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Caries experience of preschool children in Johannesburg

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CARIES EXPERIENCE OF PRESCHOOL CHILDREN IN SELECTED SITES IN JOHANNESBURG

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752168

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.

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Johannesburg, 2017.

DECLARATION

I, Abdalraof B Kalil declare that this research report is my own work. It is being submitted for an MSc degree in Community 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, and all the sources I have used or quoted have been indicated and acknowledged by complete references.

A. Kalil

21th November 2017.

DEDICATION

To my mother, father, beloved wife, precious son and extended family for their support and encouragement.

ABSTRACT

Introduction

Although the prevalence of dental caries experience among the children in the world has decreased significantly in the last fifty years, dental caries is one of the most predominant chronic childhood diseases worldwide, and it is a public health problem, both for individual children and families who choose to deal with young children suffering from a toothache.

Aims and objectives

The purpose of this study was to determine caries experience and associated factors contributing to the condition among preschool children in Johannesburg. The objectives were to determine the dmft status, the pufa index of the children and to compare the prevalence of caries between age-groups. Furthermore, the association between demographic characteristics and the caries experience was assessed.

Methodology

A cross-sectional study was carried out at six sites in Johannesburg on children aged 2-5 years. Data was collected by means of a parental questionnaire covering demographic information and oral dietary habits. This was followed by an oral examination using two indices: Decayed Missing Filled Teeth (dmft) and Pulp Exposure Ulceration Fistula Abscess (pufa).

Results

Two hundred and twenty-two preschool children aged 2- 5 years participated in this study (n= 222): girls (n= 125) (56%), slightly outnumbering boys (n= 97) (44%)**.** The mean dmft at 2, 3, 4 and 5 years was 0.96, 1.93, 3.44 and 3.38 respectively**.** The prevalence of dental caries

of the children was 47.74% with a mean dmft of 2.41 (SD ± 3.60). The mean age of the children in the study was 3.5 years (SD ± 1.01 years).

The results showed statistically significant difference among the age groups. The 4 and 5-year olds had higher levels of dmft than the 2 and 3 year olds ($P < 0.001$). There were no significant differences ($P = 0.3566$) in the mean dmft between the boys and girls in the study. There were negligible pufa scores, only 2.2% of the children had pufa scores. The largest contribution was the abscesses.

The average dmft value for the children in Berea/Yeoville area was significantly higher (3.8; SD± 4.2) than the one for the children in OR Tambo Diepsloot immunization clinic (1.5; SD± 2.8), ($P < 0.001$). Household size and parental education had no significant influence on the dmft.

Conclusion

The prevalence of dental caries was found to be high among 2 to 5-year-old preschool children in Johannesburg, and the mean dmft was directly proportional to the age.

ACKNOWLEDGMENTS

I would like to express my deepest gratitude to my supervisors, Dr. Molete Mpho and Prof. Veerasamy Yengopal who taught and guided me all the way. Thank you for your excellent guidance, caring, patience, monitoring and constant encouragement throughout the learning process, it was much appreciated.

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- To my family and colleagues who have made this thesis possible and because of whom my postgraduate experience has been one that I will appreciate forever.

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NOMENCLATURE

Preschool children

Primary dentition

Aetiological factors

ECC: Early Childhood Caries.

CDC: Centers for Disease Control and Prevention.

NHANES III: The National Health and Nutrition Examination Survey III.

AAPD: American Academy of Pediatric Dentistry.

pufa index: Pulp exposure, Ulceration, Fistula and Abscess teeth.

dmft index: Decayed, Missing and Filled teeth.

BMI: Body Mass Index.

WHO: World Health Organization.

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CHAPTER 1- INTRODUCTION

Dental caries is considered to be one of the most predominant chronic childhood diseases in the world and a public health problem, both for individual children, families and those involved with young children suffering from a toothache (Sarumathi *et al*, 2013). Once it occurs, its effects persist throughout life, even after the lesion is treated (Sarumathi *et al*, 2013). Pain and sepsis due to untreated tooth and gum disease can contribute to problems in speaking, eating, and reading. Furthermore, when early loss of primary teeth occurs, the surrounding teeth may drift into space and may contribute to crowding when the permanent teeth erupt (Whitmer, 2012).

Although there has been a significant decrease in the prevalence of dental caries experience among children around the world in the last fifty years, early childhood caries (ECC) still remains a serious threat to children specifically in developing countries (Centers for Disease Control and Prevention (CDC), 2005). Published studies show that a considerable percentage of children younger than 6 years of age suffer from the condition (Zafar *et al*, 2009). According to "The National Health and Nutrition Examination Survey III" (NHANES III) conducted in the USA (1988-1994), 8.4% of 2 year olds and 40% of 5-year-old children had at least, one filled or decayed tooth (CDC, 2005).

In developing countries, ECC has reached epidemic proportions (Weinstein *et al* 1994; Vadiakas 2008). A higher prevalence occurs among 3-year olds, which ranged from 30 to 53 % in the East Asia region (Taiwan). In the Middle East (Abu Dhabi), studies have shown that the prevalence of ECC ranged from 71 to 86% among 4 year olds and 82 to 94% among 5 year

olds children, while in Indian studies, the reported prevalence was 44% in 4 year olds (Weinstein *et al*, 2004; Tsai *et al*, 2006; Al-Hosani and Rugg, 1998; Jose and King, 2003).

The expression "early childhood caries" (ECC) is used to refer "to caries lesions affecting any surfaces of primary teeth up to 71 months of age" (Tiano *et al*, 2009). The literature defines it as: "the presence of one or more decayed, missing (due to caries) or filled tooth surfaces in primary teeth in the preschool age child between birth and 71 months of age "(11 months and 5 years) (Whitmer, 2012). However, there is no consensus on this definition, and there remains controversy about the age ranges that could be included in the definition (Wyne, 1999).

In the past, the definitions used to describe caries in the children involving the primary teeth were related to etiology such as "baby bottle-fed tooth decay, rampant caries, maxillary anterior caries, comforter caries, nursing caries," and much more (Çolak *et al*, 2013). Over recent years policy statements from the American Academy of Pediatric Dentistry (AAPD) indicated that caries lesions were not solely due to poor feeding practices. Therefore terms such as (baby bottle tooth decay), (bottle mouth), and (nursing decay) were misleading (AAPD, 2003) and the term *early childhood caries* was found to be more appropriate (Ismail, 2003).

Knowledge regarding the etiology of dental caries has been well established, and four main factors have been recognised: bacteria (mainly streptococci mutanus); carbohydrates; a susceptible tooth surface; and time) (Dawani *et al*, 2012). Predisposing risk factors include: - "socio-demographic factors, behavioural indicators such as poor oral hygiene, insufficient tooth brushing, frequency and timing of consumption of sugar- containing drinks, gender and increasing age" (Declerck *et al*, 2008).

Research has shown that tooth decay is also influenced by "socio-economic conditions such as parents' education, work status and size of the family" (Jahani *et al*, 2013). Children of single, uneducated mothers with a low level of education who live in poor economic conditions present with more ECC (Çolak *et al*, 2013).

