CARIES PREVALENCE OF CHILDREN ATTENDING SPECIAL NEEDS SCHOOLS IN JOHANNESBURG, GAUTENG PROVINCE, SOUTH AFRICA

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Degree of

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DECLARATION

I, **Batseba Cathrine Nqcobo**, declare that this research report is my own work. It is being submitted in partial fulfilment for the degree of Master of Science in Dentistry at the University of the Witwatersrand, Johannesburg, South Africa. It has not been submitted for any other degree or examination at this university or any other university.

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.....day of 2012

DEDICATION

This is dedicated to my late father

Christopher Godfreed Malau

May his soul rest in peace

1942-1996

And to my mother, Mokgadi Regina Malau, whose love, support and encouragement made this research report possible.

ABSTRACT

Anecdotal evidence in Johannesburg suggests that the burden of oral health disease, especially dental caries, is significantly higher in children with special health needs than in healthy children. This study sought to determine the dental caries prevalence of children attending special needs schools in Johannesburg, South Africa. The **objectives** of the study were to determine: (1) demographic characteristics of children attending special needs schools in Johannesburg, (2) the dental caries status of children attending special needs schools in Johannesburg, and (3) treatment needs of children attending special needs schools in Johannesburg; to (4) compare dental caries status and treatment needs of children attending special needs schools in Johannesburg with those revealed by the National Children's Oral Health Survey (NCOHS); and to (5) To determine the association between type of disability and dental caries status. **Results:** The mean age was 10.5 years of age, with the majority being males (64.97%). The dental caries prevalence was 27.55% in the primary dentition and 33.56% in the permanent dentition. Cerebral palsy and Hearing impaired groups had higher dental caries prevalence. **Conclusion:** The results demonstrate that children with special health care needs as a group have lower caries prevalence in both the primary and permanent dentition compared to the general population in the NCOHS. They also have high unmet treatment needs regardless of the type of disability.

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ABBREVIATIONS AND ACRONYMS

ADHD	Attention Deficit Hyperactivity Disorder
BILD	British Institute of Learning Disability
COHOP	Community Oral Health Outreach Programme
CSHCN	Children with Special Health Care Needs
deft	decayed extracted filled teeth (primary dentition)
deft+ DMFT	Mean number of decayed missing or filled teeth of mixed dentition
dmfs	decayed missing filled surface (primary dentition)
DMFS	Decayed Missing Filled Surface (permanent dentition)
dmft	decayed missing filled teeth (primary dentition)
DMFT	Decayed Missing Filled Teeth (permanent dentition)
FT	Filled Teeth
GI	Gingival Index
NCOHS	National Children's Oral Health Survey
OHI	Oral Hygiene Index
OHI-S	Simplified Oral Hygiene Index
(sd)	Standard deviation

SHCNS	Special Health Care Needs School
SiC	Significant Caries Index
USA	United States of America
UTN	unmet treatment needs
WHO	World Health Organization

CHAPTER 1: INTRODUCTION

1.1 Background

Children with Special Health Care Needs (CSHCN) are defined as "those who have or are at increased risk for a chronic physical, developmental, behavioural, or emotional condition and who also require health and related services of a type or amount beyond that required by children generally" (McPherson *et al*., 1998).

Gauteng Province has 109 Special Health Care Needs Schools (SHCNS) registered with the Department of Education, of which 42 are located in Johannesburg. These schools are found in the north, south, east, and west of Johannesburg and are categorised as follows: ordinary, hospital, deaf, special, cerebral palsied, school of focus learning, industrial, child welfare, learning disability, mild mental disability and severe mental disability. This study focused on the following four disabilities: cerebral palsy, hearing impaired, learning disability and mental disability. These disabilities were chosen because they were the only groups that were accessible to the research team.

There is anecdotal evidence from clinic records that children with special needs do not have adequate access to oral care in Johannesburg. Little or no data is available on the oral health status of these children. This is in stark contrast to the two national surveys (1988/89 and 1999-2002) that provide detailed information on the oral health status of children in South Africa. Hence, this study sought to determine the oral health status and unmet treatment needs

among special needs children in Johannesburg. Additionally the data obtained was compared against the National Children's Oral Health Survey (NCOHS) 1999-2002 data for children.

CHAPTER 2: LITERATURE REVIEW

PUBMED and various other databases such as Google scholar were searched for journal articles relating to the objectives of this study. The search terms used were ‘‘oral health status’’ and ‘‘children with special health care needs’’. The search was limited to children age ranged between three and 18 years and the databases were searched from 1 June 2000 to 1 June 2011. Only articles relating to the oral health status of children with special needs were identified. The review of literature explored the oral health status of the disabled population in general and highlighted some of the factors that influenced oral hygiene and oral health in this population.

2.1 Description of the Disabilities

Cerebral Palsy is a condition where there is gross delay in the development of motor functions. Children with cerebral palsy have great difficulty in initiating and controlling their muscles and body movements. Many of these children are perfectly well in all other aspects, such as in their speech, learning ability and socialisation. This differentiates cerebral palsy from mental retardation, which does not have an impact on motor functions. In addition, the legs and arms of patients with cerebral palsy may appear very stiff or limp (World Health Organisation, WHO, 2006).

“Deafness”, according to the WHO (2010), refers to the complete loss of hearing ability in one or both ears. “Hearing impairment” refers to both complete and partial loss of the ability to hear and for the purpose of this report, the term hearing impaired will be used to refer to the children attending the deaf school in the study cohort

According to Statistics South Africa (2001), there are at least 2.2 million people with disabilities in South Africa, with approximately 20% of all disabled people in South Africa made up of people with a hearing loss that makes them either hearing impaired or hard of hearing. South Africa has a long-established hearing impaired education system (Berke, 2011). Demographic statistics indicate that there are more than 40 schools for the hearing impaired in South Africa (Berke, 2011).

Mental disability, according to the WHO (1996), is defined as a condition in which there is a delay or deficiency in all aspects of development, i.e. there is a large-scale and noticeable deficiency in the development of motor, cognitive, social, and language functions. Other studies define mental disability as a physical, mental or emotional condition in which an individual has difficulties in doing any of the activities that involve learning, remembering and/or concentrating (Erickson and Lee, 2008). The above definitions are often used interchangeably and refer to the same type of patient. For the purpose of the study, Erickson and Lee's (2008) definition of mental disability was used.

The WHO defines learning disability as "a state of arrested or incomplete development of mind" A person with a learning disability is said to have "significant impairment of intellectual functioning" and "significant impairment of adaptive or social function"(WHO 1996). The person will have difficulties understanding, learning and remembering new things, and a difficulty in generalising any learning to new situations. Owing to these difficulties with learning, the person may have difficulties with a number of social tasks; for example, communication, self-care, and awareness of health and safety (WHO, 1996). According to Northfield (2004), is a diagnosis and is not a disease, nor is it a physical or mental illness.

Three criteria are required to be met before learning disability can be diagnosed: intellectual impairment, social or adaptive dysfunction, and the early onset of the condition.

2.2 Disability and Oral Health

People with disabilities such as mental and/or physical disabilities have been reported to have poorer oral health than the general population (US General Report, 2000) which can have a significant effect on an individual's quality of life (Horwitz *et al*., 2000). It can cause difficulty with eating, speech impediments, pain, sleep disturbances and missed days at school or work (Horwitz *et al*., 2000). Poor oral health also has a negative impact on nutrition, digestion and the ability to chew and enjoy food (Altun *et al*., 2010). Nunn (1987) confirms that individuals with disabilities may have great limitations in oral hygiene care and performance due to their motor, sensory and intellectual disabilities and, as a result, are more susceptible to poor oral health and may require assistance from their parents, siblings, or caregivers. Often, their oral health needs compete with other chronic health conditions, which means that their oral health can be neglected (Oredugba and Akindayomi 2008). The consequences of unmet oral health needs include infection of oral tissues, negative behaviour and aggravation of associated medical conditions (Oredugba and Akindayomi, 2008).

The health of CSHCN is of great importance because these children represent a high risk group for oral diseases such as dental caries, periodontal diseases, gingivitis and tooth eruption (which may be accelerated, delayed or inconsistent), halitosis, malocclusion and enamel opacities (Oredugba and Akindayomi , 2008). The oral health condition of an individual with special health care needs is influenced by various socio-demographic factors such as age, living conditions, severity of impairment, special diets and the type of medication taken daily

(Oredugba and Akindayomi , 2008).

This section has shown that there are various factors which affect the oral health of people with disabilities and create barriers to dental care. For example, if oral health is not perceived as a priority or as important by the parents or caregivers, then children will not be taken for dental visits unless in an emergency.

2.3 Oral Health Status of Children with Special Health Care Needs

2.3.1 Studies from developing countries

A cross-sectional comparative study was conducted in Bangladesh by Nahar *et al.* (2010) to assess the state of the dentition and oral hygiene among disabled (n=110) and healthy young people (n=110) aged between three and 14 years. This study revealed that the decayed missing filled teeth (primary dentition) or "dmft" score in the disabled group was 5.6 compared to a dmft of 5.9 in the healthy group of the same age and the difference was not significant ($p>0.05$). Periodontal problems based on the Oral Hygiene Index (OHI) and Gingival Index (GI) were significantly higher in the disabled group compared to young healthy children ($p<0.05$). The study recognised that there were some health promotion activities/facilities for disabled people in some centres in Bangladesh and yet no structured dental care delivery system was in place for this group of children. The authors recommended that more oral health programmes be provided in special needs schools to address and prevent gingivitis, which leads to juvenile periodontitis, which in turn leads to tooth loss (Nahar *et al*., 2010).

Liu *et al.* (2010) conducted a cross-sectional study in Taiwan to assess the impact of social factors on the oral health of people with disabilities. They conducted an analysis of the impact

of dietary and tooth brushing habits on the participants (n=535) aged six to 12 years, who were divided into groups of disabilities, including hearing impaired, intellectual, learning, and others like autism. The study focused on mixed dentition. Children with mild to moderate disabilities had worse dental health-related indices (i.e. 63.25% dental caries prevalence and mean number of decayed, missing or filled teeth of mixed dentition (deft+DMFT) of 4.18) than those children with severe and profound disabilities (50% prevalence and deft+DMFT of 3.19). The reason given was that the children with mild to moderate disabilities brushed their teeth without the help of their caregivers, which was less effective. Dental-related index scores among children whose brushing was carried out by parents were lower than index scores among children who were not brushed by caregivers. The authors concluded that oral health is affected by factors such as the knowledge, attitude and practices of caregivers that influence the outcome of oral care of disabled persons. This study showed that self-sufficiency was not a guarantee for better oral health or lower dental caries experience among the disabled groups.

