order to facilitate restorative care and in turn, allow for an improvement in the QOL of these children.

Policy guidelines

An analysis of the questionnaire responses received from the dentists at the 22 facilities included in the sample illustrated that the policy guidelines for DGA at the majority of these clinics only contained criteria for patient selection. In fact, there was an overall lack of formally prescribed guidelines for DGA in the public service. This implies that there is a lack of formal guidance regarding DGA which is necessary to allow for evidence-based practices to be implemented in order to achieve the objective of reducing the ECC prevalence in the WC as well as preventing re-treatment. Hence, there is a need for policy guidelines for DGA to be developed for these facilities.

Pre-and Post Prevention

This study also revealed an alarming lack of promotive and preventive services related to DGA of pre-school patients in the public health service. The fact that only 9 % (2 clinics) of the clinics included pre-DGA preventive procedures and 5% (1 clinic) included post-DGA preventive procedures is even more distressing.

In light of the reported lack of preventive services related to DGA in the public service in the WC, it is not surprising that the majority of the dentists (77%) reported that patients returned for re-treatment under DGA. This sharply contrasted with the re-treatment rates from international studies which ranged from 1% to 14.9 % (Harrison *et al*, 2000; Sheller *et al*, 2003; Albadri *et al*, 2006; Kakaounaki *et al*, 2006). The high rates reported for re-treatment under DGA in the public service in the WC could most likely be attributed to the lack of pre-and post preventive services associated with DGA. The majority of the dentists in this study also cited “the lack of preventive services at the clinic level” as the reason patients returned for re-treatment. The international studies however, reported that pre-and post preventive services were routinely part of the DGA treatment modality offered at these facilities. The

preventive interventions in these studies include oral hygiene instruction, pre- and post DGA fluoride application and dietary consultation.

It therefore stands to reason that pre-and post DGA prevention is an essential intervention that is required as part of the DGA modality for pre-school patients. Despite these preventive measures, re-treatment under DGA is still likely, due to the lack of parental compliance (Harrison *et al*, 2000; Sheller *et al*, 2003; Albadri *et al*, 2006; Kakaounaki *et al*, 2006). The issue of parental compliance and it's relevance to ECC has been raised in the literature review.

Clinical preventive and dental health education have limited benefit as behaviours such as oral hygiene practices, dietary patterns and attendance for dental care are largely influenced by factors that are not controlled by the individual i.e. family, social and community factors (Watt, 2005). In fact, a systematic review of health promotion revealed that individualistic programmes displayed conflicting findings and there is very little hard evidence that long-term behaviour can be influenced (Kay *et al*, 1998). Therefore, in order to affect a decrease in the prevalence of ECC, additional public health strategies need to be implemented in order to address the underlying determinants of ECC. It has been acknowledged that a combination of the high-risk and directed population approach is the best option in the prevention of oral diseases (Watt, 2005). Thus, instead of relying only on preventive and health-education programmes targeted at high-risk individuals, a mix of complementary public health approaches is recommended which focuses on assisting individuals and communities to avoid disease and sustain health.

Water fluoridation has been shown to be the most effective public health measure in preventing caries and has played a pivotal role in oral health promotion in the past half a century (Clarkson *et al*, 2000). Despite the fact that water fluoridation in South Africa was legislated in 1998, this policy has yet to be implemented (Singh, 2003).

A recent systematic review of the scientific evidence for preventing ECC revealed that there was a fair amount of evidence that suggests that potentially effective interventions should occur in the first 2 years of a child's life (Gussy *et al*, 2006 as cited by Twetman, 2008). The use of dental health education based on early start,

