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AN AUDIT OF PAEDIATRIC PATIENTS PRESENTING FOR DENTAL GENERAL ANAESTHETIC AT WITS DENTAL HOSPITAL IN 2011

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfillment of the requirements for the degree

of

Master of Science in Dentistry

Johannesburg, 2014

Declaration

I, Natalie Gray declare that this research report is my own work. It is being submitted for the degree of Master of Science in Dentistry at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other university.

……

……day of……, 2014

Dedication

To my husband, Rodney, and my children, Emma and Christopher.

Acknowledgements

I would like to acknowledge the following people:

- My supervisor, Professor JL Shackleton, for all her support and encouragement during this process. Giving up was not an option, and I thank her for this.
- Professor S Setzer, for his passion for paediatric dentistry and for nurturing that enthusiasm in his students.
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- My family, for their patience and understanding.

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Acronyms

ART – Atraumatic Restorative Technique

CMJAH – Charlotte Maxeke Johannesburg Academic Hospital

DGA - Dental General Anaesthetic

ECC - Early Childhood Caries

GA - General Anaesthetic

s-IgA – Secretory IgA

SPSS – Statistical Package for the Social Sciences

WDH – Wits Dental Hospital

Abstract

Title:

An audit of paediatric patients presenting for dental general anaesthetic at Wits Dental Hospital in 2011.

Key words:

Caries, children, dental general anaesthetic.

Background:

Dental caries is one of the most common chronic childhood diseases and its prevalence is increasing globally. Dental general anaesthetic is resource intensive and not without risk. These services exist frequently to manage children with advanced stages of dental disease. The patients accessing this facility, as well as the treatment they receive, require analysis in order to address the demand for this form of treatment.

Objectives:

- To determine the age, ethnicity, home language, socioeconomic status, distance travelled and how many patients accessing this facility are physically or mentally compromised.
- To determine the source of referral and the referral request.
- To determine the waiting time before treatment.
- To record the treatment received.
- To record the average duration of each procedure.

- To determine how many of the patients were not scheduled but received treatment.
- To determine the incidence of repeat dental general anaesthetic.
- To assess how gender and ethnicity might influence the treatment outcomes.
- To compare the treatment received by the mentally and physically compromised patients to that received by the rest of the study population.

Methods:

This was a retrospective, observational, cross-sectional study of paediatric patients undergoing dental general anaesthetic at Wits Dental Hospital in 2011.

A total of 516 patients were treated at this facility in 2011 and 459 met the inclusion criteria of being ≤ 16 years. A sample size of 300 was calculated. One hundred and ninety-four(64.9%) of the sample patient files were retrieved. Data was also collected from the theatre register and day sheet(appointment register). Information was extracted from the various sources and recorded on a data capture sheet. This was then captured in Excel and exported into SPSS, Version 21, for analysis.

Results:

The mean age of healthy children in this study was 4,90 years. Of the healthy patients 54.3% were male. Black patients were underrepresented in this group. English(27.2%)

and Zulu(26.5%) were the most commonly reported home languages. As expected most patients were classified as younger than 6 years or committed children according to the hospital classification based on assets and income. More than half the population travelled distances greater than 10km for treatment. Mentally and physically compromised patients comprised 13.7% of the study population. 20.4% of patients had been referred to this facility and private dentists accounted for the majority of the referrals. The waiting time was 5.03 months before treatment. An average of 9.19 extractions were performed on healthy patients and the mean duration of each procedure was 29.07 minutes. 17.4% of patients were found to be unscheduled. Only 1% of the patients had a history of previous dental general anaesthetic.

Recommendation:

Addressing the social determinants of disease in the study population will reduce the demand for this type of service. The severity of dental disease can be improved with early diagnosis. Prevention and promotion programs need to be designed with the specific demographic characteristics of these patients in mind. The study highlighted areas for further research.

CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW

1.1 Introduction

Dental general anaesthetic (DGA) facilitates dental treatment in patients who cannot be treated in the dental chair for various reasons. As with any general anaesthetic procedure, DGA is not without risk[1,2]. The main reasons for children being referred for dental general anaesthetic (DGA) are their age, anxiety and the presence of advanced disease(Early Childhood Caries)[3,4,5].

Early childhood caries(ECC) is defined as the presence of one or more decayed, missing or filled tooth surfaces in any primary tooth affecting children up to the age of five[6]. In the USA dental caries is the most common chronic childhood disease, five times more common than asthma and seven times more than hayfever[7]. Studies have shown that globally caries prevalence is on the increase[7,8,9].

There are biological, social and behavioural risk factors at play in the development of early childhood caries[6,8]. Biological factors comprise early colonisation and

individual saliva variation ie. host factors. High saliva flow rate, increased resting saliva pH, increased salivary buffering capacity and increased s-IgA have been shown to offer protection against the development of dental caries[10]. Behavioural factors include prolonged bottle- or breastfeeding, a cariogenic diet, poor oral hygiene and insufficient fluoride exposure[8,11,12].

Parent education, immigrant status, cultural and ethnic factors, and socioeconomic status are all social factors that affect caries prevalence[6,7,8,9,11,12]. Families, especially mothers, are primarily responsible for the socialisation of their children and therefore the mother's oral health knowledge and attitudes are considered important[13]. A study by Hood[13] that looked at the characteristics of mothers of children attending a DGA clinic, found that most of the mothers in the study had finished formal schooling before 16 years of age. Many of the mothers admitted to seeking dental treatment only when a problem arose. The mothers in the study seemed to know what caused caries but weren't as knowledgeable about its prevention. Attending the dentist was also not perceived as important unless there was pain[13].

The effects of ECC include pain and loss of function[11]. This can affect children's nutrition, growth and early development[7,8]. Dental pain and infection can lead to poor

school attendance as well as difficulty eating, speaking and learning[7,15]. Other adverse effects of caries include parents having to take time away from work when taking their child to the dentist, and the high cost of dental treatment. Poor aesthetics can impact the child psychologically, due to the appearance of carious teeth or early tooth loss[7,11]. ECC has also been shown to put these children at risk for future disease[7,14].

Naidoo, Sheiham and Tsakos (2013)[15] examined oral impacts on daily performance in rural Kwazulu Natal. Dental caries was shown to impact eating and speaking, and caries with toothache affected learning.

Stephen Hancocks[16], as editor-in-chief for the British Dental Journal in 2011, challenged the statement that caries is a preventable disease and suggested rather that caries is preventable in theory, but that oral health professionals, public health workers and society have “utterly” failed to prevent it. DGA is an expensive solution to a preventable problem[17,18]. It has been suggested that a combination of oral health prevention and promotion behaviour as well as addressing social determinants of caries is necessary to effect positive change in patients with severe forms of ECC[19].

There is very little data regarding the patients that access Wits Dental General Anaesthetic Service or the nature of the service itself. The purpose of this study was to gather data regarding the patients accessing Wits DGA services. The information gathered could help to design a service where prevention and promotion(behavioural) programs are more effectively placed and explore alternative treatment modalities such as advanced sedation as well as alternative treatment techniques such as the atraumatic restorative technique(ART).

1.2 Literature review

Worldwide

Numerous studies have been done on the demographic characteristics of patients undergoing DGA in various centres around the world.