Oredugba and Akindayomi , (2008) conducted a study in Nigeria to evaluate the oral health status and treatment needs of 54 children and young adults (aged between three and 26 years) with special health care needs attending a private day institution. The disabilities which were included in the study were cerebral palsy, learning disability, Down's syndrome, Attention Deficit Hyperactivity Disorder (ADHD), seizure disorders and autism. Demographic data regarding education levels of parents, age and gender was collected. The authors reported that 66.7% of the children were caries free and that there was no statistical difference between gender, age groups and the education of parents. Oral hygiene status was measured by the Simplified Oral Hygiene Index (OHI-S) of Greene and Vermillion (1964), the outcome of which was that 46% had good oral hygiene, 21% had poor oral hygiene and 33% needed

restorative care. Gingivitis was predominantly present in subjects with seizure disorders, learning disability, Down's syndrome and autism. Two of the reasons given for increased occurrence of caries in this group of individuals were consumption of sweets and drinks and the additional impact of long-term use of medication in the form of sweetened syrups. The small sample size (n=54) was due to lack of consent provided, and participants being absent on the day of assessment or being uncooperative may have limited the general findings. The proportion of caries free subjects (66.7%) was lower than the proportion of 93% which was found in children with disabilities in public day institutions. Hence, the authors concluded that there was a higher prevalence of dental caries and unmet treatment needs in this group of participants (33.3% vs. 7%).

A study in South India by Purohit *et al*. (2010) compared the oral health status of 265 children with special health care needs to the oral status of 310 children with no disabilities. The age group ranged between five and 15 years. The children with disabilities had a significantly higher burden of oral diseases, with a prevalence of caries in primary dentition of 95.9% vs. 76.6% and of 89.1% vs. 58.6% for the permanent dentition. The decayed missing filled teeth (primary dentition) or dmft/ Decayed Missing Filled Teeth (permanent dentition) or "DMFT" of the disabled children was found to be 1.45 and 2.52 respectively compared to the healthy group, which had dmft/DMFT scores of 1.23 and 0.61 respectively. The reasons given by the authors for the high caries prevalence in the disabled children were that poor muscle coordination and muscle weakness interfered with routine daily oral hygiene practices, and that they frequently consumed sweetened snacks in between meals. Other factors were less frequent brushing, a lack of oral health knowledge on the part of their caregivers and poor access to care and preventive measures such as fluoride treatments and dental sealants. The

authors further reported that the majority of the participants both with (83.8%) and without disabilities (88.1%) had never visited a dentist, which could have been due to low socioeconomic status. The authors concluded that there was a definite need for preventive treatment for children with special health care needs.

In Turkey, a study was conducted to determine the dmft/DMFT index score and oral hygiene status of 136 individuals aged two to 26 years old attending a special school for the disabled. The participants were grouped according to type of disabilities, i.e. cerebral palsy, mental disability, Down's syndrome and autism. A dental caries prevalence of 84.6% was reported and a substantial variation in oral cleanliness by type of disability was found, with the mental disability group having the poorest oral hygiene and the highest DMFT score at 2.11 (standard deviation (sd) 3). The prevalence and severity of oral disease among the group were also high when compared to the general population. Reasons given were the low physical abilities of the individuals, which resulted in difficulty in tooth brushing, as well as limited understanding of the importance of oral hygiene care. One in three subjects was found to have large amounts of plaque deposits. Difficulty of the participants in communicating oral health needs together with their fear of oral health procedures also led to the above findings (Altun *et al*., 2010).

A descriptive cross-sectional study conducted in Tanzania by Simon et al. (2008) investigated the oral health status of 321 children with different disabilities aged between seven and 22 years. The children were grouped according to their disabilities, i.e. hearing impaired, blind and mentally retarded. The hypothesis was that the diverse groups of disabilities differed greatly in their understanding and capabilities, and in performing tasks such as oral hygiene procedures. The authors found that dental caries prevalence in the entire group was low (about 12%). However, the levels of gingival bleeding (73%) and of calculus (82%) were relatively

high. Over 80% of the children needed scaling and polishing but only 23% of the children needed one or two surface restorations. In the deciduous dentition, most of the decayed teeth were in the seven to nine years age group, with the hearing impaired group having the highest mean decayed missing filled surface (primary dentition) or "dmfs" (3.24). In the permanent dentition, the 10- to 12-year-old mentally retarded children had a mean Decayed Missing Filled Surface (permanent dentition) or DMFS of 1.25 and the hearing impaired children of the same age had a much lower DMFS of 0.52. The other noteworthy finding was that none of the participants had any filled teeth, which clearly showed that the type of dental service that the children received involved extractions only. The authors reported that the extractions were performed on an emergency basis to relieve pain. The study concluded that there was low dental caries prevalence in the children with disabilities, high gingival bleeding and calculus scores. The authors did not discuss the reasons for the low caries prevalence in this cohort. The authors recommended that because different groups of disabilities have distinct dental caries experiences and needs a tailored oral health programme which is appropriate for their respective disabilities and needs be provided for them (Simon *et al*., 2008).

Du *et al*. (2010) conducted a study in China of 72 preschool children aged between two and six years with cerebral palsy compared to those without cerebral palsy of the same age. The authors reported a caries prevalence of 42.5% in children with cerebral palsy and 47.9% in those without cerebral palsy. However, there was no significant difference between the two groups (p=0.506). The children with cerebral palsy had high Simplified Debris Index and GI scores, which were related to the poor neuromuscular control that prevents proper oral hygiene practice, especially in older children, as well as twice the amount of tooth wear than those without cerebral palsy. The authors did not give a reason why there was no significant

difference in the dental caries prevalence between the two groups. However, one can speculate that the children with cerebral palsy had access to oral health care services, which could have balanced the risk level between the two groups.

Choi and Yang (2003) compared oral health among 267 disabled and 128 non-disabled subjects within an age range of three to 34 years in the Republic of South Korea. These authors found that dental caries experience of the disabled children was lower than that of the non-disabled group, with dmft/DMFT scores significantly lower. Scores for dmft/DMFT of 3.5 and 0.13 respectively were found in the disabled six year olds, and the non-disabled group had dmft and DMFT scores of 6.75 and 0.17 respectively. The 12-year-old disabled subjects had a DMFT score of 1.13 as compared to the 2.1 of non-disabled group. The authors did not give a reason for the difference in the dental caries experience between the two groups. However, the assumption was that the disabled children lived in institutions, where there was stricter diet control.

Shyama *et al*., (2001) assessed the dental caries experiences of different groups of disabled populations with special needs in Kuwait (n=832, age range 3-29). The disabilities included were visually impaired, hearing impaired, and physically disabled such as cerebral palsy and Down's syndrome. In the primary dentition, the proportion of dental caries free subjects was 11.2% and the highest percentage of dental caries free subjects was found in the physically disabled group. There was no significant difference in the dental caries experiences as revealed by the dmft scores and the caries prevalence in primary dentition of the different disability groups. The cerebral palsy group had a dmft score and caries prevalence of 5.5 and 87.2% respectively while the hearing impaired group had a dmft score of 5.3 and caries prevalence of 88.3% respectively. In the permanent dentition the proportion of dental caries

free subjects was 24.2% and there was a significant difference between the groups in the DMFT and filled teeth (FT) scores. A dental caries prevalence of 84% was found in the hearing impaired children (n= 304) with a DMFT score of 5; hence, the hearing impaired had the lowest proportion of dental caries free subjects, and first permanent molars of this group showed a significantly higher attack rate than the blind and physically disabled groups. The cerebral palsy group (n= 229) had a dental caries prevalence of 68% and DMFT score of 3.7. The participants in this study were non-institutionalised and living at home, where their diet is presumably unregulated and may have been cariogenic.

Of interest was that the prevalence of fissure sealants was highest in the blind as well as hearing impaired groups and the authors suggested that this was because the blind and hearing impaired possibly cooperate more in receiving treatment than do patients with Down's syndrome or cerebral palsy. The authors concluded that the groups with a high prevalence of dental caries received less oral health care than the general population and that the severity of the oral status of this group was due to lack of awareness about oral health care and inability to access oral care facilities. In the permanent dentition, increasing age, impaired hearing and poor oral hygiene were found to be significantly associated with dental caries risk.

Huang *et al*. (2010) in a study conducted in Taiwan determined the oral health status and treatment needs of institutionalised children with cerebral palsy (n=345) aged below 18 years. The authors found that females had higher deft and DMFT scores (4.76 and 6.17) respectively than males, who had a deft score of 3.34 and DMFT of 5.19. The authors also reported that six year olds had the highest dental caries prevalence (85%) in primary dentition; and that seven to 12 year olds and 13 to 18 year olds had 75% and 84% dental caries prevalence in permanent dentition respectively.

De Camargo and Antunes (2008) in a study to assess untreated dental caries in 200 children with cerebral palsy who were from a low socioeconomic area in Brazil have found that the proportion of children that presented with untreated dental caries was 49.5%. The prevalence of untreated dental caries in four to seven year olds was 54.5% and 58.5% in the eight to 12 year old group. These percentages were higher than those found in the Brazilian survey (2003) of healthy children, which were 44.7% and 34.8% in the five and 12 year olds respectively. In the study by De Camargo and Antunes (2008), socioeconomic factors in relation to untreated caries were investigated and the authors reported that the majority of children with dental caries in the primary dentition (80%) had received no prior dental treatment at all and patients from low socioeconomic status had high levels of untreated caries.

Rodrigues dos Santos *et al*., (2003) in their study in Brazil involving 62 non-institutionalized patients with cerebral palsy (six to 11 year olds and 12 to 16 year olds) found that the participants were more prone to developing dental caries. This was attributed to difficulty in controlling plaque, consumption of sugary foods, use of medications as well as problems in chewing and swallowing compared to 67 patients without cerebral palsy of similar ages. The chewing and swallowing problem prolonged the time from intake of food to swallowing, which further increased the risk of developing dental caries.

A study in Brazil by De Carvalho *et al*., (2011) involving 52 children with cerebral palsy aged seven to 18 was conducted in two institutions both dedicated to providing integrated rehabilitation and special education for CSHCN. There was a low prevalence of dental caries with a mean DMFT score of 1.09, which was lower than the DMFT score of 3.19 obtained by normal 12 year olds in the Brazilian survey in 2003. The reason provided by the authors for the low score was that the institutions had multidisciplinary teams to care for the children and

one of the institutions had a dedicated programme designed to restore and maintain the oral health of the patients and the caregivers.