outreach activities and novel motivational interactive techniques seemed to be more effective than those utilizing more traditional counseling (Twetman, 2008). The beneficial effect of these interventions was considered to be significant, even though there was no strong evidence found to support it (Twetman, 2008). The intervention recommending the use of fluorides was however supported by strong evidence that found that the daily use of fluoridated toothpaste is the most cost-effective method to prevent caries in childhood (Twetman, 2008). Furthermore, two systematic reviews supported the fact that fluoride-based interventions for ECC prevention was currently the best available evidence (Gussy *et al*, 2006; Ammari *et al*, 2007 as cited by Twetman, 2008). The majority of studies also highly recommend the regular application of topical fluoride varnish for the prevention of ECC (Twetman, 2008). Another intervention that was considered to be of benefit in the prevention of ECC, although the evidence is inconclusive, was the strategy to combat the early transmission of cariogenic bacteria from parents to their off-spring (Twetman, 2008). This form of primary-primary intervention (as it is named) is most often directed towards pregnant women and/or mothers of newborn babies (Twetman, 2008). Although the prevention of caries in children has traditionally utilized schools as the main setting for oral health interventions it is recommended that other settings such as nurseries and baby clinics be considered to prevent ECC at a more primary level (Watt, 2005).

Waiting lists

The responses received from dentists with regards to the existence of waiting lists for DGA revealed that the majority (91%) of clinics in the sample did in fact have waiting lists. This is an indication that there is a high demand for DGA of pre-school patients in the WC. This level of demand is expected as the caries prevalence in this province is the highest in the country. Furthermore, most of the dentists approximated that fewer than 50 patients were on the waiting list (Fig 7). In view of the high caries prevalence in the WC, this approximation appears rather conservative. However, this could in fact be a reasonable estimation as not all patients requiring treatment under DGA were placed on a list in an attempt to prevent an administrative backlog. According to the dentists, patients were rather asked to return after a period of time. The fact that at 63% of the clinics' patients generally had to wait between 1 to 3

months before being treated under DGA confirms the dentists' concern that if all patients requiring DGA were placed on a list, this would create additional administrative tasks that would require additional personnel. At only 14% of the clinics patients were treated within one month (Fig 8).

The waiting lists and waiting time for DGA is an indication that the QOL of these pre-schoolers is further compromised by the time that they have to wait to be treated. It has been reported in this study and the others documented earlier, that patients from socially deprived backgrounds mostly present for treatment only when pain and sepsis arise. This implies that these patients have to cope with this morbidity for a longer period of time. North *et al* (2007) confirmed that children who had their extractions delayed suffered further pain and disruption to their life. It is unacceptable that the patients in the public service of the WC are expected to cope in this state. There is a need for other interventions to be considered in order to alleviate the pain and suffering of these children. Provision of timely dental care for these young children is imperative (Schroth *et al,* 2007).

A similar scenario exists in Manitoba, Canada regarding the waiting list and waiting period for DGA (Schroth *et al,* 2007). The issues identified there included the fact that the waiting list process is not mandated, managed or effective at quantifying the true demand for service (Schroth *et al,* 2007). As the situation is similar, the same could be assumed for the results presented in this study regarding the waiting list process and waiting as the situation is similar. The other challenge documented in Manitoba is the high rate of cancellations that result in the inefficient use of hospital operating theatres (Schroth *et al,* 2007). Interventions are being planned in Manitoba to establish a framework for improved management of the waiting list (Schroth *et al,* 2007). At the Tygerberg Oral Health Centre, the Paediatric Dentistry Department was faced with similar issues. Previously, the waiting list for DGA at Tygerberg Oral Health Centre was extremely full resulting in waiting periods of up to 6 months. The lists were managed by making use of the extra theatre time that became available due to non-utilization by the Department of Maxillofacial and Oral Surgery, thereby completely clearing the current waiting list. The issue of the cancellation rate at Tygerberg Oral Health Centre remains a dilemma yet to be addressed. Furthermore, patients who present with pain and sepsis at Tygerberg Oral Centre are treated under conscious

sedation, and are not expected to simply cope with the pain. The interventions offered to patients during the waiting period at the Charles Clifford Dental Hospital in the UK when the extraction service was interrupted, included temporary restorations, extractions under local anaesthesia and prescription of antibiotics (North *et al*, 2007). It was acknowledged that these interventions were not ideal and the rationale for prescription of antibiotics had a weak evidence-base (Keenan, 2005 as cited by North *et al*, 2007).