Alcaino, Kilpatrick and Kingsford Smith (2000)[20] did a retrospective study at the Westmead Centre for Oral Health in New South Wales, Australia. They looked at the total number of day-stay DGA patients (<16 years old) for each year from 1984 to 1996. Further information such as age, gender, area of residence, medical history, reason for referral, source of referral, waiting time from referral to treatment completion, ethnicity (country of birth and home language) was obtained from 1984 to 1996. Over the study period they found an increase in the number of patients requiring DGA as well as the waiting times before treatment. They found that 80% of children were younger than 6 years old with a mean age of 5.2 years in 1996. The majority of the patients were of Anglo-Saxon descent; however the proportion of Asian and Middle-Eastern patients increased over the study period, which was representative of the changing population of Sydney. Many of the Asian and Middle-Eastern children were found to be self-referred, accessing

treatment through the hospital emergency services and did not appear to have access to dental treatment elsewhere[20].

Jamieson and Roberts-Thomson[21] in Australia also conducted a retrospective study from 1993 to 2004. It included public and private hospitals across all Australian states. Demographic information was recorded such as age, gender, indigenous status(Aboriginal/Torres Strait Islander) and residential location. Two age groups were considered, namely 0-4 years and 5-9 years. They found that children requiring DGA were from low socioeconomic backgrounds, had often had a previous DGA and their parents or guardians generally had poor oral health. In Australia the demand for DGA was shown to be increasing, with waiting times of up to two years in some parts. In this study Jamieson and Roberts-Thomson found DGA rates tripled over the study period (1993-2004). There was a higher incidence of DGA in the younger group(0-4years). These children were usually less cooperative in the dental chair and their parents were more open to treatment under GA. Males, the indigenous and rural population all showed higher DGA rates. They showed an increase in the number of extractions as opposed to restorative procedures over the study period[21].

In New Zealand Foster Page[22] looked at children undergoing DGA from 2001 until 2005. She found that the number of DGA

cases increased over the 5 year period. There were more males than females with the mean age of the children treated being 5 years. Nearly half of the study sample were Maori and there was a greater percentage of children from low and middle socioeconomic groups. The average waiting time was 2.8 months which improved with time. 2.4% of children had repeat DGA over the study period. The number of extractions increased as well as the number of stainless steel crowns which could indicate that the children were presenting with more severe forms of disease. Maori children had nearly three times the number of extractions compared with the other children treated. The number of restorations and pulpotomies remained relatively constant[22].

Olley, Hosey, Renton and Gallagher(2011)[23] in the UK did a prospective study that looked at the treatment received by children undergoing DGA, and the views of their parents and guardians. Most of the children in the survey only attended the dentist with a problem and those that were regular attendees felt health promotion had been inadequate. This study reported a high percentage of repeat DGA at 47%. The parents often did not intend to seek further dental treatment for their children once the DGA was complete. They also reported difficulties in refusing their children cariogenic foodstuffs, and enforcing correct oral hygiene practices. Peer pressure and cultural problems were cited as

obstacles to compliance which is why the extended family and caregivers should be included, when giving dietary advice. The authors felt that innovative dental health promotion programs were essential and would be welcomed by parents. These programs would have to be ongoing to be most effective. They also felt that government policies should focus on prevention and look at inequalities in children's oral health experience[23].

Savanheimo *et al*[5] conducted a study on patients of all ages undergoing DGA, for all oral surgery in one year. Sixty-six percent of the 349 patients were younger than 12 and the majority of patients in this younger group were healthy. Eighty-six percent of the adult patients had medical conditions requiring their dental treatment be performed under general anesthetic, and half of these older patients had a history of previous DGA.

The child (and caregiver) should be able to implement preventive measures, so the child can address his/her oral health issues. Even though DGA may have its place in paediatric dentistry, repeat DGA should be avoided at all costs[24]. DGA carries with it all the risks of general anaesthesia. Investigators have looked at the incidence of repeat dental general anaesthetic at various centres[24,25].

Harrison and Nutting (2000)[24] looked at referral patterns, charted disease and treatment in children who had undergone repeat DGA at Guys Dental Hospital in London from 1992-1997. They felt that lack of communication between the referring dentist and the dentist performing the DGA accounted for as much as 85% of the repeat DGAs in their study. Even when all disease present at the first DGA was treated there was a 15% incidence of repeat DGA. In this study the number of self-referrals rose significantly from the first to the second DGA.

Albadri *et al* (2006)[25] looked at repeat dental anaesthesia at Liverpool University Dental Hospital. They found a negative correlation between the number of extractions performed in the first DGA and the incidence of repeat DGA. In patients who had undergone a repeat DGA, often the radiographs had not been available at the first DGA. It was suggested that possibly there was under-treatment in the first instance and inadequate diagnosis due to lack of diagnostic information in the form of radiographs.

South Africa

In South Africa a National Children's Oral Health Survey was conducted between 1999-2002[26]. They found an overall decrease in caries prevalence over a 20 year period. Despite this,

less than 40% of 6 year old children were found to be caries free and the incidence of untreated dental caries was more than 80% in South African children. Van Wyk, Louw and du Plessis (2004)[27] suggest that this could be due to lack of resources in general or inadequate patient education on the availability of dental resources.

Untreated caries is concerning because this can lead to more serious disease, including odontogenic infections[28]. High rates of untreated caries in the primary dentition were also recorded in other studies around the world and ranged from 40%(Australia) to 93%(Nigeria)[7,20,28].

Peerbhay (2009)[29] conducted a study at the University of Stellenbosch Paediatric Dentistry Department, South Africa. Sixty-eight patients were treated under GA in 2001 with the mean age of the patients being 4 years 6 months. She found that many patients had not altered their sugar consumption, despite having dietary counseling before treatment. Seventy-eight percent of patients failed to attend their 3 month follow up appointment.

Peerbhay and Barrie (2012)[30] examined the burden of ECC in the Western Cape Public Service in relation to DGA. In 3 years 17 868 DGA's were performed, and an average of 10 teeth were extracted at each appointment. Repeat DGAs were

reported as common, but the numbers were not specified. That showed there was a high demand for DGA, but very little preventive activity was reported.

Kolisa, Ayo-Yusuf and Makobe(2013)[31] reported that 78 paediatric DGAs were performed in a two year period in Pretoria. Extractions were the most frequent treatment, but restorative and preventive procedures were also carried out. Return for follow-up visits was low (18%) and of the 14 children who returned for follow up, 7 (50%) required a second referral for DGA.

At Wits Dental Hospital there is a demand for DGA even though caries is in theory, a preventable disease[11,16]. Children accessing these services are often the most vulnerable and severely affected by this disease. It is important to know who is presenting for DGA at this hospital in order to address the treatment needs of this population more effectively.

CHAPTER 2

AIM AND OBJECTIVES

2.1 Aim

The aim of this study was to:

a. Profile the demographic characteristics of the children (aged ≤16years) presenting for dental general anaesthetic at Wits Dental Hospital in 2011.
b. Analyse the treatment rendered under GA.

2.2 Objectives

The study objectives were to:

1. Describe the patient making use of the Wits Dental general anaesthetic services at Wits Dental Hospital, within Charlotte Maxeke Johannesburg Academic Hospital(CMJAH) by recording- the distribution of their age(≤16y), gender, ethnicity, home language, socioeconomic status(hospital class), distance travelled and what proportion of the sample population were mentally or physically disabled(compromised).

2. Record who, if anybody, had referred the patient to the dental general anaesthetic service and what the referral request had been.
3. Determine the waiting time from screening appointment to the completion of treatment under general anaesthetic for the patients.
4. Record the treatment received – the number of extractions, restorations, fissure sealants and scale and polish procedures carried out over the study period and the trends in the extraction of specific teeth.
5. Record the average duration (in minutes) of each general anaesthetic procedure.
6. Compare the number of patients scheduled, to the number of patients who actually received treatment.
7. Establish the incidence of repeat general anaesthesia at this facility.
8. Analyse the influence of gender and ethnicity on the number of teeth extracted(i.e, treatment outcome).
9. Compare the demographic characteristics and treatment outcomes of the mentally and physically disabled(compromised) patients with that of the rest of the study population.