Although there is anecdotal evidence of high caries rates among children in the Johannesburg area, studies are required to investigate this.

CHAPTER 2- LITERATURE REVIEW

Early Childhood Caries (ECC) has negative effects on a child's development, school performance, behaviour and quality of life (Casamassimo *et al*, 2009). For example, learning and school performance are related to dental disease in terms of the number of days that the child is absent from school due to pain, dysfunction and routine dental visits. Dental services to families and the public amount to significant costs (Casamassimo *et al*, 2009).

Although there has been a reduction in permanent dentition caries due to fluoridation of water and the use of fluoridated toothpaste, high levels of ECC persist (Casamassimo *et al*, 2009). The multilevel nature of health determining factors is considered important in current work in population health. These health determining factors related to individual, family, and community levels. Furthermore, the multifactorial model of ECC as seen in Figure 1 below illustrates that individual children live in families that are embedded in communities, as well as within the general environment (Fisher-Owens *et al*, 2007).

2.1 The Environment Level Influences

The child is greatly influenced by the family environment in which parental attitudes to oral health can affect the child's behavior positively or negatively (Duijster *et al*, 2014). The interaction between genetic and environmental factors leads to a vertical transmission of cariogenic agents whereby offspring with poor oral health tend to have parents who display poor oral health (Shearer *et al*, 2012; Shearer and Thomson, 2010).

Children from some rural areas in countries like Brazil display higher levels of ECC than those in urban areas. This is probably due to a number of factors, namely: isolation from urban

centers; limited knowledge about oral health care; and inefficient bacterial control practices (Correa-Faria *et al*, 2013). Environmental tobacco smoke and maternal smoking status have been associated with an increased risk of caries among children (Tanaka *et al*, 2015).

Child development is influenced by the social environment(Christensen, 2004) which includes the development of dental caries. One study has demonstrated a stronger relationship between social conditions and dental health for preschool children than for older children (Christensen et al, 2010).

2.2 The Community Level Influences

A considerable number of risk factors have been associated with early childhood caries (ECC). However, poverty is considered the single most important risk factor for ECC (Gibson and Williams, 1999). Studies conducted in the United States and Canada have shown that poverty rates among the indigenous children are higher than those of the general population, with approximately 52% of Canadian First Nations children (Ogunwole and Stella, 2006); 36% of American Indians/Alaska Native children in the United States and up to 60% of children of single parents residing on reservations living in poverty (Bureau, 2017).

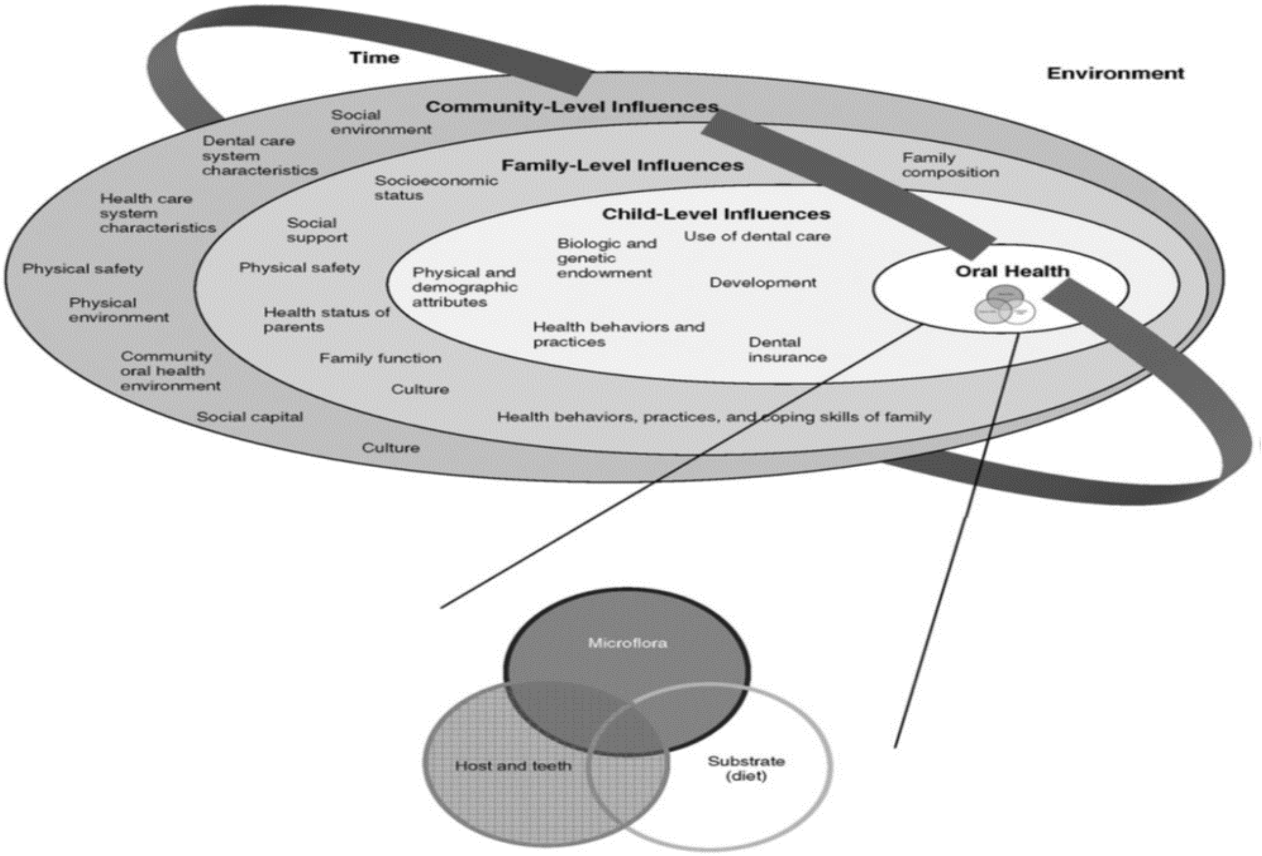

Figure 1: "Influence of Child, Family, and Community on oral health outcomes of children" (Source: Fisher-Owen *et al*, 2007).

A conceptual model by Fisher-Owens *et al*, (2007) highlights five domains which include; "genetic and biological factors, social environment, physical environment, health behavior and dental, medical care." Their multilevel model illustrates how these domains influence outcomes of child oral health (Fisher-Owens *et al*, 2007).

Recent systematic reviews of the international literature (1966 – 2002) identified 260 publications on ECC and analyzed the importance of individual risk factors for caries in primary teeth. The prevalence of caries was found to be related to 106 risk factors. The most significant combination of risk factors included the following; an early infection with

Streptococcus mutans; an unfavorable diet; and frequent sugar intake with inadequate oral hygiene (Harris *et al*, 2004).

2.3 The Family Level Influences

The variation in the prevalence rate of ECC in different populations is partially due to socioeconomic differences resulting in inequalities in the distribution of wealth, availability of technological advances and access to education and healthcare services (Do, 2012). A study conducted in Brazil indicated that the occurrence of ECC was greater among children with substandard oral hygiene and low monthly household income (Correa-Faria *et al*, 2013). In addition, the mothers' educational levels were also found to have an effect on the prevalence of caries among preschool children (Bhardwaj and Bhardwaj, 2014).