Theatre time

The perception of the majority (91%) of dentists interviewed was that the demand for DGA of pre-school patients was not adequately being met and that more theatre time should be allocated. This perception was possibly related to the fact that the prevalence of caries was high, thus implying that the demand for DGA was also high. This perception however does not correlate with the fact that all districts except the Cape Metropole and West-coast exhibited a relative frequency of DGA that was actually proportional to the relative frequency of population of each of the districts (Table 4, Fig 5 and 6). Also, a study undertaken by de Villiers *et al* (2002) revealed that the theatre utilization in the WC for dental treatment was rated as being the third highest relative to all other surgical procedures provided in the District Hospital Services. Furthermore, dental procedures were the most common theatre procedures performed at district hospitals in the WC (De Villiers *et al*, 2002).

It is possible that the oral health needs of the different communities differ and hence the demand for DGA will therefore differ accordingly. Epidemiological studies would need to be conducted to confirm this. However, an increase is not recommended even if epidemiological studies confirm the dentists' perception that more DGA is needed. The reason is that firstly, DGA is a very expensive modality that provides a short-term solution to the problem of ECC and secondly, it appears that adequate DGA is being provided in all districts except the Cape Metropole and Westcoast. An extremely conservative estimate of the cost of providing one DGA at R2000/DGA means that, it has cost the DoH R33 464 000 to treat the 16 732 patients under DGA in the period 1 January 2005 until 31 December 2007. These resources in the public health service

could have been better spent on oral health promotion and prevention in order to initiate the long-term benefits of a reduction in ECC prevalence.

Intubation

Dentists reported that not all patients were intubated under DGA. This could possibly indicate that these patients are being placed at more risk than those that are intubated. The common reason cited by the dentists for patients not being intubated was that these patients required four anterior extractions and no complications were expected for this quick procedure. The fact that the anaesthetists were not interviewed regarding the details of the procedure signifies a lack of information in this regard. Further research is required in this area to shed more light on the subject of not intubating patients under DGA.

However, in the instance of four primary anterior teeth requiring extraction, DGA appears to be a rather radical and expensive intervention to use. An appropriate pharmaco-therapeutic intervention that could be utilized is conscious sedation.

Conscious Sedation

The fact that all 22 dentists reported that there was no conscious sedation facilities available at their clinics possibly explains why young patients requiring four anterior extractions, and who cannot be managed under local anaesthesia, are treated under DGA. DGA is only recommended where there is no other appropriate method of pain and/or anxiety management available (Department of Health, UK, 2003). The Standing Dental Advisory Committee (UK) further qualifies that “It is absolutely essential that a wide margin of safety is maintained between conscious sedation and unconscious state of general anaesthesia where verbal communication with the patient and protective reflexes are lost” (Department of Health, UK, 2003).

Conscious sedation is a form of relative analgesia that enables an unpleasant procedure to be carried out without distress to the patient and is a far cheaper option than DGA (Milnes, 2003). It has been recommended that conscious sedation be used as the treatment modality for patients who present for emergency treatment and who

may not otherwise receive treatment (Woodward, 1996 as cited by Carson *et al*, 2001). Conscious sedation however is not suitable for children requiring extensive dental treatment or for children younger than 3 years of age (Milnes, 2003). Also, children presenting with certain medical conditions are better managed under DGA (Milnes, 2003).

Comparison of treatment provided under DGA in the Health Districts and Tygerberg Oral Health Centre

The nature of treatment provided for paediatric patients under DGA at the district hospitals when compared to the Tygerberg Oral Health Centre, indicates that the treatment provided in the district hospitals are only extractions. This is confirmed by the conclusions of a study done by Barrie (2006) who predicted that the public health service would become a purely extraction service.