The results from the De Carvalho *et al*., (2011) and Huang *et al*., (2010) studies differ possibly because there were better resources in the Brazilian institutions than in their Taiwanese counterparts. There was no access to a dental clinic or to oral health intervention in the institutions which were surveyed in Taiwan (Huang *et al*., 2010).

The studies discussed in this section have highlighted that socioeconomic factors, severity of the disability, and knowledge and attitude of caregivers regarding oral health care had an impact in the oral health status of the study participants. Additionally, although the dental caries prevalence of CSHCN when compared to healthy children showed variable results the unmet needs were high regardless of the caries prevalence.

2.3.2 Studies from developed countries

Only two studies from developed countries were identified in the literature search. One of these studies was a cross-sectional study conducted in the United States of America (USA) by Pezzementi and Fisher , (2005) among 12 099 athletes (mean age 23.1 years and 24.9 years). The authors evaluated the oral health status of non-institutionalised Special Olympics athletes and reported on the extent of oral health disparities among people with intellectual disabilities. The individuals were categorised according to the states in which they resided. The overall caries prevalence rate was reported as 28.2% (n=12 099). When individual states were compared, the caries prevalence ranged from 27.8% to 40.7% (eight states compared), with higher rates reported in poorer states. The results showed that athletes from the poorest states

were more than one-and-one-half times as likely to have restorations and almost one–third as likely to have sealants compared with athletes from the less poor states. Additionally, the poverty level of individuals was found to be related to their oral health status. A limitation of this study was that the results could not be compared to those of other studies owing to differences in survey designs, reporting methods and definitions of oral health terms (Pezzementi and Fisher, 2005).

The second study reviewed was by De Jongh *et al*., (2008), who conducted a study in the Netherlands to assess the oral health status, treatment need and barriers to dental care of 61 non-institutionalised children with severe mental disabilities aged between four and 12 years old (mean age 7.7 years old). The caries prevalence rate was found to be 70% for all the children, 57.4% had untreated dental caries, and the proportion of dental caries free children was 30% compared to the 55% reported from the 2003 Dutch National Survey (Den Dekker *et al*., 2003). The mean dmft/DMFT scores reported were 2.0 and 0.97 respectively, with the authors explaining the difference in caries prevalence as being because the children in the study suffered from relatively severe mental disabilities, which generally have been found to be associated with a higher level of oral problems (Nunn, 1987). Other reasons included the children's lack of cooperation during treatment. Caregivers indicated problems and challenges during daily oral care. Over 68.4% of the caregivers reported problems with brushing the children's teeth because the children would turn their heads away or chew on the toothbrush. A high proportion (53.1%) of CSHCN did not receive routine dental care compared to 23.8% in the general population.

This section has shown that even in developed countries the CSHCN have variable caries prevalence rates with high unmet treatment needs.

Concluding Remarks

The published literature is biased towards studies that are conducted in developing countries. An analysis of the reviews suggests that the following generalisations can be made:

1. Studies from both developed and developing countries reported variable caries prevalence rates among CSHCN vs. healthy children. Some studies reported higher caries prevalence in the special needs groups while others reported significantly higher caries levels in healthy groups.
2. Similarly, when the disabilities were compared, the caries prevalence rates were variable.
3. It was clear that in groups where motor, sensory and muscular control was a problem (Shyama *et al*., 2001; Du *et al*., 2010; Huang *et al*., 2010; De Carvalho *et al*., 2011) the oral hygiene status was poorer. This was significantly worse in cases where no caregiver or parental assistance was reported.
4. In groups where caregiver or parental assistance was reported, caries prevalence rates were lower. Thus knowledge and attitude towards oral care were significant risk factors for caries prevalence or oral hygiene status.
5. Although caries prevalence rates were variable among CSHCN, the unmet treatment needs for these children were high in all published studies.

In South Africa, there is a paucity of studies that report on the dental caries prevalence of CSHCN, which makes this research particularly important.

AIMS AND OBJECTIVES OF THE STUDY

AIM

The aim of this study was to determine dental caries prevalence of children attending special needs schools in the city of Johannesburg, in the Gauteng Province of South Africa.

OBJECTIVES

1. To determine the dental caries status of the children
2. To determine the unmet treatment needs (UTN) of the children
3. To determine the demographic characteristics of the children
4. To determine the association between type of disability and dental caries status
5. To compare dental caries status and treatment needs of children attending special needs schools in Johannesburg with those of the National Children's Oral Health Survey

CHAPTER 3: METHODOLOGY

This chapter describes the research methodology used to conduct this study. Methods of conducting the study, ethical considerations and analytic techniques pertaining to this study are also dealt with in this chapter.

3.1 Study Design

The research was designed as a cross-sectional descriptive study.

3.2 Study Population

The study population consisted of all the children attending special needs schools in Johannesburg aged between 3 to 18 years.

3.3 Study Sample

A list of all the special needs schools in Johannesburg was obtained from the Gauteng Department of Education. From the list, schools were stratified according to the type of disability they serve. A copy of the list of schools is attached as Appendix I. Within each stratum, schools were randomly selected and all the children attending the facility were invited to participate in the study. The statistical sample size calculator for descriptive studies on Epi info version 3.5.3 was used to calculate the sample size. From a population of 10 000, the sample was calculated to be 882 at a confidence level of 95% and assuming a prevalence of 65% (Liu *et al*., 2010).

All CSHCN attending special needs schools and in Johannesburg whose parents gave consent to participate in the study were included in the study. The children with no parental consent

and those who had parental consent but were unable to cooperate during the clinical oral examination were excluded from the study.

3.4 Study Instruments

The data-collection form, which is referred to as the "assessment form" in this research report, was adapted from the form which had been used on previous research projects by the Community Oral Health Outreach Programme (COHOP) in the Department of Community Dentistry at the University of the Witwatersrand – Johannesburg. The form consisted of two sections: a section that was used to collect demographic data, such as age, gender and disability, as well as a clinical assessment section, which assessed the presence of decayed, missing, and filled teeth (dmft/DMFT) and treatment needs (see Appendix II).

The clinical examination was conducted by three calibrated examiners, all of whom had undergone a calibration exercise to standardise clinical criteria for diagnosis of dental caries. The calibration exercise was conducted by a specialist in the Department of Community Dentistry at the University of Witwatersrand. The calibration exercise was conducted using extracted teeth which were mounted in a white stone dental material. The intra- and inter-examiner reliability agreement was assessed using the Cohen Kappa statistic (1968), with an overall score of 0.9 for diagnosis of dental caries.

3.4.1 Dental caries examination

The participants were examined on site at the school under natural light. The subjects were in a seated position in accordance with the WHO guidelines (WHO, 1997) and were examined using a mouth mirror. The parameter that was measured was the presence or absence of dental

caries using the decayed, missing, and filled teeth (dmft) index for primary dentition and Decayed, Missing and Filled Teeth (DMFT) index for permanent dentition. A tooth was considered decayed when there was a frank carious cavity on any surface of the tooth. A tooth was classified as missing in the index if it was assessed as extracted due to dental caries. A tooth was classified as filled if it had a restoration on a carious lesion. Exfoliated teeth in the primary and mixed dentition, unerupted teeth and those extracted for other reasons apart from dental caries were not included in the indices. All the teeth in the mouth were examined for dental caries.

3.5 Data and Statistical Analysis

All the data collected was entered into a spread sheet using Microsoft Excel. Descriptive statistical analysis was made using means, frequencies, and ranges. T-tests were used to compare two means and ANOVA tests were used for comparing more than two means. Significance was set at $p < 0.05$. All the dmft/DMFT scores for disabilities and different age categories were ranked in a descending order and the top one-third were analysed independently to determine the Significant Caries Index (SiC).

Regression analysis was undertaken to investigate the associations of gender, age and type of disability with dental caries experience.

3.5.1 Independent variables

The independent variable that was analysed during the research project was the demographic profile and included the age, gender and disability of the participants.

3.5.2 Dependent variable

The dependent variable that was analysed in the research was identified as dental caries as measured using dmft/DMFT index or caries prevalence.

3.5.3 Analysis by objective

Objective 1: To determine the dental caries status of children attending special needs schools in Johannesburg

The proportion of children with dental caries was determined using frequency tables, and the dental caries prevalence was reported using histograms

Objective 2: To determine the unmet treatment needs (UTN) of the children

The unmet treatment needs were calculated by the formula d/d+f for primary dentition and D/D+F for the permanent dentition.

Objective 3: To determine the demographic characteristics of the children

Frequency tables for categorical variables and continuous variables were used to describe the study population variables.

Objective 4: To determine the association between type of disability and dental caries status

The associations between type of disability and dental caries were tested using Pearson's Chi-squared test of proportions. Logistic regression was used to identify factors, which were

associated with dental caries. The odd ratios were used to determine the strength of the association. The statistical significance was calculated at the 5% significance level and estimates were reported at the 95% confidence interval.

3.6 Ethical Considerations

Permission to undertake the current study was granted by the University of Witwatersrand Ethics Committee and the ethics clearance certificate is attached as Appendix VI (Ethics Clearance Certificate number M110834). The parent or caregiver of each participant was given an information sheet (see Appendix III) and a written consent form for obtaining their permission to allow their children to participate in the study (see Appendix IV), which they had to sign. The assent form for the children (see Appendix V) was filled in before an examination could be conducted.

CHAPTER 4: RESULTS

This chapter focuses on the description of the sample by age, gender and disability as well as data analysis per individual disability and in comparison with the NCOHS. The total sample with disabilities studied consisted of 882 children.

4.1 Demographics

4.1.1 Distribution by age

The mean age of the study population was 10.45, as shown in Table 4.1, and the profile of this population by age groups is shown in Table 4.2, with nearly equal proportions of seven to nine year olds and 13 to 15 year olds. The majority group was the 10 to 12 year olds, who made up one-third of the sample (33.1%; n=289).

Table 4.1: Number and percentage of participants by disability, mean age (sd) and median age

Disability	**n**	**%**	**Mean age (sd)**
Cerebral palsy	163	18.48	9.65 (2.41)
Hearing impaired	99	11.22	9.19 (4.34)
Learning disability	171	19.39	10.00 (1.70)
Mental disability	449	50.91	12.97 (3.35)
Total	882	100	10.45(3.44)

Table 4.2: Number and percentage of the total sample by age group

Age group	**n**	**%**
3-5 years	23	2.60
6 years	41	4.60
7-9 years	189	21.40
10-12 years	289	32.80
13-15 years	200	22.70
16 and above	140	15.90
Total	882	100

4.1.2 Distribution by gender

Figure 4.1 provides information on the gender split among the sample recruited for this study. Males comprised almost 65% of the total sample size.