CHAPTER 3

MATERIALS AND METHODS

The study was a retrospective, observational, cross-sectional study of paediatric patients undergoing dental general anaesthetic at Wits Dental Hospital in 2011.

3.1 Inclusion criteria

Male and female patients who were 16 years (or younger) on the day of treatment, and who had a dental general anaesthetic at Wits Dental Hospital in 2011.

In the Department of Paediatric and Restorative Dentistry, patients aged 16 and under are designated as “paediatric”.

3.2 Sample size

According to the theatre register 516 patients were treated under general anaesthetic at Wits Dental Hospital in 2011, 459(89%) of those patients were 16 years or younger.

After consulting with a statistician, a sample size of 200 patient files was calculated. To test for ease of file retrieval, a pilot study was conducted where only 31(69%)

out of 45 files could be accessed. For this reason the sample size was increased to 300 files to allow for records that may not be accessible.

The patients were divided into the month in which they were treated. Male and female patients were separated out in each month. The internet site, www.stattrek.com, was used to generate random numbers of patient files to retrieve. A total of 194(64.9%) of the 300 patient files could be retrieved. For the patients whose files could not be retrieved some of the data was collected from the theatre register or the day sheet.

3.3 Sample method

Each patient was assigned a patient code (001 to 300) to protect their identity. A data capture sheet was used to extract information from the patient files, theatre register and day sheet. The sample size became 299 due to the fact that patient number 80 had to be excluded because they were found to be older than 16 years on the date of treatment.

Data was captured in Excel exclusively by the researcher. When a particular variable was available from more than one source, it was assumed that the file would be the more accurate source. The data was then exported into SPSS Version 21. This was an exploratory analysis using

descriptive statistics summarising data in tables, graphs, histograms and Box and Whisper plots.

3.4 Recording variables

3.4.1 Age

The patient's age was calculated from the date of birth that had been entered in the file or from the day sheet(when available). The date of birth was available from either source for 265 patients. The age was recorded as the age on the date of treatment, in full years.

3.4.2 Gender

The gender of each patient was taken from the file or the theatre register (when gender had not been recorded in the file or the file could not be retrieved). Gender was available for all 299 patients.

3.4.3 Ethnicity

The patient's ethnicity was recorded from the file or from the theatre register (if necessary). The only error with using ethnicity from the theatre register was that the individual who had assigned ethnicity to each patient in theatre, had classified Oriental individuals as White and not Asian. Ethnicity was available for all 299 patients.

3.4.4 Language

12 languages were recorded as home languages by patients. This information was taken from the patient files and was available for 147(49.2%) patients.

3.4.5 Socioeconomic status

The socioeconomic status for each family was measured by their hospital classification. This variable was only taken from the file, when available, as the hospital classification from the theatre register was found to be unreliable. Table 3.1 below describes how patients were classified at Charlotte Maxeke Johannesburg Academic Hospital in 2011, based on their income or assets.

Table 3.1 Hospital Classification (based on assets or income) of patients attending CMJAH in 2011

Code	Income/Assets for individuals	Income/Assets for families
HG	Children <6y/Committed children	Children<6y/Committed children
H0	Formally unemployed/Social Pensioner	Formally unemployed/Social Pensioner
H1	Annual income < R36000 Assets < R151200 R0 to R3000 per month	Annual income < R50000 Assets < R231300 R0 to R4156 per month
H2	Annual income R36000 to R72000 Assets R151200 to R321200 R3001 to R6000 per month	Annual income R50000 to R100000 Assets R231300 to R473300 R4157 to R8333 per month
PP No M/Aid	Annual income > R72000 Assets > R321200	Annual income > R100000 Assets > R473300
PM	A member of a medical scheme	A member of a medical scheme

3.4.6 Distance travelled

When examining the distance a patient had to travel, the area of residence (suburb) was recorded from the file(or the daysheet). The internet site, www.distancesbetween.com, was used to calculate how far(in kilometers) each patient had to travel to get to the Wits Dental Hospital, in Parktown, Johannesburg.

3.4.7 Disability

Patients were assumed compromised if it was specified in their file that they were either mentally or physically disabled or if they were older than 10 years on the day of treatment. At Wits Dental Hospital healthy(not compromised) children older than 10 years were unlikely to have dental treatment under general anaesthetic. The remaining children were classified as healthy.

3.4.8 Source of referral

Out of the 299 patients in the sample population, 61(20.4%) had been referred from various sources. The remaining 238(79.6%) of the children treated under GA were self-referred, having no record of referral in their files.

The source of referral was classified into 5 groups ie. patients who were referred from:

1. A private dentist

2. A private medical doctor
3. A Wits Dental Hospital interdepartmental referral
4. A CMJAH medical referral
5. Another provincial hospital in Gauteng

3.4.9 Referral request

The referral request was also divided into 6 groups where the referral request had been:

1. To manage with no diagnosis or an extraction only request
2. A request for extractions and restorations
3. A request for restorations only
4. A specific number of extractions requested
5. Another request
6. No referral letter retrieved

3.4.10 Waiting time

The waiting time was calculated in calendar months from the screening appointment to the treatment date. This information was available for 177(59.2%) of patients.

3.4.11 Treatment received

The number of extractions, restorations, fissure sealants and scale and polish procedures were recorded mainly from the theatre register and confirmed in the files where possible.

The tooth numbers extracted were recorded in 163 of the files retrieved. There were 49 permanent teeth extracted in 11 patients in this study. Of these 11 patients, 10 patients were compromised. As a result it was decided to exclude permanent teeth when looking at extraction trends in this study.

3.4.12 Average duration

The average duration of each case (from induction to transfer to recovery) was calculated from the theatre register and was recorded in minutes.

3.4.13 Number of patients scheduled

The number of patients who were scheduled for general anaesthetic (taken from the day sheet) was compared to the number of patients who were eventually treated.

3.4.14 Incidence of repeat DGA

This information was taken from patient files.

3.5 Data handling

One of the study objectives was to find out what proportion of the population treated at this facility were mentally or physical disabled, and how their demographic characteristics

and treatment outcomes might differ from the rest of the sample population. When looking at the study population as a Whole (299 patients), 41(13.7%) of the patients treated were found to be compromised(mentally or physically disabled) and 258(86.3%) were found to be healthy. Compromised patients were excluded from the first part of this analysis because trends relating to caries prevalence and treatment demands are different for this group.

3.5.1 For the first part of this study compromised patients were excluded for all the following variables:

Age
Gender
Ethnicity
Socioeconomic status
Source of referral
Referral request
Treatment received
Duration of procedure

3.5.2 The entire study population (all 299 patients) was examined for the remaining variables:

Language
Distance travelled

Waiting times

Patients scheduled

Repeat DGA

How gender and ethnicity affect extraction rate

3.5.3 Mentally and physically compromised patients were examined for all the variables listed in 3.5.1 above.

CHAPTER 4

RESULTS

Who is making use of Wits Dental general anaesthetic services?

4.1 Healthy Patients

4.1.1 Age

The mean age of the healthy children treated was 4.90 years, with an age range of 1.79 years to 9.66 years (fig. 4.1). Date of birth was available for 224 patients in this group.