The nature of treatment at the Tygerberg Oral Health Centre is based on the scientifically sound principles of current evidence and is preventive and comprehensive in nature. This is evident from the combination of procedures provided for paediatric patients under DGA at Tygerberg Oral Health Centre, which included pre and post DGA prevention, a higher percentage of restorations and a lower percentage of extractions. The argument that arises is whether it is fair to compare the treatment provided at an academic institution with that in the rest of the public health service.

In context of the Dental Public Service in South Africa, it appears that oral health prevention and oral health promotion policies do exist and are well structured according to the WHO guidelines. However, these policies are not being practiced routinely and their impact cannot be seen in the context of this study. In fact, although the concept of health has traversed through the centuries from a purely medical one as reflected in the biomedical model, to one that encompasses different components in the currently accepted socio-environmental model, the provision of treatment in the Public Service in the WC emerges as retaining remnants of the biomedical model.

A critical analysis of the provision of oral health promotion confirms that disparities do exist between health promotion policies and the current implementation of strategies, interventions and programmes (Singh, 2003). The National Oral Health Policy document is based on scientifically sound principles of oral health promotion and prevention. However, the findings of this study show that these principles have yet to be firmly applied in the WC to address the extremely high prevalence of ECC in this province. Although the National Oral Health Policy encompasses a variety of health promoting and disease-preventing services, the desired outcomes of paediatric oral health and quality standards for its provision have not been specified. It is not surprising then that preventive care services currently being provided are deficient in meeting the needs of the children with ECC. There is a need for the oral health outcomes of children to be specified in this policy. A Regional Oral Health Strategy needs to be formulated with oral health outcomes for children specified based on the oral health needs of the individual populations. It is recommended that the Oral Health Strategy of the WC include aggressive promotive and preventive strategies to address the high prevalence of ECC.

The literature confirms that an investment in the prevention of ECC in general and its relation to DGA is the key to changing the face of caries in children of the future (Weinstein, 1998; Horowitz, 1998; Weintraub, 1998). The immediate effects of this prevention may not be evident initially and cannot necessarily be measured quantitatively but long-term benefits will most definitely follow.

CHAPTER 6

CONCLUSION

Although improvements in oral health have occurred in developing countries in recent years, oral health inequalities still exist as a major public health challenge because lower income and socially deprived populations continue to experience disproportionately high levels of caries. This is a problem especially in young children.

ECC in pre-school children has reached epidemic proportions in the Western Cape. Treatment of these children can prove to be clinically challenging particularly as some of these children present with behaviour management problems and medical conditions. These children essentially require treatment under Dental General Anaesthesia. The rationale for DGA is to firstly, treat the caries and secondly, modify the child's behaviour with subsequent non-invasive preventive visits so that the child can accept future dental treatment without pharmaco-therapeutic intervention. Furthermore, preventive interventions before and after DGA are crucial in preventing the perpetuation of ECC. The lack of these preventive interventions results in a vicious cycle of disease.

The demand for DGA in the public health service in the WC is high. The Cape Metropole and West-coast, however are the only two districts that display a relative frequency of DGA lower than the other districts. The reason for the low rate in the Metropole could be attributed to the fact that a percentage of the population utilize the private sector for these services. The relative frequency of DGA's in this study was calculated relative to the entire population and not just the indigent population. If only the indigent population were taken into consideration, then the Metropole would reflect a slightly higher frequency of DGA's. There is however a need for an equitable distribution of DGA resources across the WC. This means that more DGA services need to be provided in the Cape Metropole and West-coast.

Pre-school patients with ECC present for treatment under DGA only when pain and sepsis arise. This means that these teeth require extractions. The type of treatment provided for pre-school patients under DGA in the public service is purely extractions. No restorative treatment is provided as the caries is extensive and this type of treatment is more time-consuming. Ideally restorative treatment would be preferable under DGA, however, the reality is that the burden of disease coupled with the minimal resources make this an almost impossible task.

Red Cross Children's Hospital, has an obligation to improve the Quality of Life of their medically compromised patients by providing more theatre time so that restorative treatment can also be provided under DGA.