In a study conducted in Gurgaon, Haryana, India, on children of less than six years of age; they determined the relationship between the children's dental caries and their mother's education levels, Bhardwaj and Bhardwaj, (2014) Results of the study revealed statistically significant differences between dmft of children whose mothers just had high school education (mean dmft 9.2; SD± 4.3; $P < 0.021$) in comparison to those that were graduate professionals (mean dmft 5.7; SD± 2.5; $P < 0.002$). This demonstrated that mothers impacted on their children's oral health behaviours; in addition, a mothers high educational background was associated with positive dental knowledge & attitude (Bhardwaj and Bhardwaj, 2014).

The infectious disease model of caries incorporates the effect of poverty, household crowding, family size, nutrition, health behaviours, parenting practices and other risk factors (Irvine *et al*, 2011). In addition, it was found that ECC was affected by the number of members of a household. Several previous studies have reported a greater frequency of ECC among children

from families with a larger number of siblings (Wellappuli and Amarasena, 2012) and those born to younger mothers (Niji *et al*, 2010).

In Brazil, a study conducted by Ferraz *et al*, (2014) examined the clinical consequences of untreated dental caries. The study carried out on 540, two to five year olds showed that the prevalence of ECC and pufa (≥1) was approximately 50% and 12% respectively. A total of 25% of the children reported that they had experienced a toothache. A toothache was significantly associated with children 5 years and older (prevalence ratio 3.70). The prevalence of dental caries was 50% (N=271), and the mean number of decayed teeth was 2.73 (SD ±3.9). The prevalence of a toothache was 25 % (N=134). The prevalence of pufa equal to or greater than one was 12 % (N=66). The prevalence rates of pulpal involvement, ulceration of the mucosa due to root fragments, fistula, and abscess were 12%, 1%, 2%, and 3%, respectively. No statically significant associations were found between a toothache and the child's gender or socio-demographic factors (Ferraz *et al*, 2014).

A recent study by Monse *et al*, (2012) compared the effects of treated and untreated dental caries on weight, height and BMI (Body Mass Index) among children whose average age was about 60 months. The group of children that received treatment had a significant increase in their BMI, weight-for-age, and BMI-for-age whereas untreated children remained unchanged.

Other studies conducted by Alkarimi *et al*, (2012) and van Gemert-Schriks *et al*, (2011) recorded insignificant improvements in anthropometric outcomes between the groups after treatment of caries. However, treated children experienced less pain and greater satisfaction with teeth compared to the children that were not treated (Alkarimi *et al*, 2012; van Gemert-Schriks *et al*, 2011).

2.4 The Child Level Influences

The child -level influences are factors directly related to the activities and factors that contribute to the development of dental caries in a child. These factors are either biological and genetic factors play a fundamental role in children's oral health (Berkman and Kawachi, 2000). However some bio sociological factors such as severity of decay and child's age; gender; low socioeconomic status; frequency and type of feeding; falling asleep with nipple in mouth; duration of breast feeding; consumption of cariogenic snacks; age at which the child started tooth brushing; brushing frequency; oral hygiene status of child; DMF scores of mothers and the mother's oral hygiene status showed a strong relationship with the development of dental caries in children (Retnakumari and Cyriac, 2012).

Genetic factors refer to an inherited predisposition to certain individual responses which could influence oral health. Caries is associated with the reduced salivary flow, while certain medications, for example, atropine can cause caries and other oral health problems (Crall *et al*, 1990). Additional factors related to caries development are the higher salivary flow of carcinogenic bacteria (*Streptococcus mutans*) and other factors which cause changes in tooth surface biofilm; and tooth morphology where pits and fissures can create a susceptible dental surface (Fejerskov, 2004). In addition to the factors mentioned above, prior caries experience increases the risk for future caries and is considered the major risk factor for decayed, missing or filled permanent teeth (Grindefjord *et al*, 1996). Caries or lesion location may therefore be a strong future predictor for caries susceptibility and progression (Fisher-Owens *et al*, 2007).

Differing results regarding the effect of the race could be due to socioeconomic and demographic confounding factors. Increased caries risk is also linked to poor nutrition and lower birth weight (Fisher-Owens *et al*, 2007).

Early childhood experiences have an effect on the child's future well-being, coping skills, and competence which in turn affect health outcome (Halfon and Hochstein, 2002). Dental health services (e.g., fissure sealants) facilitate dental oral health and good health in general (Halfon N and Hochstein, 2002). A study was conducted in Stockton, California by Ramos-Gomez *et al*, (1998) to estimate the prevalence of early childhood caries and factors related to low-income population. The study collected data from 220 children aged 0-6 years and found that the prevalence of dental caries ranged from 12 to 30%, respectively. More than 17% of children aged 2 years had one primary maxillary incisor affected, and 13.2% had 2 affected incisors (Ramos-Gomez *et al*, 1998).

A study by Thekiso *et al*, (2012) was conducted in the West Rand District in Gauteng Province, South Africa, to determine the prevalence and clinical consequences of dental caries in school children in Gauteng region. The examination was carried out on 800 preschool and primary school children, 6 to 8-year-olds. The prevalence of dental caries was 47% with a mean pufa index of 2.96 for 4- 5-year-olds and 0.1 and 2.4 for 6- 8-year-olds, respectively (Thekiso *et al*, 2012).

The prevalence of dental caries between 3 and 5 year olds varies amongst studies (Vigild *et al*, 1996; Ueda *et al*, 2004; Dawani *et al*, 2012). A study done in Kuwait showed that the prevalence of dental caries amongst children under 4 was more severe, in comparison to that found among 4 and 6 years of age. The percentage of caries-free children was 19% and 9% respectively for children aged 4 and 6 years of age (Vigild *et al*, 1996). On the contrary, a study conducted in Thailand by Kanchanakamol *et al*, (1996) showed an incremental increase of caries as the childrens' ages increased: 13 to 24 months, 25 to 36 months and 37 to 38

months had a prevalence of caries as follow: 9.40%, 36.50%, 50.40% respectively, and the dmft index was 0.30, 1.40, 1.70 for the age group studied. (Kanchanakamol *et al*, 1996).

A similar trend was shown by the National Children Oral Health Survey in South Africa, which indicated a proportional increase of caries with age as follows: ages of 4 and 6 years was 50.6% and 60.3%, respectively (Wyk and Wyk, 2004). Literature has suggested that the experience and severity of caries increasing with age was attributed to increased exposure to food containing sugar, changes in dietary habits and improper oral hygiene practices (Sarumathi *et al*, 2013; Ghazal, 2013).

In Brazil, a study conducted by Ueda *et al*, (2004) assessed the prevalence of dental caries in 3-5-year olds children in the rural and urban zones of Cambria. The examination was carried out on 143 children, and the results indicated that 68.5% of the children were caries free at age 3 compared to 13.1% at age 5. The dmft index at 3 and 5 years was 2.10 and 3.51, respectively. The dmft index at 5 years was 1.76 times greater than at 3 years. The number of children who had more than three carious lesions at 3 and 5 years of age was 16.4% and 34.4%, respectively. No statistically significant difference was found in the prevalence of dental caries between males and females at 3 to 5 years of age and between the rural and urban area (Ueda *et al*, 2004).