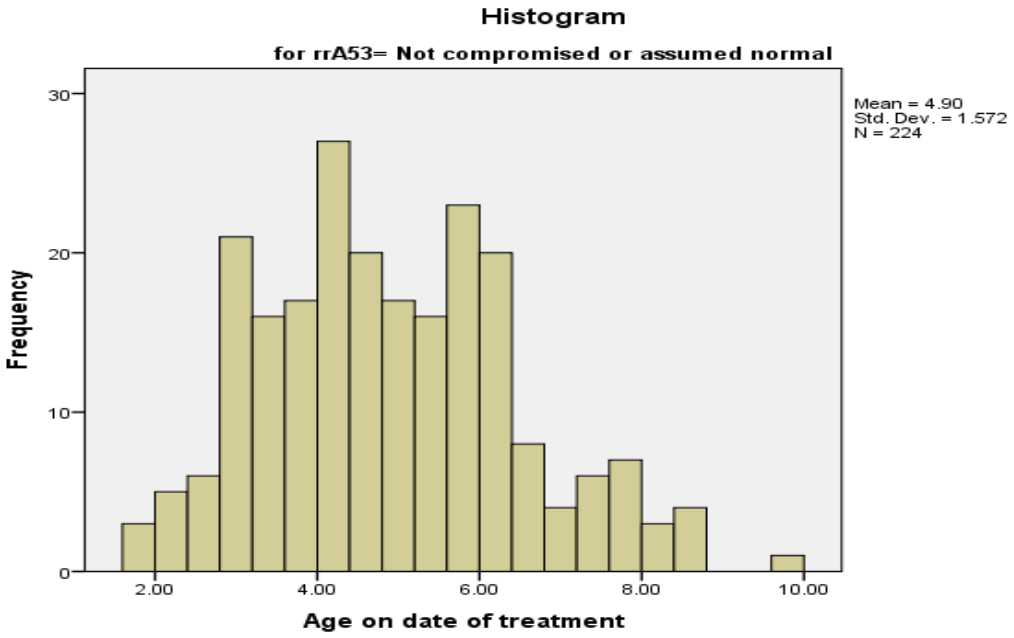

Figure 4.1 Age distribution of healthy patients

4.1.2 Gender

Of the 258 healthy patients, 140(54.3%) were male and 118(45.7%) were female.

4.1.3 Ethnicity

Table 4.1 Ethnic distribution in healthy patients

Ethnicity	Count(Percentage)
Black	156(60.5%)
White	54(20.9%)
Coloured	33(12.8%)
Asian	15(5.8%)

4.1.4 Socioeconomic status

Table 4.2 illustrates 132 of these patients fell into the hospital class HG (children <6y/committed children), 2 fell into the hospital class H0(formally unemployed or social pensioner), 10 of the patients were classified as H1(annual income < R36000), 9 patients were H2(annual income R36000 to R72000) and 4 were classified as PM(member of a medical aid scheme).

Table 4.2 Distribution of hospital classification in healthy patients

Hospital class	No.	%
HG	132	84.1
H0	2	1.3
H1	10	6.4
H2	9	5.7
PM	4	2.5

4.1.5 Source of referral

Forty-six of the 61 patients referred to this facility over the study period were healthy. Table 4.3 describes the distribution of referral sources for these patients.

Table 4.3 Source of referral in healthy patients

Source of referral	**No.**	**%**
Private dentist	22	47.8
Wits interdepartmental referral	10	21.7
CMJAH medical referral	8	17.4
Other provincial hospital referral	4	8.7
Private doctor	2	4.3
Total	46	100.0

4.1.6 Referral request

Table 4.4 demonstrates how in the majority of cases, the referral requests were to manage with no specific diagnosis or an extraction only request.

Table 4.4 Referral request in healthy patients

Referral request	**No.**	**%**
Manage with non-specific diagnosis or extraction only request	29	63.0
Extractions and restorations	9	19.6
Restorations only	2	4.35
Specific number of extractions requested	3	6.5
Other request	1	2.2
No letter	2	4.35
Total	46	100

4.1.7 Treatment received

4.1.7.1 Number of extractions

Mean number of extractions for healthy children was 9,19 teeth per patient treated at Wits Dental Hospital in 2011. The minimum number of extractions performed per patient in

this group was 2 extractions, the maximum was 20 extractions.

4.1.7.2 Most commonly extracted teeth

Table 4.5 below shows the most commonly extracted teeth for healthy children. The least commonly extracted tooth in this group was tooth 81.

Table 4.5 Most commonly extracted teeth in healthy patients

Tooth no.	Number extracted	Percentage
62	109	79.00
74	107	77.50
52	105	76.10
54	103	74.60
64	103	74.60
61	98	71.00
84	98	71.00
51	97	70.30
85	75	54.30
75	68	49.30
65	59	42.80
55	58	42.00
53	45	32.60
63	45	32.60
83	28	20.30
72	26	18.80
73	24	17.40
82	20	14.50
71	19	13.80
81	18	13.00

4.1.7.3 Other treatment received

There were no restorations, fissure sealants or scale and polish procedures, on healthy children, in this study.

4.1.8 Duration of procedure

For healthy patients, the mean duration of treatment was 29.07 minutes with a range of between 10 minutes and 55 minutes as illustrated in Fig 4.2 below.

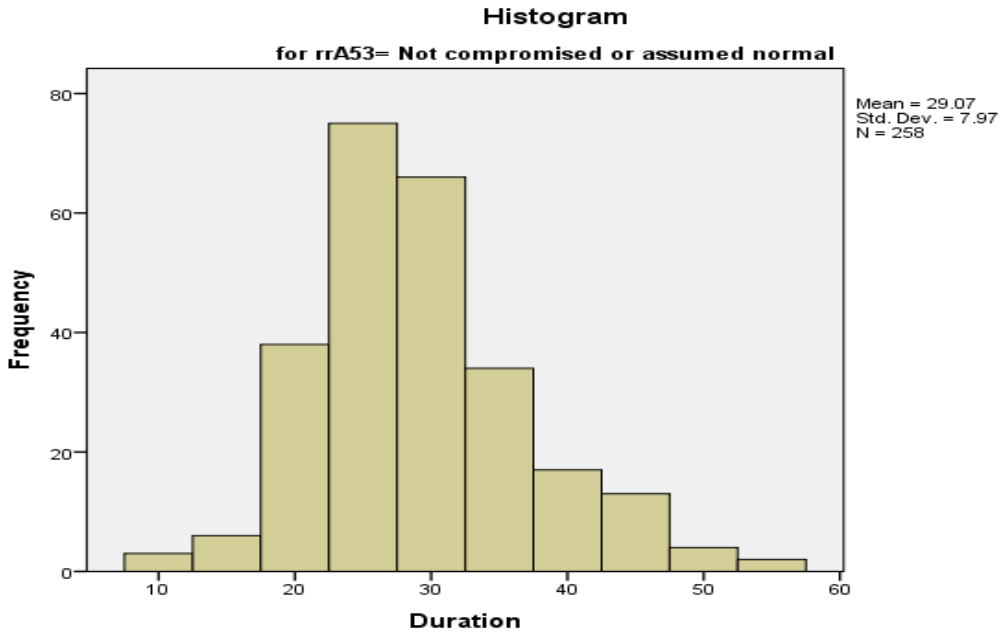

Figure 4.2 Duration of procedure for healthy patients

4.2 For the remaining variables the study population was examined as a whole.

4.2.1 Language

The most commonly spoken languages, in this study, were found to be English(27.2%), Zulu(26.5%), Afrikaans(14.3%), Xhosa(10.2%) and Sotho(7.5%). Figure 4.3 illustrates the distribution of all 12 languages recorded.