A serious lack of prevention regarding DGA exists in all districts in the WC. The outcome of simply treating the disease without prevention is counterproductive and there is an urgent need for preventive interventions to be introduced in order to improve the outcome of DGA. The benefits of topical fluoride applications are well supported by the current evidence and must be included in the preventive protocol of all district health clinics in the provision of treatment for pre-school children under DGA.

There is no justification for the lack of prevention regarding DGA in the public service given that the evidence for oral health promotion and prevention based on the WHO guidelines is already firmly embedded in the National Oral Health Policies in South Africa. The public health programmes in the WC need to be strengthened through the implementation of effective oral disease prevention measures and oral health promotion and common risk factor approaches should be used to integrate oral health with national policies. The implementation of these promotive and preventive interventions will be vital in achieving success of future efforts to improve oral health care delivery and oral health of pre-schoolers particularly those who are at highest risk of developing caries. Intervention such as the use of fluorides and preventive interventions directed towards pregnant women and mothers of infants are of value and need to be introduced in the public health service in the WC in an attempt to reduce the prevalence of ECC. Furthermore, attempts should be made to implement water fluoridation in South Africa as legislated by the National Department of Health.

Conscious sedation is a suitable alternative to DGA and should be introduced for the treatment of pain and sepsis to alleviate pain in the child and the burden on the DGA service in the WC.

There is an inherent lack of policy guidelines regarding DGA for pre-school patients and this should be addressed urgently in order to streamline the effectiveness of this valuable but expensive service. A set of guidelines based on the current scientific evidence has been formulated for paediatric DGA. These guidelines are recommended for use in the public and private health sector. This will be covered in the following section.

GUIDELINES FOR DGA

The objectives of paediatric Dental General Anaesthesia are to:-

- eliminate cognitive, sensory and skeletal motor activity in order to facilitate the delivery of comprehensive oral health care
- modify behaviour of the child so that future dental treatment can be accepted without pharmaco-therapeutic interventions

Criteria for patient selection:-

- Pre-school children who require extensive dental treatment and do not cooperate for invasive treatment under local anaesthesia
- Children who are fearful, uncooperative and require extensive dental treatment but cannot be managed under local anaesthesia
- Medically, physically and mentally compromised children who require extensive dental treatment. The benefits of DGA for this type of child must outweigh the risk of DGA
- Children who require surgical treatment and cannot be treated with local anaesthesia
- Children who have sustained extensive orofacial or dental trauma

Pre-Dental General Anaesthesia procedure:-

Patients who have been selected for treatment under DGA must receive:-

- At least 2 applications of topical fluoride before DGA
- Oral Hygiene instruction
- Dietary consultation with specific instruction regarding nursing/bottle-feeding practices
- A pre-DGA appointment to assess compliance with oral hygiene and dietary /feeding practices

Dental General Anaesthesia procedure:-

Dental treatment provided under DGA should include:-

- Provision of treatment to alleviate pain and sepsis
- One application of topical fluoride
- Restorative treatment where resources are available

Post-Dental General Anaesthesia procedure:-

Following the provision of treatment of DGA patients should receive:-

- One-week post-DGA and three-monthly follow-up appointments to re-assess compliance with oral hygiene and dietary/feeding practices and to provide additional applications of fluoride

RECOMMENDATIONS

- The public health programmes in the WC need to be strengthened through the implementation of effective oral disease prevention measures and oral health promotion especially at ante-natal and well-baby clinics.
- The dental care of pre-school children under DGA at all district clinics in the WC should include appropriate comprehensive prevention.
- Conscious Sedation is an essential adjunct for the emergency dental treatment of children presenting with pain and sepsis and this modality should be implemented at all district health clinics to avoid children having to bear the burden of severe pain and sepsis in the waiting period for DGA. General anaesthesia still has a role, especially for multiple extractions and/or restorations in young, anxious, pre-school children. It is essential that adequate facilities exist for the safe provision of dental sedation and DGA for those children who need it.
- Water fluoridation should be implemented in the WC as legislated by the South African National Department of Health.
- Provision should be made for more theatre time to be allocated at Red Cross Children's Hospital to allow for restorative treatment to be provided to medically compromised children under DGA.
- More DGA services need to be provided in the Cape Metropole and West-coast regions.
- The Department of Health needs to reassess the quantitative measure of performance management systems in the dental public health service to include incentives for oral health prevention and promotion.