2.5 Conclusion of the Literature Review

The aim of this literature review was to summarize the current knowledge regarding the factors that influence the development of early childhood caries in preschool children. The literature demonstrated multilevel factors involved in the development of ECC. These include; the mothers educational background, socioeconomic background of the family, environmental

factors, risky behaviours such as poor oral hygiene practices and diets. All these factors are consistently linked with early childhood caries development in preschool children.

CHAPTER 3- AIMS and OBJECTIVES

3.1 Aims

To determine the caries experience and associated factors contributing to the condition among preschool children in selected sites in Johannesburg.

3.2 Objectives

- To determine the dmft status of preschool children in selected sites in Johannesburg.
- To determine the pufa index of preschool children in selected sites in Johannesburg.
- To compare the prevalence of caries between ages.

3.3 Rationale of the Study

As highlighted in the literature review, a high prevalence of ECC exists in developing countries. However, there is a lack of information on the consequences and socio-demographic influences of the condition in our setting. Furthermore, very few studies in South Africa have used the PUFA/pufa index among children. This study, therefore, aimed to not only assess the prevalence of the condition but to further explore the severity of the condition and factors that are associated with caries experience amongst the children within the urban South African context. It is hoped that these results will inform policy makers on oral health issues affecting pre-school children and hence equip them to facilitate an intervention at the local level.

CHAPTER 4- METHODOLOGY

4.1 Study Design

A cross-sectional study was carried out at six sites in Johannesburg.

4.2 Study Population

The sites included five crèches within the inner precinct of Johannesburg and an OR Tambo Diepsloot immunization clinic at a Primary Health Care Centre. All these sites are served by the Wits Community Oral Health Outreach Program (COHOP). The study population involved children aged between the ages of 2 to 5 years (preschool age). The crèches were located around the Berea, Yeoville area and the OR Tambo Diepsloot immunization clinic was located in a township called Diepsloot. Parents of the children were from a low-socioeconomic background and were largely unemployed.

4.3 Study Sample and Sampling Procedure

The Epi-info (version7) software program was used to calculate the sample size needed for this study. The total number of preschool children at selected sites were approximately 527 and then a sample size of 222 was required to have 80% power at 95% confidence interval; this was assuming a 50% expected frequency, at a 5% Acceptable Margin of Error and a design effect of 1.0. The sampling procedure was convenient sampling as all children were invited to participate according to the inclusion and exclusion criteria.

4.4 Inclusion Criteria

- Children aged between 2-5 years old.

- Children whose parents had provided written consent.

4.5 Exclusion Criteria

- Children that were not within the age range.
- Children with learning or physical disabilities.

4.6 Measurement Tools

Data collection was obtained by a parental questionnaire (Shanbhog *et al*, 2013) and a clinical oral examination.

4.6.1 Clinical oral examination

An oral examination was done, and data was collected using two dental indices. The dmft index was used to measure the prevalence of dental caries while the pufa index was used to determine the severity of caries (Monse *et al*, 2010) **(Appendix E).**

The dmft index evaluated the number of decayed (d), missing due to caries (m), filled teeth (f) (WHO., 2013). The Pufa index was used to evaluate the consequences resulting from untreated caries by scoring the presence of visible pulp (p), ulceration of the oral mucosa due to fragmentation of a tooth (u), fistula (f) and an abscess (a). The pufa index assesses and quantifies various caries complications; it is easy and safe to use, the evaluation is short and does not require any additional tools (Monse *et al*., 2010). Lesions in the surrounding tissues that were unrelated to a tooth with visible pulp due to caries were not recorded (Monse *et al.*, 2010). The examination was done with a child sitting on a chair in a well-lit room using a light tongue depressor under artificial light according to the WHO, (2013).

4.6.2 Questionnaire

The questionnaire was used to determine demographic information and was adapted from an article by Shanbhog *et al*, (2013). It consisted of 20 closed-ended and multiple-choice questions which included information oral hygiene, dietary habits, oral health behaviours and socio-demographic status **(Appendix A).** The questionnaire was piloted on ten caregivers who were not involved in the main study. This was done to ensure validity and reliability (Shanbhog *et al*, 2013).

At the creche's, the questionnaire was distributed to the parents by the class teacher and returned once completed. In Diepsloot, the parents were present during the oral examination, and they completed the questionnaire immediately.

4.7 Data Collection

Two dentists were calibrated by the Wits Department of Community Dentistry and inter and intra-examiner reliability was established to standardize data collection (Shanbhog *et al*, 2013). Kappa statistics was used to assessed intra and inter-examiner reliability. Scores in the range of 0.7 and 0.8 were achieved indicating high intra- and inter-examiner reliability.

4.8 Data Management and Analysis

The data was entered into an Epi-info software program (version 7), and the information was imported into the STATA version 13.1 for analysis. Descriptive statistics were used to determine the prevalence and severity of dental caries; ANOVA statistics were employed to compare caries experience amongst the different age groups. The chi-squared test and a T-test

were conducted to evaluate the level of the association between dental caries and socio-demographic factors. The level of significance was set up at $p < 0.05$.

4.9 Ethical Consideration

The parents were given a participant's information sheet which detailed the information and purpose of the study **(Appendix B, C & D**). Ethical clearance was obtained from the University of the Witwatersrand ethics committee **(M160308) (Appendix F).**

CHAPTER 5- RESULTS

5.1 Demographic Information

There was a 100% response rate in that 222 children were examined, and 222 questionnaires were returned from parents. Demographic characteristics considered in this study included age, gender, level of education of parents, the area of residence of the family, and size of the family. The mean age of the children in the study was 3.5 years (SD ± 1.01 years). Approximately 56% of the children were female, and 44% were males (Figure 2).

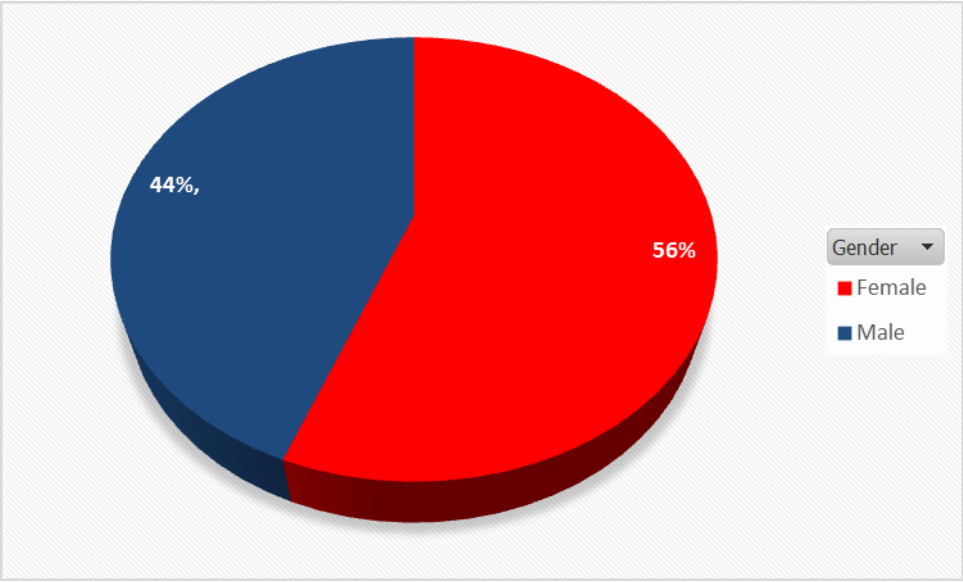

Figure 2: Distribution of the studied population according to gender

In terms of parental education, 47% of the mothers had attained high school education while 62.7% had secondary school level education (Refer to Table 1 below). There were no fathers that had attained tertiary education, while 12.16 % of the mothers had.