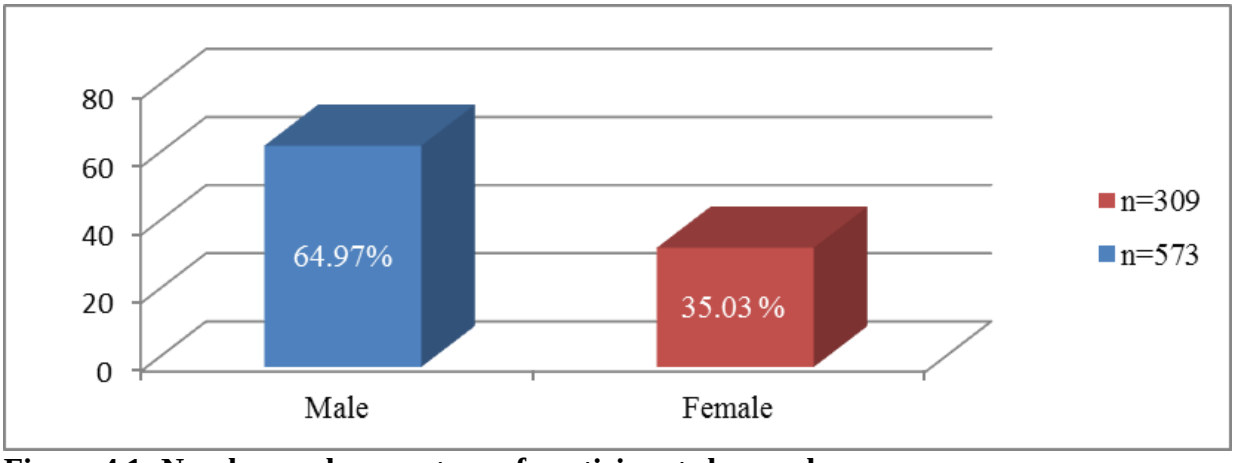

Figure 4.1: Number and percentage of participants by gender

When the disabilities were analysed according to gender, males again dominated for all the groups assessed (see Table 4.3).

Table: 4.3: Number and percentage of participants by gender and disability

Disability	Male	%	Female	%
Cerebral palsy	106	65.03	57	34.97
Hearing impaired	58	58.59	41	41.41
Learning disability	130	76.02	41	23.98
Mental disability	279	62.14	170	37.86
Total	**573**	**64.97**	**309**	**35.03**

4.1.3 Distribution by disability

Figure 4.2 provides information about the percentage distribution of the participants in the sample population according to type of disability. More than 50% of the participants were mentally disabled and nearly equal proportions of participants had learning disability and cerebral palsy. The lowest proportion was the hearing impaired group of participants (11.22%; n= 99).

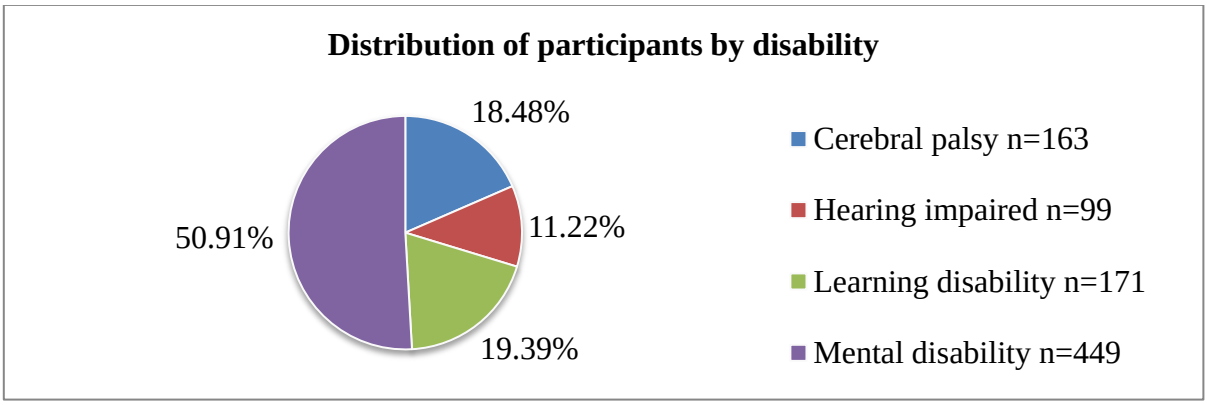

Figure 4.2: Number and percentage of participants by type of disability

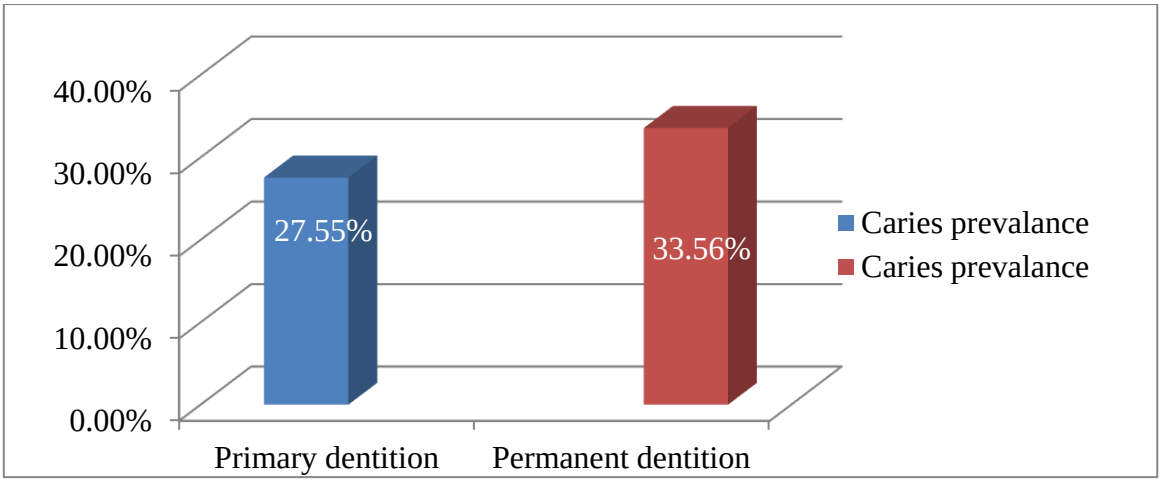

Figure 4.3: Dental caries prevalence in permanent and primary dentition

4.2 Dental Caries Status in Primary Dentition

The prevalence of dental caries in primary teeth was 27% (see Figure 4.3), with no significant difference between males and females. An analysis of the sample per disability (see Table 4.4) showed a significant gender difference in the dental caries prevalence only in the hearing impaired group , which was 46.55% for males and 63.41% for females ($p<0.05$).

Table 4.4: Percentage caries prevalence in primary dentition by gender and disability

Disability	**Male**	**Female**
Special needs group	27.57%	26.86
Cerebral Palsy	43.17%	42.10%
Hearing impaired	46.55%	63.41%
Learning disability	6.92%	7.31%
Mental disability	22.58%	19.41%

Figure 4.4 provides information on the caries prevalence and untreated caries in the primary dentition of the participants in each of the disabilities. The lowest caries prevalence was found in the learning disability group (7.02%) and the highest was found in the cerebral palsy group (56.44%) (p=0.000). There was a relatively low dental caries level in the learning disability group compared to the other groups (p=0.000).

Untreated caries remained high across all the disabilities regardless of the caries prevalence rate (see Figure 4.4). The dmft scores for the primary dentition per disability (see Figure 4.5) mirrored the results shown in Figure 4.3. Again, the highest dmft score was found in the cerebral palsy group at 2.32, followed by the hearing impaired group with a dmft score of 1.99. The lowest dmft score was found in the learning disability group.

Further analysis of the data using logistical regression indicated that the cerebral palsy and mental disability groups were more likely to be at risk of having dental caries in primary dentition than the other groups of disabilities were. There was a significant association between dental caries in primary dentition and cerebral palsy (OR 2.9; CI 1.9-4.3 and p=0.00) and mental disability (OR 1.9 CI 1.3-2.8 p=0.002).

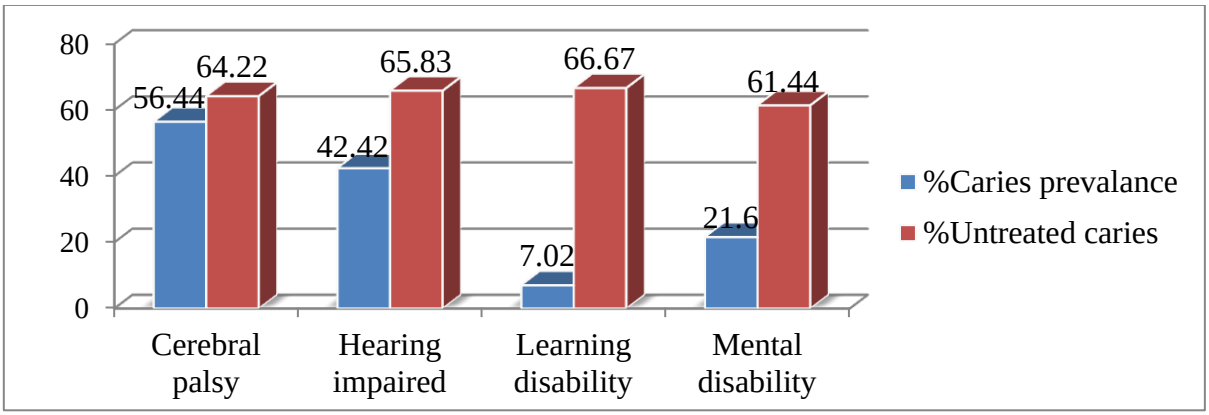

Figure 4.4: Dental caries prevalence and untreated caries in primary dentition by disability

Figure 4.5 shows that the dmft score in the cerebral palsy group was significantly higher (p=0.001) than in the learning disability group. However, there was no significant difference between the dmft in the cerebral palsy and hearing impaired groups (p=0.564).