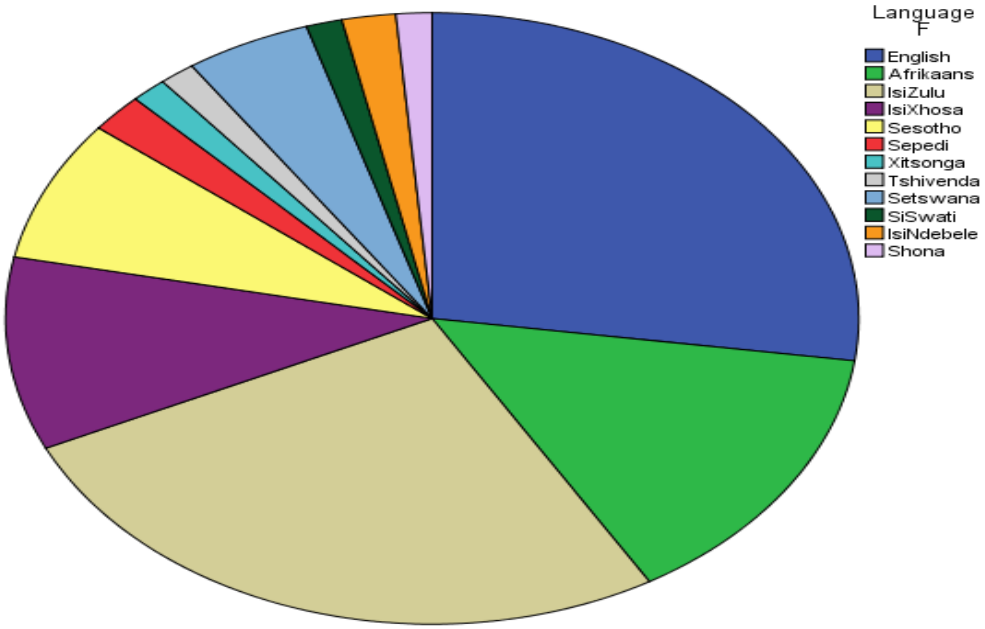

Figure 4.3 Home language distribution for the entire study population

4.2.2 Distance travelled

Figure 4.4 illustrates the distances travelled by patients to access this DGA facility. It was found that 44.3% of patients travelled less than 10km and 55.7% travelled more than 10km.

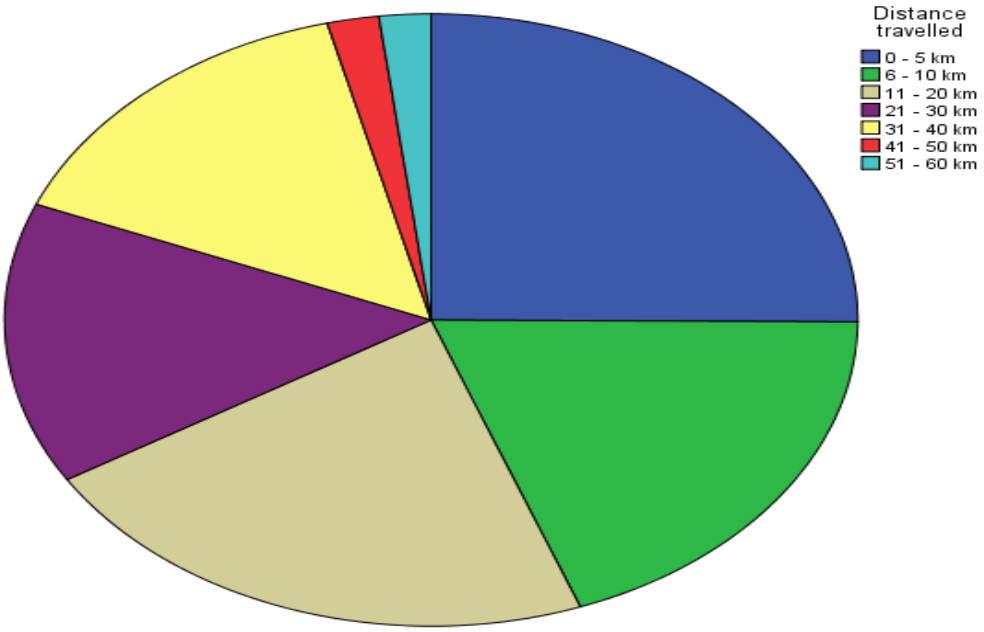

Figure 4.4 Distance travelled to CMJAH for the entire study population

4.2.3 Waiting time

The mean waiting time for a dental general anaesthetic at this facility was 5.03 months. The minimum waiting time was found to be 0.56 months and a maximum of 46.78 months.

4.2.4 Scheduled patients

Of the 299 patients, 52(17.4%) were not scheduled on the day sheet which means 4.3 patients per month had not been scheduled.

4.2.5 Repeat dental general anaesthetic

There were only 3 cases (1.0%) of repeat DGA recorded in both compromised and healthy patients.

4.2.6 Gender and extraction rate

Figure 4 shows how male patients had more teeth extracted (mean of 9.07) than female patients(mean of 8.65).

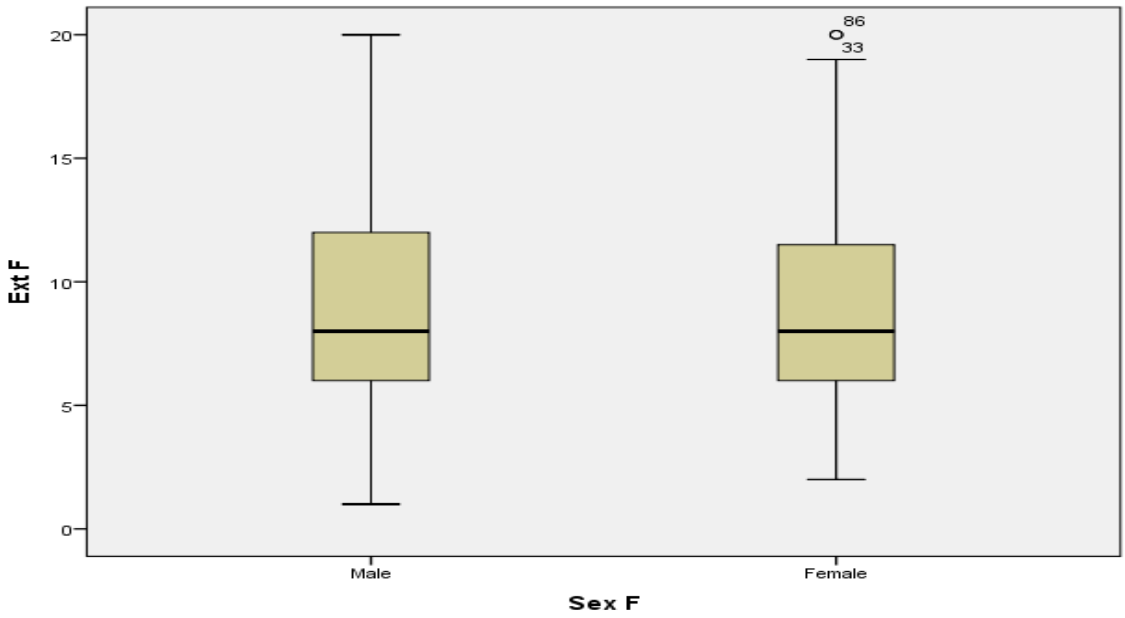

Figure 4.5 Male and female extraction rate for the entire study population

4.2.7 Ethnicity and extraction rate

Coloured patients had the highest extraction rate (mean of 9.89), then Black patients(mean of 8.95), then White patients(mean of 8.34) and lastly Asian(mean of 7.75).