Table 1: Distribution of parents according to level of education.

Mother	**n**	**Percent**
Non-schooling	1	0.45
Less than primary schooling	9	1.05
Secondary	80	36.04
High school	105	47.30
Tertiary school	27	12.16
Total	**222**	**100**
Father	**n**	**Percent**
Non-schooling	2	0.90
Less than primary schooling	33	14.86
Secondary	184	62.66
High school	3	1.36
Tertiary school	0	0.00
Total	**222**	**100**

Figure 2 shows the distribution of the boys and girls according to the ages. A total of 222 children participated in the study with girls (n= 125) outnumbering boys (n= 97).

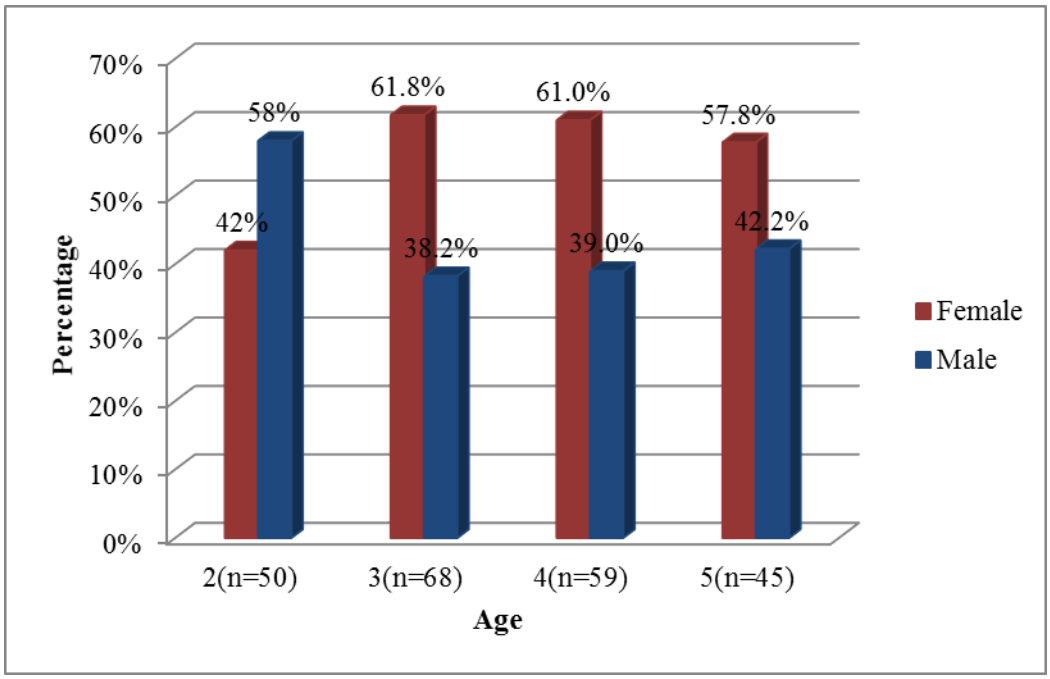

Figure 3: The percentage distribution of the boys and girls according to age.

Table 2 below shows the percentage of decayed, missing and filled teeth (dmft) status among the children that were part of the study. Out of the 222 children, 116 were caries-free while 106 children had caries. The dental caries component comprised the bulk of the mean dmft, while filled and missing components existed in almost equal proportions (See table 2).

Table 2: Percentage of decayed, missing, and filled teeth.

dmft index	n	Percent
Caries-free	116	52.25
Decay (d)	106	47.74
Filled (f)	6	2.75
Missing as result of caries (m)	5	2.25

the “decayed” component constituted 47.7%, “missing” constituted 2.2%, whereas “filled” constituted 2.7%.

Table 3: Contribution of each component to the overall mean of the dmft.

dmft		**d**		**m**		**f**	
Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
2.41	3.60	2.23	3.4	0.05	0.4	0.12	0.8

The decayed teeth made a major contribution to the dmft (see Table 3 above).

Table 4: Comparison of the mean dmft between location.

Location	**dmft**		**d**		**m**		**f**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Berea/Yeoville	3.86	4.2	3.43	3.8	0.10	0.6	0.32	1.3
Diepsloot	1.53	2.8	1.52	2.8	0.014	0.1	0	0

A t-test was (P = 0.0007) between the two groups of children.

There was a significance difference (*P < 0.001*) between the mean dmft value between the children in Berea/Yeoville and those in Diepsloot. The average dmft value for the children in Berea/Yeoville area was significantly higher (3.8; SD± 4.2) than the one for the children in Diepsloot (1.5; SD± 2.8).

Table 5: Mean dmft according to age.

Age	n	Mean dmft	Std deviation
2 years	50	0.96	2.03
3 years	68	1.93	3.20
4 years	59	3.44	4.39
5 years	45	3.38	3.78
Total	**222**	**2.41**	**3.60**

One-way ANOVA for age (P = 0.0004).

Table 6: Mean dmft according to gender**.**

Gender	n	Mean dmft	Std deviation
Female	125	2.60	3.63
Male	97	2.15	3.56
Total	**222**	**2.41**	**3.60**

Student t-test for gender (P = 0.3566).

In terms of age, the ANOVA statistics showed a statistically significant difference. The 4 and 5-year-olds had higher levels of dmft than the 2 and 3-year-olds (*P < 0.001*). There were no significant differences (*P = 0.3566*) in the mean dmft between the boys and girls in the study.

5.2 Prevalence of Caries

Prevalence of caries = $\frac{\text{no.of children with at least one decayed tooth in the mouth}}{\text{Sample size}}$ (Jong, 1981).

Prevalence of caries = 106/222 x 100 = 47.74%

Unmet treatment needs = $\frac{\text{Mean number of decayed teeth}}{\text{Mean number of decayed teeth and filled teeth}} \times 100 =$ 94.6 (Jong, 1981).

5.3 The results of the pufa index

Table 7 shows the results of the pufa. There were negligible pufa scores, only 2.2% of the children had pufa scores (see table 4). The largest contribution to the score were the abscesses. The mean pufa score was 0.022 with (SD± 0.14).