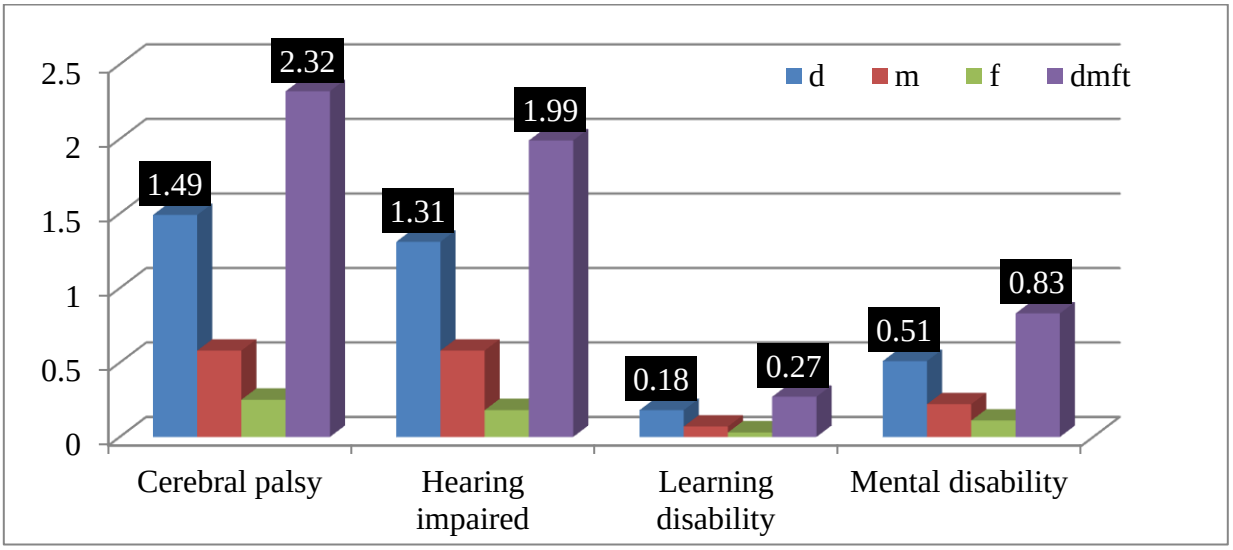

Figure 4.5: d, m, f and dmft components by disability

Table 4.5 provides information about the dmft status by age categories within each disability. The data illustrates that in the primary dentition, the mean dmft score was highest in the seven to nine year age group of the cerebral palsy group (3.53), followed by the hearing impaired three to six year old group (3.40). The lowest dmft was found in the seven to nine year olds in the learning disability group (1.35) and there was a significant difference in the dmft between seven to nine year old cerebral palsy group and seven to nine year old learning disability group (p=0.005). However, there was no significant difference in the dmft between the seven to nine year old cerebral palsy group and the three to six year old hearing impaired group (p>0.05).

Table 4.5: Number, mean, standard deviation (sd), d, m, f and dmft by age and disability

Mean(sd) dmft and by age and disability										
Disability	**Age**	**n=**	**d**		**m**		**f**		**dmft**	
			Mean	(sd)	Mean	(sd)	Mean	(sd)	Mean	(sd)
Cerebral palsy	3-6 years	18	1.83	(2.33)	0.78	(1.83)	0.39	(1.04)	3.00	(3.61)
	7-9 years	58	2.66	(2.62)	0.67	(1.93)	0.20	(0.49)	3.53	(3.05)
Hearing impaired	3-6 years	30	2.33	(3.25)	0.70	(1.37)	0.37	(1.40)	3.40	(3.87)
	7-9 years	33	1.73	(2.63)	1.06	(2.25)	0.18	(0.58)	2.97	(3.17)
Learning disability	3-6 years	0	*	*	*	*	*	*	*	*
	7-9 years	34	0.88	(1.75)	0.35	(0.77)	0.15	(0.61)	1.38	(2.29)
Mental disability	3-6 years	16	1.75	(3.17)	1.06	(3.23)	0.00	(0.00)	2.81	(4.51)
	7-9 years	64	1.59	(1.95)	0.89	(2.62)	0.42	(1.63)	2.90	(3.43)

* No participants available in the age group.

4.3 Dental Caries Status in Permanent Dentition

In the permanent dentition, the dental caries prevalence for the whole sample was 33.56% (see Figure 4.3). In the whole group females had a higher dental caries prevalence (34.95%) than males, with a prevalence of 32.46%, except in the learning disability group where males had a

dental caries prevalence of 42.30% compared to the female prevalence of 36.58% (see Table 4.6).

Table 4.6: Percentage caries prevalence in permanent dentition by gender and disability

Disability	**Male**	**Female**
Special needs group	32.46%	34.95%
Cerebral Palsy	23.58%	29.82%
Hearing impaired	15.51%	21.95%
Learning disability	42.30%	36.58%
Mental disability	34.76%	39.41%

Figure 4.6 provides information on the caries prevalence and the untreated caries in the permanent dentition of the participants in each of the disability groups. The results show that the lowest dental caries prevalence was found in the hearing impaired group (18.18%) and the highest was found in the learning disability group (41.52%) ($p=0.000$). The data also indicates that the cerebral palsy and hearing impaired groups had relatively low dental caries levels when compared to the other groups. However, there were generally high levels of untreated dental caries regardless of the type of disability.

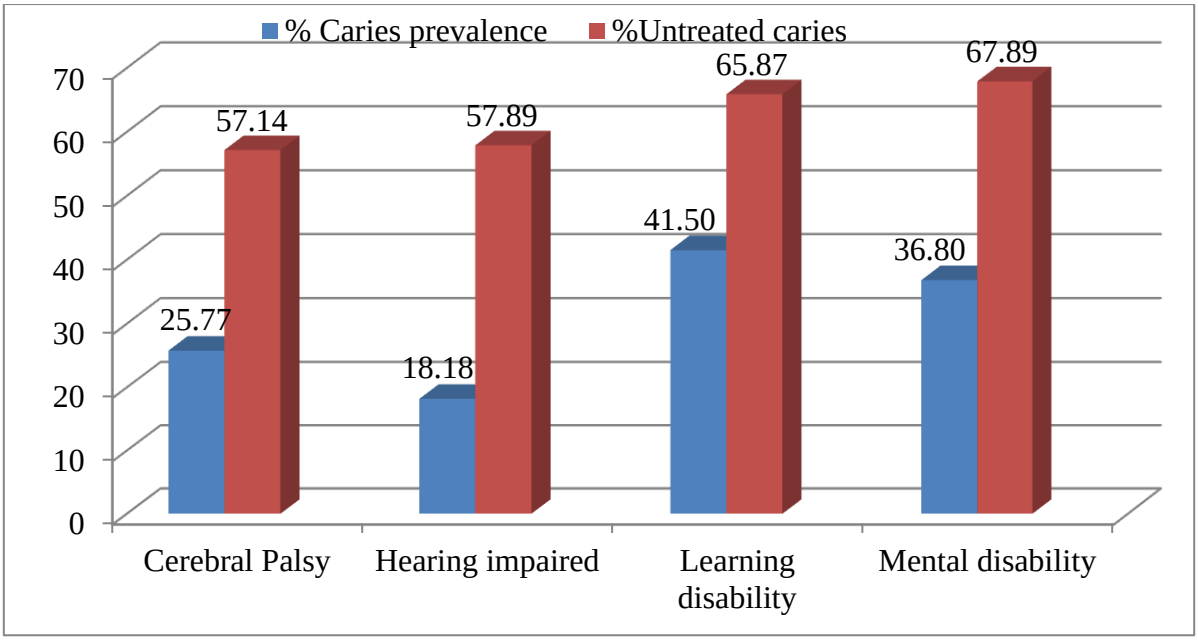

Figure 4.6: Dental caries prevalence and untreated caries in permanent dentition by disability

The DMFT scores in the permanent dentition per disability shown in Figure 4.7 mirror the results shown in Figure 4.6, where similarly the learning disability group shows a high DMFT score.

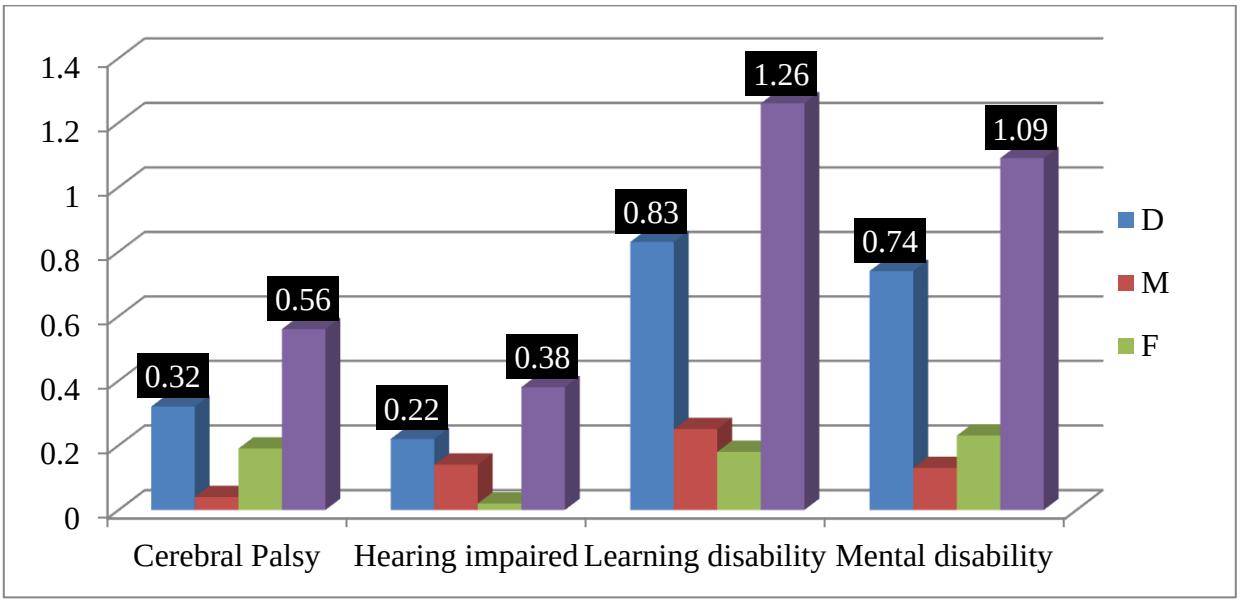

Figure 4.7: D, M, F and DMFT by disability

A logistical regression analysis was performed in order to assess if disability is a risk factor for dental caries in permanent dentition. The analysis showed that the learning disability group had increased odds of having dental caries in permanent dentition (OR 1.76; CI 1.2-2.5 and p=0.002). There was no similar significant association found for the other disabilities.