LIMITATIONS OF STUDY

- This study was a secondary analysis of routinely collected data.
- This type of analysis may be useful in providing preliminary estimates of the extent of the perceived problem. It does however only allow limited control over the manner in which the information is collected.
- A deficiency of this study was that it lacked important quantitative data pertaining to actual waiting times, follow-up care, repeat DGA's and caries prevalence. Qualitative data was therefore collected in this regard.
- Several inconsistencies existed in the codes recorded as reflected in the exclusion criteria.

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APPENDICES

APPENDIX A

1 August 2008

Dr FB Peerbhay
Division of Pediatric Dentistry
Dental Faculty: UWC

Dear Dr Peerbhay

RESEARCH PROJECT :Dental general anesthesia (DGA) of pre-school paediatric patients in the Western Cap
PROJECT NUMBER : N08/07/198

It is my pleasure to inform you that the abovementioned project has been provisionally approve on1 August 2008 **for a period of one year from this date**. You may start with the project, but this approval will however be submitted at the next meeting of the Committee for Human Research for ratification, after which we will contact you again.

Notwithstanding this approval, the Committee can request that work on this project be halted temporarily in anticipation of more information that they might deem necessary to make their final decision.

Please quote the abovementioned project number in all future correspondence.

Please note that a progress report (obtainable on the website of our Division) should be submitted to the Committee before the year has expired. The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly and subjected to an external audit.

Federal Wide Assurance Number: 00001372
Institutional Review Board (IRB) Number: IRB0005239

The Committee for Human Research complies with the SA National Health Act No.61 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

Kind regards

MERTRUDE DAVIDS
RESEARCH DEVELOPMENT AND SUPPORT (TYGERBERG)
Tel: +27 21 938 9207 / E-mail: mertrude@sun.ac.za

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Departement van Gesondheid
Department of Health
Isebe leziMpilo

Dr F.B. Mohamed Peerbhay
Private Bag X1
Tygerberg
7505

Fax to 0866134606

Dear Dr Mohamed Peerbhay

Dental General Anaesthesia of Pre-school Paediatric Patients in the Western Cape

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research. Please contact the following members of staff to assist you with access to the facilities:

1) Dr Kathy Grammar at kgrammar@pgwc.gov.za Tel: 021 7821121 (Western and Southern Sub-District)
2) Dr J. Claassen at jclaassen@pgwc.gov.za Tel: 021 4839361 (Klipfontein and Mitchell's Plain Sub-District)
3) Dr F. Krige at fkrige@pgwc.gov.za Tel: 023 3488101 (Boland/Overberg District)
4) Ms C. Bester at cwbester@pgwc.gov.za Tel: 022 4879210 (West Coast Winelands District)
5) Ms L. Phillips at lphillip@pgwc.gov.za Tel: 023 3488101 (Cape Winelands District)
6) Ms N.E Msindo-Mayeng at lmmayeng@pgwc.gov.za Tel: 023 4148200 (Central Karoo District)
7) Dr T. Marshall at tmarshal@pgwc.gov.za Tel: 044 8032700 (Eden District)

We look forward to hearing from you.