Table 7: Percentage of pulp exposure, ulceration, fistula, and abscess.

pufa index	**n**	**Percent**
Zero pufa	217	97.75
Pulp exposure(p)	0	0
Ulceration (u)	0	0
Fistula (f)	1	0.45
Abscess (a)	4	1.80
Total	**222**	**100**

Table 8: Contribution of each component to the overall mean of the pufa

pufa		**p**		**u**		**f**		**a**	
Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
0.02	0.18	0.004	0.06	0	0	0	0	0.02	0.15

The pulp exposure and abscesses made a major contribution to the pufa (see Table 8 above).

Table 9: Association between mother's education and dmft

Mother	**n**	**Mean dmft**	**SD**
Non-schooling	1	0.00	-
Less than primary school	9	1.11	1.76
Secondary schooling	80	2.28	3.80

High schooling	105	2.52	3.54
Tertiary schooling	27	2.85	3.68
Total	**222**	**2.41**	**3.60**

Pearson chi2 (P = 0.2670).

Table 10: Association between father's education and dmft.

Father	**n**	**Mean dmft**	**SD**
Non-schooling	2	4.00	5.66
Less than primary school	33	2.93	3.78
Secondary schooling	184	2.29	3.58
High schooling	3	2.33	2.51
Tertiary schooling	0	0.00	-
Total	**222**	**2.41**	**3.60**

Pearson chi2 (P = 0.7110).

There was no significance difference in the number of tooth decay and the mothers' educational level (*P = 0.2670*) (table 9) as well as the fathers' educational level (*P = 0.7110*) (Table 10).

Table 11: Association between parental education and tooth brushing habits

Mother	**Don't know**	**Once**	**Twice**	**Thrice**	**Total**
Non-schooling	0	0	1	0	1
Less than primary school	0	8	1	0	9
Secondary schooling	1	53	22	4	80
High schooling	1	53	46	5	105

college	2	11	15	1	27
Total	4	125	85	10	222

Pearson chi2 (P = 0.267).

Father	**Don't know**	**Once**	**Twice**	**Thrice**	**Total**
Non-schooling	0	1	1	0	2
Less than primary school	1	13	17	2	33
Secondary schooling	1	109	66	8	184
High schooling	0	2	1	0	3
Total	2	125	85	10	222

Pearson chi2 (P = 0.711).

The highest percentage of children (77.78%) who brushed their teeth regularly was found among the children whose mothers had a high school education (n=104, 46.8%), and also among the children whose fathers had a secondary education (n=184, 82.9%). [See table 11]. The association between education level and habits of brushing was not significant ($P > 0.05$) in both the mother and father of the children. Furthermore, at the selected site, the children were fed diets that contained mainly carbohydrate-rich foods, and the lunches that the parents prepared for them was mostly also cariogenic.

Table12 below shows the number of family members in a household and the mean dmft among the children in the household who were in the study. There were no significant differences ($P = 0.8367$) in the mean dmft between the children despite the differences in the number of family members in the household.

Table 12: Association between dmft and the number of family members living in the household.

Number of family members	N	Mean dmft	Std deviation
2	12	3.33	3.55
3	81	2.07	3.50
4	66	2.20	3.47
5	32	2.75	3.89
6	18	3.39	4.30
7	10	2.60	3.66
8	2	2.50	3.54
9	1	1.00	0.00
Total	**222**	**2.41**	**3.58**

One-way ANOVA test performed, P = 0.8367.

CHAPTER 6 - DISCUSSION

This study assessed the caries experience among the population of pre-school children in Diepsloot and Berea/Yeoville. It outlined the socio-behavioural factors associated with dental caries and further elucidated differences in the two suburbs of Johannesburg.

The study revealed that the overall caries prevalence for the two to five-year-olds in the current study was 47.7%, with a mean dmft score of 2.41 (SD± 3.6). No statistical differences in dmft levels were found between the boys and girls and the pufa scores of 2.2% and mean pufa scores 0.22 with (SD± 0.14) were negligible. It was noted also that there was a no significant association between the mean dmft score and the number of people that lived in the household. Noteworthy was the fact that the dmft increased significantly, proportional to increasing age, particularly from the age of 3 onwards. Furthermore, the unmet treatment need (94.6%) was disconcertingly high, indicating that this group received very little attention for their dental caries. Although nearly half of the pre-school children experienced caries in the study, no significant associations were found between behavioural and socio-demographic factors.

One important finding of this study was the strong association between the age of children and dental caries. As children grew older, the number of decayed teeth increased. These finding are similar to those reported different studies conducted in Taiwan (Tsai *et al*, 2006; Ferraz *et al*, 2014); USA (Tang *et al*, 1997); Turkey (Doğan *et al*, 2013); Brazil (Carvalho *et al*, 2010); Australia (Arora *et al*, 2011; Gussy *et al*, 2006), and Korea (Department of Health and Welfares, 2000), where the prevalence of dental caries increased in 2 to 5-year old children (Tsai *et al*, 2006; Ferraz *et al*, 2014). In this study, the results are further corroborated by

another study, in the United States, where the prevalence of dental caries was found to have increased from 6% in the 1-year-old children to 49% in the 4-year-old children (Tang *et al*, 1997). A similar trend was observed in Turkey, among the pre-schoolers aged between 8 and 60 months (Doğan *et al*, 2013). The implications of this trend are of concern as it means that as the children get older, the likelihood of a greater caries burden also increases. This could result in an increase in the biological and financial costs.

Other studies that came out with the same outcome among the 2-5-year olds were conducted in Brazil (Carvalho *et al*, 2010); Australia (Arora *et al*, 2011; Gussy *et al*, 2006), and Korea (Department of Health and Welfares, 2000). The increased level of dmft as the children grew older could be contributed to the progression of dental caries. There were no differences between the genders in the prevalence of untreated dental caries as was reported in a study among the 3 to 6-year old preschool children in India by Kashetty *et al*, (2016). Research findings suggest that with increasing age there might be a higher tendency amongst children to consume sugary food and that could result in dental caries prevalence progression and the consequence thereof (Jose and King, 2003).

In the current study, about 52.2% (see Table 2) of the pre-school aged children between two and five years' old had no dental caries, and 47.7% had dental caries. The results of the current study are consistent with the findings of a study conducted in Brazil which found that the prevalence of early childhood caries is approximately 50% (Ferraz *et al*, 2014). Furthermore, the average dmft for the 2-5-year-olds was 2.41, and the value recorded in this study was above the 1.5 goals set by the Department of Health (South Africa) by Wyk and Wyk, (2004) for this age group. The huge difference between the target goal and the actual findings may indicate that oral health campaign messages are not filtering down to the parents as well as the

poor access to the dental care units, also it highlights the need to strengthen oral health educational campaigns among these communities in and around Johannesburg. Additionally, this points to a lack of knowledge of the caregivers (mothers, teachers, guardians) about mouth hygiene, the importance of the primary teeth, and prevention of tooth decay.