Table 4.7 provides information regarding the DMFT status by age category within each disability. The data shows that the mean DMFT was highest (1.86) in the 16 and above age group in the mental disability group, followed by the 13- to 15-year-old hearing impaired group (1.76). The lowest (0.23) was among the 10- to 12-year-old hearing impaired group. When the DMFT score for the different age categories per disability was compared with the score for the permanent dentition, a significant difference was found among the DMFT scores of the 10 to 12 year olds in all the disabilities (p=0.0009), and no significant difference was noted among the 13 to 15 year old groups in all the disabilities (p=0.58). T-test was used to compare the mean DMFT of the 10 to 12 year old cerebral palsy group with the 10 to 12 year olds in other disability groups and a significant difference was noted between the cerebral palsy and the learning disability groups (p=0.001).

Table 4.7: Number, mean (sd), D, M, F and DMFT by age and disability

Mean (sd) DMFT by age and disability										
Disability	**Age group**	**n=**	**D**		**M**		**F**		**DMFT**	
			Mean	(sd)	Mean	(sd)	Mean	(sd)	Mean	(sd)
Cerebral palsy	10-12 years	69	0.35	(0.94)	0.04	(0.27)	0.07	(0.31)	0.46	(1.11)
	13-15 years	17	0.41	(1.46)	0.00	(0.00)	1.12	(1.80)	1.53	(2.43)
Hearing impaired	10-12 years	13	0.15	(0.55)	0.08	(0.28)	0.00	(0.00)	0.23	(0.60)
	13-15 years	8	1.13	(1.81)	0.63	(1.77)	0.00	(0.00)	1.76	(3.24)
	16 & over	15	0.20	(0.77)	0.27	(0.59)	0.00	(0.00)	0.47	(0.92)
Learning disability	10-12 years	96	0.82	(1.27)	0.30	(0.84)	0.22	(0.86)	1.34	(2.06)
	13-15 years	41	0.59	(1.16)	0.15	(0.57)	0.12	(0.40)	0.86	(1.74)
Mental disability	10-12 years	111	0.49	(1.06)	0.12	(0.57)	0.07	(0.42)	0.68	(1.40)
	13-15 years	134	0.87	(1.55)	0.18	(0.71)	0.18	(0.69)	1.23	(1.86)
	16 & over	124	1.17	(1.92)	0.15	(0.58)	0.54	(1.90)	1.86	(2.86)

Table 4.8 provides information on the percentage of UTN in primary and permanent dentition of the whole population sample and for individual disabilities. The cerebral palsy group had a high percentage of UTN (90.77%) in the primary dentition, followed by the hearing impaired group (88.16%), and in the permanent dentition the hearing impaired group had the highest percentage of UTN (100%), followed by the learning disability group, which had a similar UTN (79%) when compared to the whole sample for the permanent dentition.

Table 4.8: Percentage unmet treatment needs by dentition and disability

Dentition	**Primary**	**Permanent**
Special needs group	81.20%	79.17%
Cerebral palsy	90.77%	55.55%
Hearing impaired	88.16%	100%
Learning disability	85.58%	79.79%
Mental disability	82.74%	75.44%

4.4 Comparison of dmft/DMFT with NCOHS

The NCOHS results form an important reference document that is used for planning of oral health services for children in South Africa. The data obtained for this study was re-arranged in the categories used for the NCOHS data, which are similar to WHO reporting formats (WHO, 1997).

None of the studies discussed in the literature review presented in Chapter 2 of this report used the WHO age groups for analysis. For ease of comparison with the non-disabled population and for standardisation, additional data analysis was conducted using the WHO age groups.

Table 4.9 displays the dmft/DMFT results of the overall sample (n=203) and the NCOHS results as published by van Wyk *et al*., (2004) in the WHO age formats. There was no significant difference found when the dmft/DMFT for CSHCN and NCOHS were compared for the different age categories. However, when individual disabilities were compared with the NCOHS results for certain age groups (this followed WHO age categorisations), children in the hearing impaired groups for the ages four to five and six (both primary dentition) were found to have significantly higher dmft scores (3.58 vs. 2.4; 3.85 vs. 2.9; $p<0.05$). This was also significant for the permanent dentition in the cerebral palsy group for the 15 year olds, where the DMFT score was 2.43 for cerebral palsy against 1.9 (NCOHS) ($p<0.05$).

Table 4.9: Mean dmft/DMFT in comparison with National Children's Oral Health Survey

Dmft/DMFT					
Age	4-5*	6*	6	12	15
NCOHS	2.4	2.9	0.2	1.1	1.9
Special needs group	**3.07**	**3.63**	0.2	0.54	1.31

* Primary dentition

4.5 Significant Caries Index

Table 4.10 provides information on the dmft/DMFT and SiC in primary (three to nine year olds) and permanent (10 years and above) dentition of the different disability groups. The SiC score for the 12 year olds (using DMFT only) for the children with special needs was 3.25. This is significantly higher than the overall DMFT score of 0.54 and indicates that a minority group within this sample carries the burden of disease in this age group. In simple terms, the distribution of dental caries among the 12-year-old CSHCN was found to be skewed. Table

4.8 provides evidence that this uneven burden and distribution of disease (caries) was present in the primary and permanent dentition for all of the disabilities.

Table 4.10: dmft, DMFT and SiC per disability

Disability	**dmft**	**SiC**	**DMFT**	**SiC**
Cerebral palsy	3.40	7.24	0.68	2.03
Hearing impaired	3.03	7.19	0.67	2.00
Learning disability	1.35	4.09	1.20	3.3
Mental disability	2.83	6.70	1.27	3.57

CHAPTER 5: DISCUSSION AND CONCLUSION

This cross-sectional study on the dental caries status of special needs children is the first of its kind in South Africa and will serve as an important reference for planning of oral health services for this group.

5.1 Demographic Profile

The study cohort had a mean age of 10.5 and the majority were males (65%). Newacheck *et al*., (1998) in the USA report that boys are one-third more likely to have a special need than girls. Other studies on special needs children have also shown significant differences in gender proportions. The study of Oredugba and Akindayomi, (2008) in Nigeria had 72% males, Huang et al. (2010) in Taiwan had 59.7% males and Liu *et al*., (2010) in Taiwan had 60.93% males in their study samples. However, it must be noted that according to the Statistics South Africa Census (2001) in South Africa, there was no significant difference in the prevalence of disabilities between males and females. The gender bias in the cohort of the current was not consistent with the census findings of 2001.

5.2 Dental Caries Prevalence

In general, there was no difference in the dental caries prevalence between males and females in the primary dentition in all the groups except in the hearing impaired group where the difference was significant (see Table 4.4). In this group, the females had a dental caries prevalence of 63% compared to a dental caries prevalence of 46% in the males ($p<0.05$). This is consistent with the results of the study conducted by Lukacs and Largaespada (2006), who

found a higher dental caries prevalence in females than in males. In the permanent dentition of the whole study sample, the females had a slightly higher dental caries prevalence of 34.95% than their male counterparts (32.46%) but this was not statistically significant.

In this study cohort, dental caries prevalence for primary dentition and permanent dentition was found to be 27.55% and 33.56% respectively. Several studies in other developing countries have reported higher levels of dental caries experiences in children with special needs when compared to the findings of the current study. Purohit *et al*., (2010) in a study conducted in India reported a prevalence of 95.9% and 89.1% in primary and permanent dentition respectively. The significantly lower dental caries prevalence in the current sample could be attributed to improved awareness of oral health by the caregivers in the schools, as some of the schools had already been visited by the COHOP team from the University of the Witwatersrand, Johannesburg in the previous years (personal communication with staff members). The authors of the Indian study reported that their cohort consumed high cariogenic foods in between meals and the majority of subjects had never been to a dentist before due to the lower socioeconomic status of the parents/caregivers, which resulted in underutilisation of oral health facilities (Purohit *et al*., 2010).

In contrast, many of the special needs facilities visited during this study appeared to have well-structured healthy diet plans. Shyama *et al*., (2001) in Kuwait reported a dental caries prevalence of 88.8% and 75.8% in primary and permanent dentition respectively. The authors reported that the participants in the study were not institutionalised, but were living at home where diet was presumably unregulated and may have been cariogenic. It must also be noted that these high prevalence rates are also found in the general population, where rates of 91% and 79% were found in the primary and permanent dentition respectively. This suggests that

children with special needs were not at higher risk of dental caries than the children of similar age groups in the general population. Additionally, the data from Kuwait indicates that a prevention strategy that targets both groups appears insufficient or absent.

Among studies (see Altun *et al*., 2010; Oredugba and Akindayomi, 2008; Simon *et al*., 2008) that report the combined caries prevalence for both primary and permanent dentition, the reported results were variable. Oredugba and Akindayomi, (2008) in Nigeria reported a combined prevalence of 33% in the study sample of CSHCN aged two to twenty six who attended a private day care institution. Altun *et al*., (2010) in Turkey reported a prevalence of 84.6% in their study involving CSHCN with different disabilities. Simon *et al*., (2008) in Tanzania reported combined lower caries prevalence (12%) in a sample of 321 children with different disabilities. It was disappointing to note that in all the quoted studies, the authors did not discuss the possible reasons for their findings. For example, in the Tanzanian study, where the combined prevalence was 12%, the low finding could be attributed to the high fluoride content in the natural drinking water that is endemic to that region (Fawell *et al*., 2006).

When this study results were compared with studies from developed countries, the results were found to be similar to results reported by Pezzementi and Fisher , (2005) and significantly lower than those reported by De Jongh *et al*., (2008). In the Pezzementi *et al*., (2005) study, some of the states in the USA contributed more to the overall prevalence than other states. This uneven distribution was also found in the current study and is discussed in Section 5.4.

Dental caries prevalence among the different disabilities in this study revealed that the cerebral palsy and hearing impaired groups had higher (56.44% and 42.42% respectively)

dental caries prevalence in the primary dentition compared to the learning disability and mental disability groups (7.02% and 21.60% respectively). The possible reason for the high prevalence in the cerebral palsy and hearing impaired groups includes the fact that cerebral palsy children have problems with dexterity, psychomotor function and coordination which affect their oral hygiene care practices. The higher caries prevalence figures reported for the hearing impaired group in this study sample could be attributed to factors such as little or no access to oral health education; no caregiver assistance for tooth brushing; poor diets; poor oral hygiene; and poor attitude to oral care. However, in the learning disability and mental disability groups, where dental caries rates were found to be lower, there was evidence of previous exposure to oral health programmes.