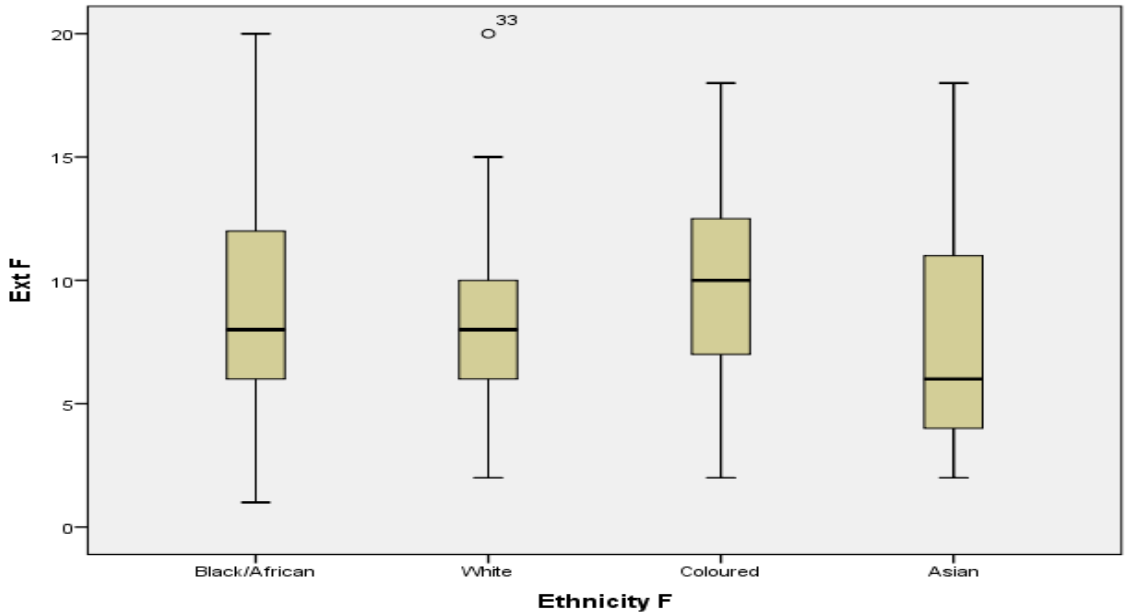

Figure 4.6 Extraction rate based on ethnicity for the entire study population

4.3 Compromised (mentally or physically disabled) patients

In this study 41(13.7%) of patients were found to be compromised and 258(86.3%) were not compromised.

The final part of this study examined the demographic characteristics of the compromised patients, and how their treatment outcomes differed from the rest of the study population.

4.3.1 Age

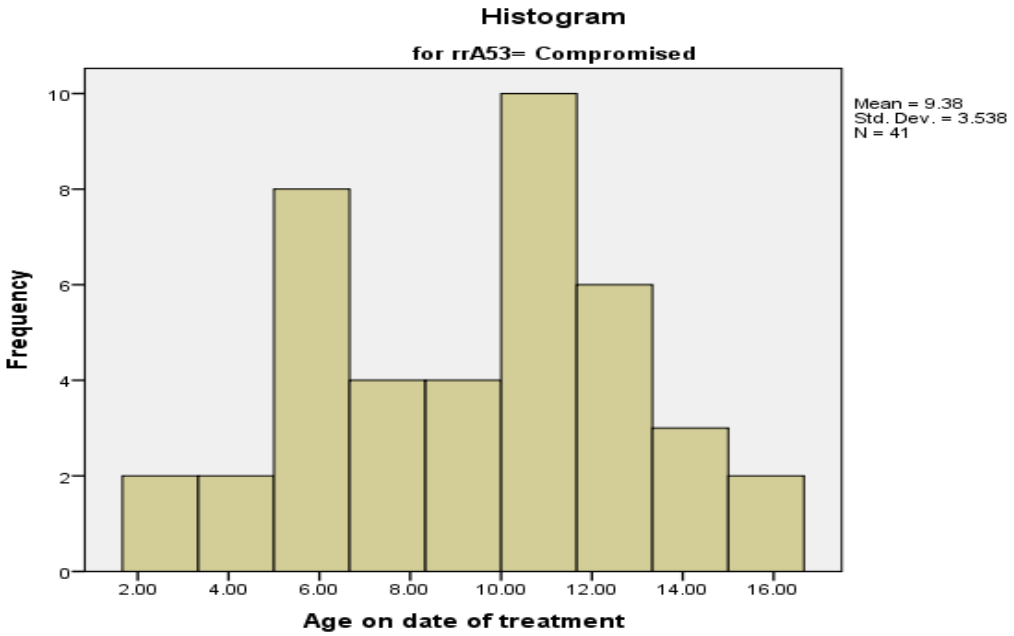

Figure 4.7 Age distribution of compromised patients

Figure 4.7 above, shows the mean age of the compromised patients in this study was 9.38 years.

4.3.2 Gender

Of the 41 patients in this group, 24(58.5%) were male and 17(41.5%) were female.

4.3.3 Ethnicity

Table 4.6 Ethnic distribution in compromised patients

Ethnicity	Count(%)
Black	32(78.0%)
White	5(12.2%)
Coloured	3(7.3%)
Asian	1(2.4%)

4.3.4 Socioeconomic status

The socioeconomic status was calculated from the hospital classification according to income or assets of each family. As shown in Table 4.7, the majority of the children were in the lower income groups.

Table 4.7 Distribution of hospital classification in compromised patients

Hospital class	No.	%
HG	22	66.7
H0	5	15.2
H1	5	15.2
H2	0	0.0
PM	1	3.0

4.3.5 Source of referral

Compromised patients that were referred to this facility were referred mainly from other provincial hospitals in Gauteng(46.7%) or CMJAH medical referrals(40.0%) as seen in Table 4.8.

Table 4.8 Source of referral in compromised patients

Source of referral	No.	%
Private dentist	1	6.7
Wits interdepartmental referral	1	6.7
CMJAH medical referral	6	40.0
Other provincial hospital referral	7	46.7
Private doctor	0	0.0
Total	15	100.0

4.3.6 Referral request

For the compromised patients 73.3% had a referral request to manage with unspecific diagnosis or extraction only request. 13.3% had a request for restorations only and 13.3% had no referral letter in the file even though there was evidence of them having been referred.

Table 4.9 Referral request in compromised patients

Referral request	**No.**	**%**
To manage with non-specific diagnosis or extraction only request	11	73.3
Extractions and restorations	0	0.0
Restorations only	2	13.3
Specific number of extractions requested	0	0.0
Other request	0	0.0
No letter	2	13.3
Total	15	100.0

4.3.7 Treatment received

4.3.7.1 Extractions

The mean number of extracted teeth for the compromised patients was 6.90 teeth, with a minimum of 1 and a maximum of 18 extractions in this group.

4.3.7.2 Most commonly extracted teeth

Table 4.10 shows the most commonly extracted teeth for the compromised group. The least commonly extracted tooth was 73 for this group.