Nagarajappa and colleagues, (2013) investigated infant oral health (IOH) related knowledge, attitudes, and practices (KAP) of 470 parents whose children were between 0-3 years in Udaipur, India and reported that 58.7% had a poor knowledge of cleaning and less than 50% of parents knew about how caries in the moth developed of caries. They concluded that parent's knowledge on infant oral health care was inadequate and recommended that health professionals, who are the first to come into contact with pregnant and new mothers, need to disseminate appropriate and accurate information about oral health-care for infants (Nagarajappa *et al*, 2013).

More recently, Henry *et al*, (2017) reported on a systematic review that sought to investigate whether Oral Health Educational Programmes for Expectant Mothers prevented Early Childhood Caries. They found that Oral health educational programmes for expectant mothers did have a positive impact in preventing ECC even though there were limitations on the quality of the papers included (Henry *et al*, 2017).

The dmft value of 2.41 obtained in this study was similar to that observed in the four to five-year-olds in the South African national survey of the oral health of children (Wyk and Wyk, 2004). The higher prevalence of dental caries and the higher mean dmft score of the current study might be directly linked to the parents' poor socioeconomic status, low educational levels and lack of knowledge about the importance of good dental health as reported in India by Kashetty *et al*, (2016).

In the current study, the proportion of the decayed teeth was 47.7%, "missing" created 2.2%, whereas "filled" formed 2.7%. The high "decayed" component in the current study is similar to findings from Mothupi *et al*, (2016), Dixit *et al*, (2015), Singhal *et al*, (2015) and Raj *et al*, (2013). Of concern is the high unmet treatment need of 94.1% in the study population. This figure is in close agreement with the finding of Mothupi *et al*, (2016) who recorded that 97% of the preschool children in the metropolitan area of Johannesburg had unmet dental needs. The high unmet restorative treatment need could be attributed to the following; insufficient preventive dental care facilities including human resources (dental clinicians and assistance), as well as lack of awareness among the population in the district (Kashetty *et al*, 2016); parent's inability to afford high treatment cost; and lack of affordable dental services within these communities (Gupta *et al*, 2015).

In addition to dmft, the study assessed the pufa index among the 2 to 5 -year-old preschool children. The data from the pufa index should be presented together with dmft because the pufa complements the dmft data by addressing the consequences of caries (Bagińska *et al*, 2013). The prevalence of pufa was 2.25% among the children. In this study the pufa scores were negligible. However, there were high levels of untreated decay. The negligible pufa score indicates that though there were high levels of untreated dental caries, caries had not deteriorated to the extent of developing abscesses, or other serious consequences and there were very few oral conditions resulting from untreated caries.

Dental caries is multifactorial as a result of factors that are both controllable and uncontrollable. For a tooth to decay, an interplay of factors such as tooth factors, cariogenic bacteria, and fermentable carbohydrates will have to occur simultaneously (Leme *et al*, 2006).

In this study, it was noticed that several other factors such as socio-economic factors, education, age could have led to the high incidence of tooth decay in the two to five-year-old age group in pre-school children. According to Petersen, (2004), the prevalence of dental caries is mainly dependent on access to oral health care, utilization of oral health services; socio-economic status; and dietary intake. Especially in disadvantaged communities, oral health planning efforts need to focus on reducing the burden of oral diseases as follows: by promoting healthier lifestyles to address the socio-economic and environmental risks to oral health; and developing policies and strategies that support oral health integration within other national and local health programs (Petersen, 2004).

In the United States, (Dye *et al*, 2007) the findings in a similar group of children aged between two and five-year-old showed a prevalence of 27.9% of tooth decay, however, the findings of the current study indicated that the same age groups of the South African population had a prevalence of 47.7%. The differences in the prevalence could be indicative of different dietary habits, sugar intake and habits with regards to brushing (Anderson *et al*, 2009; Punitha *et al*, 2015). There was not much difference in per capita sugar consumption in South Africa (34.1 kg.capita per person) and the USA (33.7 kg.capita per person) (Home Page of the Indian Sugar Mills Association, 2017). The differences in prevalence could be attributed to other factors such as the high carbohydrate diets these pre-schoolers ate on a daily basis at crèches and poor oral hygiene awareness. (Sheiham and Watt, 2000).

In the current survey, the prevalence of dental caries pre-school children was higher (47.7%) than what was recorded in the previous national studies conducted in South Africa in 1989 and 2002. The higher value is a reflection that our oral health programmes have not succeeded as yet to address the problem of ECC, moreover there are high levels of poor oral health hygiene,

as well as a greater preference for sugary foods and beverages among the children (Ruottinen *et al*, 2004, Çolak *et al*, 2013).

The low frequency of brushing increased the risk for enamel hypoplasia due to low exposure to fluorine and leads to a predisposition of an accumulation of fermentable sugars and the growth of the bacteria that cause tooth decay (Çolak *et al*, 2013).

In the current study, it was observed that the education of the mother and father was not directly related to the prevalence of decayed teeth in children. The findings in the current study were similar to a previous study that noted that parental education had limited effect on oral health status of children (Abanto *et al*, 2011; Ismail *et al*, 1997; Jackson, 2006; Martins-Júnior *et al*, 2013). It appears that education was not a factor because all the children attended crèche in the same area and hence there were no vast socioeconomic differences.

It is clear that whilst some parents had a better education, their standard of living and affordability was at a similar level to those that had lower levels of education. This implies that their incomes were such that they could only afford to live and send their children to crèches in those areas. Thus, the oral health status in this cohort appeared to be more a function of financial status rather than the educational level of the parents, hence, a more reliable indicator of health status in this setting could be related to income/job status rather than educational level. In Portugal, it was noted that parental education was linked to income level (Ardérius *et al*, 2015).

In India the authors planned to evaluate the prevalence of ECC in preschool children in the age group between 18 and 72 months, and its relationship with parent's education and socioeconomic status of the family of 2771 children attending primary schools in Salem

(India). Their findings showed that ECC was high among the children of the low socioeconomic status group with a mean dmft of 5.23 ± 1, and the children of working mothers had a mean dmft of 10.47 (Stephen *et al*, 2015).

In the current study, the educational status of the mother did not correlate with a better oral health status in the child. The phenomenon observed in the current study could be attributed to the fact that although some of the mothers had higher educational levels, their socio-economic status was the same as mothers who had lower educational levels which then implied that the disposable incomes available to both categories were the same.

From the studies, it appears that some of the factors that contribute to early childhood dental caries are similar to those noted in other regions of the world. The prevalence of dental caries increased with age in the pre-schoolers, and this was observed across the world. However, indicators on parental education and income were debatable according to the contextual social factors of the countries concerned.

CHAPTER 7 - CONCLUSIONS & RECOMMENDATIONS

Dental caries is a public health issue and if not treated properly, it will lead to infection of the tooth, gum and early tooth loss. The aim of this research report was to contribute to the understanding of the risk factors that lead to the development of early childhood caries in preschool children in the suburbs of Yeoville, Berea, and Diepsloot in Gauteng Province. South Africa.

7.1 Conclusion

In summary, the current study found that the prevalence of dental caries among preschool children was high and the mean dmft was directly proportional to the age.