Yours sincerely

DR J CUPIDO
DEPUTY-DIRECTOR GENERAL
DISTRICT HEALTH SERVICES AND PROGRAMMES
DATE: 19/8/2008

CC: DR A. DALVIE DD: ORAL HEALTH SUB-DIRECTORATE

Dorpstraat 4
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APPENDIX C

Questionnaire

From database/records	
Year	No of DGA's per year
2005	
2006	
2007	

Name of Facility _____

Name of Dentist_____

Designation/Position

of dentist _____

1. Do you screen patients for DGA at your facility? **Yes / No**

2. Where are the patients that are selected for DGA treated?

At the facility	Referred to another facility

3. Name the facility that patients are referred to for DGA?

_____

4. Do you follow a guideline for DGA at your facility? **Yes / No**

5. Does the guideline include details about:-

a) Criteria for patient selection for DGA? **Yes/ No**

b) Pre-GA preventive treatment **Yes/ No**

c) Post GA preventive treatment **Yes/ No**

6. Does the pre –preventive treatment plan include:-

Type of treatment	YES	NO
a) Fluoride Application		
b) OH instruction		
c) A dietary analysis		
d) Pre GA assessment appointment to evaluate compliance with OH ,dietary advice /feeding practices		

7. With regards the post-GA preventive treatment, where do the patients who are referred to another facility receive the post-GA treatment?

NO POST-GA TREATMENT OFFERED AT ALL	AT THE FACILITY WHERE PATIENTS ARE SCREENED	AT THE REFERRAL FACILTY

8. How would you describe the type and nature of treatment being performed for patients under DGA at your and/or the referral facility?

COMPREHENSIVE TREATMENT (extractions and restorations)	EXTRACTIONS ONLY

9. Do you have a waiting list for DGA at your facility or are you aware of any waiting list at the facility that you refer the DGA paediatric patients to? **Yes/ No**

10. What would be your estimate of the waiting list at the facility?

O – 50 patients	50 -100 patients	Over 100 patients

11. How long does a paediatric patient have to wait to be treated under GA after the initial treatment planning is completed?

Less than one month	Between 1-3 months	Between 3-6 months	More than 6 months

12. How much theatre time do you have available per week? _____

13. Is this enough time to address the demand for DGA? **Yes/ No**

14. (If the answer to 13 is NO) In your opinion, what are some of the possible reasons that there is limited time afforded for DGA?

Medical conditions/fraternity given priority over dental conditions/fraternity	Financial resources allocated for DGA is inadequate

15. Is the general anaesthesia at your facility and/or referral facility done with intubation? **Yes/ No**

16. In your professional opinion and based on your experience at the clinic, would you say that the demand for DGA of paediatric patients is being met?

ADEQUATELY	NOT ADEQUATELY

17. In your experience with the paediatric DGA, do you get patients requiring retreatment under with DGA? **Yes/ No**

18. What are some of the common reasons that patients return for retreatment?

_____
_____
_____
_____

19. Do you have conscious sedation available at your facility to treat paediatric patients for dental procedures? **Yes /No**

20. Are there any other comments you would like to make with regards DGA for paediatric patients?

_____
_____
_____
_____
_____
_____

APPENDIX D

Informed consent form

I am a Masters student in the Department of Community Oral Health at the University of Western Cape. I would like to interview you regarding dental treatment of children under general anaesthesia at your facility in order to ascertain the type and nature of treatment performed as well as to determine the guidelines followed with regards to dental general anaesthesia (DGA) of pre-school children. The reason for this study is to identify any potential problems associated with DGA in the public service and assist in the evidence based planning of future GA services in Paediatric Dentistry in the Western Cape.

The interview will be done telephonically and will take about 10 minutes. All information gathered in the study will be treated as strictly confidential .No one will have access to this information except the researcher. Neither your name nor anything that identifies you will be used in any reports of this study. All information collected will be maintained and stored in such a way so as to ensure confidentiality. Your participation is voluntary and you may withdraw from the study without any consequences.

If you would like to take part in the study, please sign the bottom of this letter and fax it to Dr F Peerbhay at 0866134606. For further information, please contact Dr Peerbhay on telephone number 0837860849.

Thank you for your co-operation.

Yours sincerely

Dr Fathima Peerbhay

I understand what will be required of me to take part in the study. I agree to participate in the research being undertaken by Dr Fathima Peerbhay. I understand that at any time I may withdraw from this study without giving a reason and without any implications thereof.

Name:…….. **……...**
(print in block letters) **(signature)**

Telephone Number: …… **……**
(witness)

Date: …….