Table 4.10 Most commonly extracted teeth in compromised patients

Tooth no.	Number extracted	Percentage
75	18	72,00
54	16	64,00
64	16	64,00
85	16	64,00
65	15	60,00
84	15	60,00
74	14	56,00
55	12	48,00
52	11	44,00
51	9	36,00
61	9	36,00
62	9	36,00
63	7	28,00
53	6	24,00
71	3	12,00
83	3	12,00
72	2	8,00
81	2	8,00
82	2	8,00
73	0	0,00

4.3.7.3 Other treatment procedures

There were no restorations performed on any of the patients, compromised or healthy, in this study. Both of the patients who underwent scale and polish procedures under GA were compromised. The only patient who had a fissure sealant, was also found to be compromised.

4.3.8 Duration of treatment

Mean duration of treatment for compromised patients was 35.24 minutes.

CHAPTER 5

Discussion

There is an increased number of children receiving DGA worldwide[20,21,22]. In South Africa the demand for DGA has been found to be relatively high[29,30]. DGA offers a short term improvement in oral health related quality of life and does not address dental fear which has to be dealt with separately[32].

The purpose of this study was to describe the demographic characteristics of the children presenting for DGA at Wits Dental Hospital in 2011 and to analyse the treatment they received.

13.7% of patients in this study were found to be mentally or physically compromised and 86.3% were considered healthy.

The mean age of the healthy patients in this study was 4,90 years. This can be compared to other South African studies. Kolisa *et al* (2013)[31], found the mean age of the children treated for DGA was 3.67 years whereas Peerbhay (2009)[29] found the average age of the patients treated to be 4 years and 6 months.

The ages of patients in studies around the world varied. In Liverpool, UK, Albadri(2006)[25] found the mean age of patients was 6.5 years. In studies by Alcaino(2000) [20], in Australia, and Harrison(2000)[24], in London, the mean age was 5 years and 4 months. In Cardiff, Olley *et al* (2011)[23] showed the mean age of the patients treated to be 7 years.

The origins of severe forms of ECC are therefore a lot younger than the age that they present for DGA. Children need to be examined much earlier in order to diagnose dental caries in its early stages and screen for susceptible individuals.

In this study slightly more males(54.8%) were treated than females overall. This trend was seen in both the compromised and healthy patient groups. Other studies have also shown a higher percentage of male patients treated under GA[5,21,22]. Females of all population groups in South Africa display less severe forms of ECC[19]. Postma, Ayo-Yusuf and van Wyk (2008)[19] suggests that this may be due to later exfoliation of deciduous teeth in males.

Ethnicity is considered a social risk factor for the development of ECC[19]. Because of the political history of South Africa it is important to consider ethnicity in certain contexts[26]. The socio-economic status of white South

Africans is still higher than other population groups[19]. The 1999/2002 South African National Children's Oral Health Survey(NCOHS) showed that caries prevalence was lower in whites compared to coloured and black population groups[19]. Coloured patients displayed the highest caries prevalence[19].

The South Africa population is made up of 79% Black, 9.5% White, 8.9% Coloured and 2.5% Asian[26]. The ethnicity of hospital patients is still registered in public hospitals for statistical purposes and in order to redress previous disadvantages. In this study 60.5% of healthy patients were black, 20.9% white, 12.8% coloured and 5.8% Asian. In compromised patients 78.0% were black, 12.2% white, 7.3% coloured and 2.4% Asian. The ethnicity of the compromised patients was more representative of the general population.

English(27.2%) and Zulu(26.5%) were the most frequently spoken languages, with Afrikaans(14.3%) and Xhosa(10.2%) less common. The area around CMJAH has a large immigrant population from neighbouring African countries. Twelve languages were recorded in this study, with only one (Zimbabwean Shona) that is not an official South African language. This possibly suggests that patients may fear that revealing their immigrant status might place them at some disadvantage when accessing this type of service. It is well documented that immigrant status negatively effects ECC[5,7,20].

As expected most of the children in this study fell into the hospital class HG which is children younger than 6 years or committed children. In South Africa children younger than 6 years have access to free health services at State facilities[27]. Numerous studies have documented a direct relationship between socio-economic status and ECC prevalence[7,9,12,19,22]. Behavioural risk factors such as poor feeding practices (prolonged bottle - and breastfeeding) have been reported in patients from the lowest socio-economic groups[19].

Fifty-five percent of patients travelled more than 10km for the DGA appointment. Public transport in Johannesburg is poor and many patients rely on commercial transport in the form of taxis. Transport costs to seek dental treatment or attend follow up appointments are therefore prohibitive for many patients even if treatment is free[33].

Healthy patients were referred mainly from private dentists. This has been confirmed in other studies[23,25]. Most of the referral requests in this group indicated the referring dentist understood the nature of the treatment offered ie. dental extractions. There were however a worrying number of referral requests for specific extractions and restorations indicating that the referring dentist was unaware that restorative dentistry was rarely undertaken at this facility

(where extractions are employed to decrease the chance of a repeat DGA). Effective communication between the referring dentist and the DGA facility has been shown to reduce the incidence of repeat DGA[24].

Many of the compromised patients were referred from other provincial hospitals or CMJAH medical referrals. The referral requests for this group were mostly to manage with unspecific diagnosis or extraction only request.

Only 61(20.4%) patients in this study were referred, from various sources, which indicates that the remaining 238(79.6%) were self-referred. Many patients access DGA facilities through the emergency departments of hospitals[22]. Alcaino *et al*[20] found that 85% of the self-referred patients were preschool children. They also found that self-referrals were higher in the immigrant population. Both groups are less likely to have access to regular dental treatment.

The mean waiting time for DGA at this facility was 5,03 months. This supplies a baseline value to monitor waiting times in future studies of this facility. In New Zealand Foster Page(2009)[22] described a waiting time of 2.8 months. Alcaino *et al* (2000)[20] observed the waiting times increase from 37 days to 80 days over the study period. Waiting times

depend on too many variables to compare this to other centres and draw any reliable conclusions.

Healthy patients in this study received only dental extractions. This reflects trends worldwide towards provision of less restorative treatment under DGA[21,22]. No restorations, fissure sealants or scale and polish procedures were performed in this group at this facility. Extractions require less theatre time and therefore the cost implications are lower[22,34].

The mean number of extractions was 8.88 overall, 9.19 for the healthy group and 6.90 for the compromised patients. There could be various explanations for this including the fact that compromised patients may be in care facilities with access to more regular screening and are therefore referred for dental treatment sooner or they may have had previous DGAs that weren't recorded in this study. In New Zealand, Foster Page (2009)[22] reported an average of 3 extractions per child. Albadri (2006) [25], in Liverpool UK, reported a mean extraction rate of 3.2 teeth per child treated. In South Africa Kolisa *et al* (2013)[31], Pretoria, reported 4.7 extractions in a facility where comprehensive dental treatment was provided under general anaesthetic. Peerbhay and Barrie(2012) [30] reported an average of 10.4 teeth extracted per patient in each district in the Western Cape

where restorative treatment was carried out in only 0.0001% of patients.

In this study the maxillary incisors and 1st molars were the most commonly extracted teeth in healthy children with the lower incisors being the least commonly extracted teeth. This is the typical pattern of disease in ECC[35,36]. Extraction patterns are related to feeding practices and eruption sequence[36].

The same pattern of extraction was not seen in compromised patients. In this group 1st and 2nd molars were the most commonly extracted teeth. The other procedures besides extraction performed in this study were negligible and only performed in compromised patients.