High prevalence levels have been reported in several studies from the developing countries. Shyama *et al*., (2001) in Kuwait reported a caries prevalence of 87% in the cerebral palsy group and 88.3% in the hearing impaired group. Huang *et al*., (2010) in Taiwan reported a caries prevalence of 85% in their study on the oral health status of institutionalised CSHCN with cerebral palsy and 89.4% was found in the normal population (Begramian *et al*., 2009).

In this study, the highest dental caries prevalence in the permanent dentition was 41.5% in the learning disability group, followed by 36.8% in the mental disability group. Bardow *et al*. (2001) reported that people with severe mental disability are susceptible to oral disease due to a lack of motivation, poor oral hygiene, dental phobia, difficulty in accessing health care facilities and side effects of psychiatric medications such as dry mouth (xerostomia). Observation of patients in this study supports the findings reported by Bardow *et al*., (2001).

Shyama *et al*. (2001) in Kuwait reported a 68% prevalence rate in the cerebral palsy group and 84% in the hearing impaired group in the primary dentition compared to the 91% found in the general population in primary dentition in six-year-old children (Vigild *et al*., 1996). Liu (2001) in Taiwan reported a dental caries prevalence of 63.25% in six- to 12-year-old children with mild to moderate disabilities, which included learning disability, compared to the 50% that was found among those with severe and profound disabilities, who needed assistance from their caregivers in their brushing routine. These findings are lower than those reported for similar age cohorts in the general population, where the caries prevalence was reported to be 89.4% (Begramian *et al*., 2009).

Choi and Yang (2003) in the Republic of South Korea reported a dmft score of 3.5 in six-year-old children with cerebral palsy in comparison with the 6.75 score in normal six-year-old children. Simon *et al*., (2008) in Tanzania reported a dmfs score of 3.24 in the seven- to nine-year-old hearing impaired group, which had the highest dmfs when compared to children with mental disability, who had a dmfs score of 1.5 in the same age group. The seven- to nine-year-old hearing impaired group in the current study cohort had a score of 2.70, which is lower than in the Tanzanian study, and the difference could be attributed to the exposure to oral health programmes targeted at the hearing impaired group.

In this cohort, the dental caries prevalence in the cerebral palsy group aged six, 12 and 15 was (61.11%, 11% and 14.48%) respectively compared to the findings of Huang et al. (2010) in Taiwan, who reported a dental caries prevalence of 84, 6%, 66, 6% and 76.66% in six, seven- to 12 and 13- to 18 year olds respectively. The 11% and 14.48% dental caries prevalence in the current cohort should be interpreted with caution owing to the small number of participants in the particular age groups(n=18 and n=7) in the 12- and 15-year-old age groups

respectively. The high prevalence rates are similar to the general population figures reported by Begramian *et al*. (2009), who conducted a review of epidemiological data from many countries. The authors reported that there was an alarming global increase in the dental caries prevalence in both adults and children in primary as well as permanent dentition. This is contrary to previous, outdated data that suggested a decline in dental caries globally. This suggests that the decay rates are on an upward trend both in healthy and special needs children.

It is clear from the analysis of the current data and the comparisons made with other published studies from developing and developed countries that dental caries prevalence rates among CSHCN vary by disability, age group and dentition (primary and permanent). However, further analysis of the data yielded some interesting generalisations. Table 5.1 provides information on the UTN of the current sample and compares this information against available data from published studies. Where the UTN were not reported, the author used the data presented in the published studies in Chapter 2 to calculate the UTN and this is displayed in Table 5.1.

There was a high level of caries prevalence and UTN in the cerebral palsy group, followed by the hearing impaired group in the primary dentition, and in the permanent dentition the hearing impaired group had the highest UTN. Newacheck *et al*., (1998) reported that CSHCN are more likely to have UTN for dental care than those without special need. Lewis *et al*., (2005) found that children with greater limitations related to their disabilities had significantly greater odds of unmet dental care needs; hence, children with cerebral palsy were generally found to have problems accessing dental care (Al Agili *et al*., 2004).

Table 5.1: Unmet treatment needs by country, dentition and study population

Author	Country	Study Population	Caries Prevalence CSHCN	Primary 1^0Dentition UTN	Permanent 2^0Dentition UTN
Current study	*South Africa*	*CSHCN*	*1^0 -27.55%* *2^{0-} 33.56%*	*81%*	*79%*
Nahar *et al*., 2010	Bangladesh	CSHCN vs. Normal	*	100%	*
Purohit *et al*., 2010	South India	CSHCN vs. Normal	1^0 95.9% 2^0 89.1%	99%	95%
Du *et al*., 2010	China	Cerebral palsy vs. non Cerebral palsy	42.5%	88 %	*
Shayma *et al*., 2001	Kuwait	hearing impaired and Cerebral palsy	Hearing impaired 75.8% cerebral palsy 88.8%	94% Cerebral palsy 87%	Hearing impaired91% Cerebral palsy 86%
Haung *et al*., 2010	Taiwan	Cerebral palsy	1^0 85% 2^0 75%	6 yrs. 69%	12yrs 67% 15 yrs. 54%
De Carmargo *et al*., 2007	Brazil	Cerebral palsy	*	88%	89%
De Jongh *et al*., 2008	Netherlands	Mental disability	70%	73%	68%

* No details published, 1^0 - primary dentition, 2^0 permanent dentition.

Kane *et al*., (2008) reported that UTN for routine medical care was a strong predictor of a UTN for dental care. Hence, the relationship between UTN for dental care and UTN for routine medical care is important and interdisciplinary collaborations together with referral

systems among medical and dental care should be encouraged. The higher UTN found among the different disabilities in this study is possibly due to the difficulty in accessing oral health services. Mickenautsch and Frencken (2007) found that restorative dental care in the public oral health services of Gauteng in South Africa was limited, with tooth extraction being the predominant treatment provided.

5.3 Comparison with National Children's Oral Health Survey

Prior to undertaking this study, anecdotal evidence suggested that CSHCN had higher dental caries levels than children of the same age groups in the general population.

The NCOHS established that dental caries is severe in primary dentition (van Wyk *et al*., 2004). In comparison with the NCOHS (dmft scores), the dmft in the CSHCN cohort for the four- to five and six year olds was significantly higher than the NCOHS as well as in the 15 year olds, where the cerebral palsy group had a higher DMFT than the same NCOHS age group. Thus the assertion that children with special needs are more prone to having higher dmft scores when compared to children of similar age group from the general population appears to have some merit in the South African context. However the prevalence of dental caries in children with special needs is lower than that of the children of similar age group from the general population.

5.4 Significant Caries Index

The Significant Caries Index (SiC) as introduced by Bratthall (2000) provides information on the distribution of caries within a sample population. DMFT/dmft scores are arranged from the highest to the lowest and the top one-third is separated and analysed independently. A

significant difference in the scores between the general and the SiC index implies that the disease burden is unevenly distributed within the population. This suggests that there is a minority group within the population or sample that is carrying the highest burden of the disease (dental caries).

The results of this study have shown (see Table 4.10) the uneven distribution of dental caries burden in the 12 year olds (DMFT = 0.54 and SiC=3.25) and in all the disabilities. This provides evidence that the major portion of the caries burden is carried by a few individuals within each of the disabilities. This has implications in terms of strategies for the treatment and prevention of the disease burden.

These findings suggest that in resource poor settings, a targeted/focused approach should be used to manage the burden of the disease, i.e. dental caries (Messer, 2000). The logic is that scarce resources are directed to those individuals/groups that are most in need of treatment. Several published studies have used this approach for delivering oral health programmes (Hausen *et al*., 2000; Sköld *et al*., 2005). For example Sköld and colleagues conducted a randomised clinical trial study in Sweden involving 13- to 16-year-old children from high, medium and low risk areas. The study aimed at assessing the effect of school-based fluoride varnish programmes on proximal caries. The authors reported that fluoride varnish treatment applied every six months, performed at school, had successfully prevented dental caries on proximal surfaces in 13- to 16 year olds in medium and especially in high caries risk areas (Sköld *et al*., 2005).

However, it must be noted that those with little or no disease burden should not be excluded from the prevention programmes as Batchelor and Sheiham (2006) have shown in their study,

which was conducted in the USA. The aim of the study was to assess the contribution that children identified as “high risk” made towards the total of new caries lesions over a four-year period by analyzing the distribution of new caries lesions. The sample comprised four groups of seven-year-old children who received differing preventive regimes. The authors reported that 94% of the new cases in dental caries were from those that were deemed to be low risk, hence the necessity for the adoption of a population approach. For example, when targeting six year olds for fissure sealants, all children should be targeted in a community or school rather than only those that are regarded as high risk.

5.5 Conclusion

Within the limitations of the study (small sample size which is only representative of CSHCN in Johannesburg and not the country data), the following conclusions can be made:

- As whole group, children with special health care needs in the current study were found to have lower dental caries levels than children in the general population.
- When the individual disabilities were analysed, cerebral palsy and HI children had significantly higher dental caries levels in the primary dentition, and in the permanent dentition the learning disability and mental disability groups were found to have higher levels of caries prevalence.
- The CSHCN have high UTN regardless of the type of disability.
- The cerebral palsy and mental disability groups were more likely to have dental caries in the primary dentition and the learning disability group more likely to have dental caries in the permanent dentition.

5.6 Recommendations

- Many of the institutions surveyed in this study provided caregiver support in terms of oral hygiene and this appears to have had an impact in terms of dental caries prevalence rates. It is thus recommended that the caregiver's education for oral health be expanded to all special needs schools.

- Oral health education and promotion especially designed for the individual disabilities and proven preventive methods such as fissure sealants among six to seven year olds are recommend for implementation in this group of children. There is significant evidence indicating that sealants can be used effectively to prevent the initiation and progression of dental caries. Evidence-based clinical trials have shown that sealants are effective in caries prevention and prevent the progression of early non-cavitated carious lesions. Permanent first molars with sealants receive less subsequent restorative treatment than those without sealants (Beauchamp et al., 2008). The greater use of sealants could reduce the need for subsequent treatment and prolong the time until treatment may be necessary for permanent first molars (Bhuridej *et al*., 2005).

- In terms of future research, more studies focused on CSHCN should be conducted and be reported according to the WHO criteria in order to facilitate standardisation and comparison with other studies. Future studies should be undertaken in South Africa in order to take into account the knowledge, attitude and practices of caregivers of the children in special needs schools.

- Public Private Partnerships need to be strengthened to ensure that services are available for members of the population who do not have access to oral health services.

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APPENDICES

APPENDIX I: List of Schools

Name of School	Type of Disability	Area
Bellavista School	Learning Disability	Johannesburg East
Crossroads School	Learning Disability	Johannesburg North
Deltapark Skool	Learning Disability	Johannesburg North
Futura Skool	Learning Disability	Johannesburg South
Goudveld Vaardigheids Skool	Learning Disability	Johannesburg North
Lantern Skool	Learning Disability	Johannesburg West
National School Of The Arts	School of Focus Learning	Johannesburg South
Pace Secondary School	School of Focus Learning	Johannesburg South
St Barnabas College	School Of Focus Learning	Johannesburg North
Hope School/Skool	Physically Disabled	Johannesburg East
Rietfontein Primary Hospital School.	Ordinary	Johannesburg East
Sparrow Combined	Ordinary	Johannesburg South
H. Moross Adolescent School	Special	Johannesburg East

Unity College	Special	Johannesburg North
Baragwanath Hospital School	Hospital	Johannesburg South
Johannesburg Hospital School	Hospital	Johannesburg East
Albertina Sisulu Special School	Industrial: Child Welfare	Johannesburg West
Walter Sisulu Child And Youth Care Centre	Industrial: Child Welfare	Johannesburg North
M.C. Kharbai School For The Deaf	Deaf	Johannesburg South
Sizwile School For The Deaf	Deaf	Johannesburg West
St Vincent School	Deaf	Johannesburg East
Forest Town School	Cerebral Palsied	Johannesburg East
Frances Vorwergskool	Cerebral Palsied	Johannesburg South
Philip Kushlick	Cerebral Palsied	Johannesburg South
Adelaide Tambo School	Severe Mental Disability	Johannesburg South
Casa Do Sol School	Severe Mental Disability	Johannesburg North
Coronation Training Centre	Severe Mental Disability	Johannesburg North
Don Matterra	Severe Mental Disability	Johannesburg South
Doug Whitehead School/Skool	Severe Mental Disability	Johannesburg East

Jiswa Training Centre	Severe Mental Disability	Johannesburg South
New Nation School	Severe Mental Disability	Johannesburg North
Nokuthula School	Severe Mental Disability	Johannesburg East
Pumelela Training Centre	Severe Mental Disability	Johannesburg South
Pumla School For The Severly Mentally Handicapped	Severe Mental Disability	Johannesburg West
Takalani	Severe Mental Disability	Johannesburg North
The Gateway School	Severe Mental Disability	Johannesburg West
The Hamlet School	Severe Mental Disability	Johannesburg South
Gresswold Senior School	Mild Mental Disability	Johannesburg East
Mezodo Vocational Skills Centre	Mild Mental Disability	Johannesburg West
Randburgskool (Kliniekskool: Gestremde Leerlinge)	Mild Mental Disability	Johannesburg North
Randeorskool	Mild Mental Disability	Johannesburg South
Roodeparkskool	Mild Mental Disability	Johannesburg West

APPENDIX II: Assessment Form

GENERAL INFORMATION

Name: ……

Date of birth: ……. ……. ……(Y/M/D)

Sex: M/F ……

Date of examination: ……(Y/M/D)

School/Pre-school Name: ……

Type of disability……..

Grade: ……...

Population group: …….

Parental consent: YES/NO……

CLINICAL ASSESSMENT

Extra-oral assessment	YES	NO
Normal appearance		
Ulceration, sores, erosions (head and neck)		
Cancrum oris		
Abnormalities of upper and lower lips		
Swellings of the face		
Other (specify)		

Intra-oral assessment	YES	NO
No abnormal condition		
Ulceration (Apthous, Herpetic, Traumatic)		
Candidiasis		
Abscess		
Other (specify)		

DENTITION STATUS AND TREATMENT NEEDED

Primary teeth

	55	54	53	52	51	61	62	63	64	65
Status										
Treatment										
	85	**84**	**83**	**82**	**81**	**71**	**72**	**73**	**74**	**75**
Status										
Treatment										

Permanent teeth

	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
Status																
Treatment																
	48	**47**	**46**	**45**	**44**	**43**	**42**	**41**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**
Status																
Treatment																

STATUS:

0 = Sound

1 = Decayed

2 = Filled and Decayed

3 = Filled, no decay

4 = Missing due to caries

5 = Missing for other reasons

6 = Sealant/varnish

7 = Bridge abutment/special crown

8 = Un-erupted tooth

9 = Excluded tooth

TREATMENT:

0 = None

1 = Caries arresting or sealant care

2 = One surface filling

3 = Two or more surface filling

4 = Crown and bridge abutment

5 = Bridge element

6 = Pulp care

7 = Extraction

8 = Need for other care ……

Summary of dental status:

D/d – decayed, M/m – missing - F/f-filled

D/d	
M/m	
F/f	
DMFT/dmft	

APPENDIX III: Parent Information Sheet

INFORMATION DOCUMENT

Study title: Caries prevalence of children attending special needs schools in Johannesburg, Gauteng Province; South Africa.

Good day:

Introduction:

We, from Department of Community Dentistry at University of Witwatersrand, are doing research on **Caries prevalence of children attending special needs schools in Johannesburg** Research is a way of trying to learn information and answers to important questions. This is a study involving research and no routine dental care will be provided during the research period. In this study we want to learn how many of the special needs children are affected by tooth decay and to what extent are they affected**.**

The purpose of the study is to determine the dental caries and treatment needs of children with special needs in order to make sure that the service that our outreach programme renders, meets the requirements of the special needs children.

We are asking for your permission to include your child in a research study.

What is involved in the study?

Your child will be examined where information about the health of their teeth will be recorded.

The study follows is a cross sectional analytical study design, about 500 children will take part in the study. The children will have their mouths examined by a hand held mouth mirror, the procedures will be done in the school premises, and the examination will take about 10 minutes.

Risks of being involved in the study,

There are no foreseeable risks associated with the study. The examination is pain-free. The examination is performed under strict universal infection control measures.

Benefits of being in the study,

Your child will benefit from the examination and diagnosis of dental problems during the study and will be referred for treatment where it is need.

Participation is voluntary,

Your refusal for your child to participate in the study will involve no penalty or loss of benefits to which the child is otherwise entitled, and that you may withdraw your child from the study at any time.

Reimbursements

There will be no compensation for participating in the study.

Confidentiality,

Efforts will be made to keep personal information confidential, Please be assured that the information recorded is kept confidential in a secure locked office. Absolute confidentiality cannot be guaranteed. Personal information may be disclosed if required by law.

Organizations that may inspect and/or copy our research records for quality assurance and data analysis include groups such as the Research Ethics Committee. If results are published, then this may lead to individual identification.

Contact details of researcher:
If you have any queries or would like more information about the study please contact

Dr Nqcobo at Department of Community Dentistry, University of Witwatersrand on

(011)717-2630, cathrine.nqcobo@wits.ac.za

For reporting of complaints / problems, you are welcome to contact the Chairperson of the Wits Research Ethics Committee, Prof P Cleaton -Jones through his secretary Ms Anisa Keshav on (011) 717-1234.

Your cooperation in this regard will be appreciated

Dr C Nqcobo

APPENDIX IV: Consent Form

Parental Consent Form:

I understand that I am free to refuse my child participation or withdraw my consent and discontinue my child participation in this project at any time.

I have been informed as to the procedures to be followed in this project.

Further I understand that should I have any questions regarding this project I can contact

Dr Nqcobo on (011)717-2630, cathrine.nqcobo@wits.ac.za

In signing this consent form, I allow my child to have his or her mouth examined.

Name of Pupil:.....

Name of pre-school /school:.....

Guardia/Parent Signature:.....

Date:.....

APPENDIX V: Assent Form

Assent Form for Children

Hi, my name is_____ (name of operator)

I am a dentists/dental therapist (choose appropriate title) from the University of Witwatersrand Department of Community Dentistry and I am here to examine your teeth.

I need to examine if there is anything wrong with your teeth, if there is any problem that I see then I will give you a letter to give to your parents to request for their permission to treat you. I'm just going to place a mirror in your mouth to examine; there will be no injections, no discomfort, and no pain.

The purpose of the study is to find out what the level of dental decay is for children with special needs as well as their treatment needs so that we can plan our services to help prevent and treat this condition. I want to ask your permission to examine your mouth. You are free to say "yes" or "no" and if you are not sure, you can ask me any questions.

Your parent(s) are aware of what I am doing and have also given me permission to look into your mouth, but I will not do this if you do not want me to.

Would you like me to start?

Yes No

(Circle the response given by the child)

Child’s name: _____

School: _____

Grade: _____

Age: _____

Date: _____

Name of Operator who administered assent: _____

APPENDIX VI: Ethics Approval Letter

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

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Dr C Nqcobo

CLEARANCE CERTIFICATE	M110834
PROJECT	Caries Prevalence of Children Attending Special Needs School in Johannesburg, Gauteng Province:
INVESTIGATORS	Dr C Nqcobo.
DEPARTMENT	Department of Community Dentistry
DATE CONSIDERED	26/08/2011
DECISION OF THE COMMITTEE*	Approved unconditionally

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

DATE 10/10/2011 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Dr Y Yengopal

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...

APPENDIX VII: Permission from Department of Education

education
Department of Education
GAUTENG PROVINCE

For administrative use:
Reference no. D2012/147

GDE RESEARCH APPROVAL LETTER

Date:	16 August 2011
Name of Researcher:	Dr C.B. Nqcobo
Address of Researcher:	31 Engelwood Crescent
	Klipoortjie Avenue
	Germiston
	1401
Telephone Number:	011 717 2630 / 076 134 8093
Fax Number:	011 717 2526
Email address:	cathrine.nqcobo@wits.ac.za
Research Topic:	Caries prevalence of children attending special needs schools in Johannesburg, Gauteng province, South Africa
Number and type of schools:	FIVE LSEN Schools
District/s/HO	Johannesburg East; Johannesburg North; Johannesburg South and Johannesburg West

Re: Approval In Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

1. *The District/Head Office Senior Manager/s concerned must be presented with a copy of this letter that would indicate that the said researcher/s has/have been granted permission from the Gauteng Department of Education to conduct the research study.*
2. *The District/Head Office Senior Manager/s must be approached separately, and in writing, for permission to involve District/Head Office Officials in the project.*

1

Making education a societal priority

Office of the Director: Knowledge Management and Research
9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0505
Email: David.Mkhabela@gauteng.gov.za
Weballe: www.education.gpg.gov.za