The mean duration of the treatment was found to be longer in the compromised patients (35.24 minutes) compared with healthy patients(29.07 minutes). This trend was noted in the literature[34]. The reason for the increased duration of treatment could be attributed to a more complicated anaesthesia in these patients. Age and severity of disease contributes to the length of procedure[34]. Younger patients are often less co-operative and more anxious which affects the duration of the DGA procedure[34,37].

Overall 17.4% of patients in this study were not scheduled. There are numerous advantages to a comprehensive pre-anaesthetic assessment. Pre-op preparation is essential to reduce the anxiety of parents and their children who are undergoing DGA[37]. Dental anxiety and stress at anaesthetic induction increases the incidence of postoperative morbidity[1]. Pre-anaesthetic screening has also been shown to decrease the prescription of DGA and reduce the incidence of repeat DGA[24,38,39]. It is also difficult to deny treatment to a child that has been starved in preparation for a DGA procedure[39]. At WDH the weekly time for DGA had been in operation for many years and was known by staff and caregivers alike, who may have decided to bring patients at that time, knowing the unlikelihood of being turned away.

Only three cases of repeat DGA were recorded during the study period. One explanation for this outcome could be the high extraction rate which has been shown to decrease the incidence of repeat DGA[24]. Poor record keeping could also contribute to this finding. Better access to diagnostic tools such as x-rays reduces the incidence of repeat DGA by not undertreating in the first instance[25].

Slightly higher extraction rates were recorded in male patients.

Coloured patients in this study had higher extraction rates than black, white or Asian patients.

Compliance in oral health prevention and promotion programs remains a challenge[29,40,41]. Frequent, regular oral health promotion programs are key to preventing ECC and future DGA[7,41,42]. The age of the patients accessing this service centre indicates the need for early intervention. Oral health promotion should be aimed at women receiving antenatal care, mothers and children[36,42,43]. Mothers are extremely important in the primary socialisation of their children with regards to setting up good oral health habits. Prevention of caries requires the combined efforts of the patient, parents, carers, teachers, medical doctors and nurses[11]. Parents and healthcare workers of young children should be taught to recognize early signs of disease[36]. Oziegbe and Esan (2013)[28] attributed low dmft scores to the dental faculty carrying out regular oral health awareness programs in primary and secondary schools in their study population. School dental programs may be the answer where access to oral healthcare facilities are difficult[7,43]. There is research to suggest that parents would support these programmes[23]. Dental therapists operating from school-based clinics were the source of most referrals to DGA in a study in New Zealand[22]. Integrated primary health care programs that not only focus on feeding practices limiting mother-to-

child HIV transmission, but also focus on oral health promotion, should be investigated[19,43].

Topical fluoride as well as water fluoridation has significant anti-caries benefits[7,16,19,27]. Kroon and van Wyk (2012)[44] concluded that water fluoridation would be a viable option in caries prevention in South Africa. School fissure sealant programs have also been suggested[43].

The cost of advanced conscious sedation was found to be significantly lower than DGA[17]. This is worth exploring as an alternate treatment option that could be offered to parents, especially of older children[20]. ART is well documented as a viable treatment alternative[27,36].

Limitations of this study

Patient file retrieval was a problem in this study.
194(64,9%) of the 299(100%) sample files were retrieved.
What happened to the other 105(35,1%) patient files? Do some of these patients re-present for DGA?
Children that were 10 years or older on the day of treatment were assumed to be mentally or physically compromised. Even though this was an accepted department policy, there was no way of confirming this.

Instead of looking at ethnicity as a variable, it might have been more relevant to include immigrant status or country of birth had this information been available.

Conclusions

In 2011, 459 patients who were up to 16 years old had dental treatment under DGA at WDH. A study of 299 of the patients showed that 86.3% of patients in this study were healthy and 13.7% were mentally or physically compromised.

The mean age was 4.90 years for healthy patients and 9.38 years for compromised patients (almost double). There were slightly more male patients (54.3% of healthy patientsand 58.5% of compromised patients) than female patients. The ethnicity of the compromised patients was more representative of the general population than the healthy group. English and Zulu were the more commonly reported home languages. The majority of children from both the healthy and compromised groups fell into the lowest socioeconomic groups. More than 55% of patients travelled more than 10km for their DGA. The cost of travel is a significant barrier to obtaining care, even if the treatment is free.

When looking at the referral patterns, 79.8% of patients in this study were self-referred. Healthy patients with referrals were mainly from private dentists, and compromised patients were referred mainly from CMJAH medical referrals or other provincial hospitals. The majority of referral requests were to manage with non-specific diagnosis or

extraction only request. There were more requests for restorative treatment in healthy patients.

The average waiting time from screening to DGA treatment was 5,03 months for the entire study population.

The mean number of extractions was 9.19 teeth for healthy children and 6.90 teeth for compromised children. No other treatment was performed on healthy children. For compromised children, 2 scale and polish procedures and one fissure sealant were performed. Lower incisors and canines were the least commonly extracted deciduous teeth in this study.

The mean duration of treatment was 29.07 minutes for healthy children and 35.24 minutes for compromised children.

Of the patients treated under DGA, 17,4% of children were unscheduled, meaning they had not been screened and given an appointment for DGA.

The incidence of repeat DGA was 1,0% amongst all the children in the study.

Gender and ethnicity had no statistically significant effect on extraction rate.

Recommendations

Dental caries is a preventable disease and yet the demand for DGA is increasing worldwide. This study set out to identify and describe the patients presenting for DGA at Wits Dental Hospital with a view to decreasing demand for this form of treatment.

The Wits DGA patient is of preschool age, from a low socioeconomic background presenting with advanced early childhood caries. They travel from all parts of Johannesburg to access this extraction only facility with little or no access to dental treatment elsewhere.

Decreasing the demand for this service translates into exploring alternative, more appropriate forms of treatment and addressing the social and behavioural determinants of ECC. Prevention and promotion programs must be accessible to patients and parents/caregivers from a young age in local primary healthcare facilities. The difficulty and costs children and parents face accessing dental treatment are well known. Parents, caregivers and healthcare providers also need to be educated on the benefits of early diagnosis and treatment in dental caries in order to ultimately reduce severe forms of disease that will require more radical intervention.

APPENDICES

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Dr Natalie Gray

CLEARANCE CERTIFICATE	**M120321**
PROJECT	An Audit of Paediatric Patients Presenting for Dental General Anaesthetic at Wits Dental Hospital in 2011: A Pilot Study
INVESTIGATORS	Dr Natalie Gray.
DEPARTMENT	School of Oral Health Sciences
DATE CONSIDERED	30/03/2012
+DECISION OF THE COMMITTEE*	Approved unconditionally

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

DATE 30/03/2012 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Prof Joy Shackelton

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

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

DATA CAPTURE SHEET DR NATALIE GRAY 2011

Patient code:				
	Theatre reg	File	Daysheet	Calc
Age(TR)				
DOB(F,DS)				
Sex(F,TR)				
Suburb(F,DS)				
Distance km(calc)				
Ethnicity(F,TR)				
Language(F)				
Screening date(F)				
Treatment date(F,TR)				
Waiting time(calc)				
Extractions(F,TR)				
Restorations(F,TR)				
Fissure sealants(F,TR)				
Scale and Pol(F,TR)				
Source of ref(F)				
Referral req(F)				
Repaet DGA(F)				
X-ray present(F)				
Hospital class(F,TR)				
GA duration(TR)				
Medical history				
Patient scheduled(DS)				
Patient treated(TR,F)				
File retrieved(Y/N)				
Disability(F)(Y/N)				

F=File TR=theatre register DS=day sheet P/M=physical/mental disability

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