The overall pufa index for the pre-school children in the Diepsloot, Berea and Yeoville areas was negligible. This value shows that even though dental caries was prevalent among the children, there was very little pulpal involvement and hence the caries were not severe. However, there was an unmet treatment need of about 94 % in this community, indicating that the community might not be receiving adequate oral health information or services in their areas.

The prevalence of dental caries among preschool children was also influenced by age, as the 4 and 5 years old, had a higher caries experience than the 2 and 3-year olds.

The average dmft for the preschool children in the Diepsloot and Berea/Yeoville areas was higher (2.41) than the 1.5 goals set by the department of national oral health survey in South Africa.

There was no association between the demographic characteristics and caries experience in this sample of pre-school children in the Diepsloot, Berea and Yeoville areas.

7.2 Recommendations

The results of the study findings demonstrate that there is a need to strengthen oral health educational campaigns among these communities in and around Johannesburg.

It is of utmost importance that authorities increase primary prevention and restorative measures to reduce the caries prevalence and at the same time attempt to maintain preschool children as dental caries free as possible.

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APPENDIXES

Appendix A- Oral Health Questionnaire for Care Givers

Date: .....

Name of the child: .....

Date of birth of the child: .....

Name of crèche: .....

1-Gender:
Male ❑ Female ❑

2-Location:
……

3-What is your highest grade (or year) qualification? Father ❑ Mother❑

No schooling	❑	❑
Less than primary school	❑	❑
Secondary school	❑	❑
High school	❑	❑
College/university	❑	❑

4- Are you a single parent? Yes❑ No❑

5-How many people are currently living in your household, including yourself? ___
Of these people, how many are children ≤18 years old? ___

6- How would you rate your own oral health?

Good❑ Fair❑ Poor❑

7-How often during the past 12 months did you have a toothache or feel discomfort due to your teeth?

Often ❑ Occasionally ❑ Rarely ❑ Never ❑

8- Have you been to a dentist in the past?

-Yes ❑ -No❑

If yes, please answer this question: -

When was your visit? Less than a year ago❑ More than a year ago ❑

Has your child been to the dentist in the past 12 months? ----------

8-Was your child nervous or frightened during dental visits?

-Yes ❑ -No❑

If yes circle code:

Least nervous 0.1.2.3.4.5.6.7.8.9 most nervous

9- How often did you go to the dentist during the last 12 months?

Once❑ Twice❑ 3 times❑ ❑ only when I have a problem ❑

10-Do you clean your child's teeth with a toothbrush and paste?

-Yes ❑ -No❑

If yes, please write kind of tooth paste.....

If No:

What do you use to clean your child's teeth?

Stick □ Gauze□ Cloth □ others□

11- How often do you brush your child's teeth each day?

Never❑ Once a day❑ twice ❑ 3 times ❑

12- How old was your child when they began to brush their teeth?

2 years❑ 3 years❑ more than 5 years old? ❑

13- How long do you normally take to brush your teeth?

About 30 second❑ about 1 min❑ about 2 min❑ don't know❑

14- When do you normally brush your teeth?

Only at morning❑ only in evening❑ in both❑ don't know❑

15- Do you use mouth rinse?

-Yes ❑ -No❑

16-Does/did your child goes to sleep with something to drink?

-Yes ❑ -No❑

If yes, what did they drink? Please be specific.....

18-What does your child drink or eat during the day?

Food item	✓	Times per day	
Breast milk			
Milk with sugar			
Honey/jam/chewing gum			
Juice or other soft drinks			
Sweets/candy			
Tea with sugar			
Coffee with sugar			

19-What is your child's source of drinking water?

-Bottled water❑ -well water❑ -city water❑ -others❑.

20- Does your child have any habits, which may affect the teeth or mouth?

-Yes ❑ -No❑

If yes, click

Breath through the mouth❑ sucks thumb ❑ bite finger nails❑ grinds teeth❑.

Appendix B- Permission for Examining Child

Greetings

My name is Dr. Abdalraof Kalil, and I am doing MSc Dent in Community Dentistry. I am conducting a study entitled: **Caries Experience of Preschool Children in Johannesburg.**

What is the purpose of the Study?

I would like to invite you to participate in the study. The purpose of the study is to determine the caries experience and associated factors contributing to the condition among preschool children in Johannesburg.

What the study entails?

An oral health care professional will be a first distributed questionnaire that is related to child oral health. Upon completing the questionnaire, your child will be examined. Should there be any oral conditions detected in your mouth, you will be offered treatment or will be referred to the Wits Dental Clinic.

Confidentiality

If you consent to participate in the study, we assure you that all your information will remain confidential. The information collected will be kept in a securely locked office.

Participation

Participation in this study is voluntary, and you are free to refuse or withdraw from the study at any time. Refusal to participate or discontinue will not disadvantage you in any way.

Risks

There are no predictable risks in your participation.

Benefits

There are no direct benefits to your child, but should you require any oral health care, treatment will be offered to you in the mobile dental unit, or you will be referred to the Wits Dental Clinic.

Contact details

If you have any queries or would like more information about the study, please contact The Principal investigator; Dr. Abdalraof Kalil at the Division of Public Oral Health, Wits on 0768507157; abdalraofkalil@gmail.com.

If you are not happy with the way this research is being conducted, you are welcome to contact the Chairperson of the Wits Human Ethics Committee, Prof P. Cleaton-Jones through his secretary Ms. Anisa Keshav on (011) 717 1234; anisa.keshav@wits.ac.za.

Your cooperation in this regard will be highly appreciated.

Dr. Abdalraof Kalil

Appendix C- Permission to Complete Questionnaire

Greeting

My name is Dr. Abdalraof Kalil, and I am doing MSc Dent in Community Dentistry. I am conducting a study entitled: **Caries Experience of Preschool Children in Johannesburg.**

What is the purpose of the Study?

I would like to invite you to participate in the study. The purpose of the study is to determine the caries experience and associated factors contributing to the condition among preschool children in Johannesburg.

What the study entails?

An oral health care professional will be a first distributed questionnaire that is related to child oral health. Upon completing the questionnaire, your child will be examined. Should there be any oral conditions detected in your mouth, you will be offered treatment or will be referred to the Wits Dental Clinic.

Confidentiality

If you consent to participate in the study, we assure you that all your information will remain confidential. The information collected will be kept in a securely locked office.

Participation

Participation in this study is voluntary, and you are free to refuse or withdraw from the study at any time. Refusal to participate or discontinue will not disadvantage you in any way.

Risks

There are no predictable risks in your participation.

Benefits

There are no direct benefits to your child, but should you require any oral health care, treatment will be offered to you in the mobile dental unit, or you will be referred to the Wits Dental Clinic.

Contact details

If you have any queries or would like more information about the study, please contact The Principal investigator; Dr. Abdalraof Kalil at the Division of Public Oral Health, Wits on 0768507157; abdalraofkalil@gmail.com.

If you are not happy with the way this research is being conducted, you are welcome to contact the Chairperson of the Wits Human Ethics Committee, Prof P. Cleaton-Jones through his secretary Ms. Anisa Keshav on (011) 717 1234; anisa.keshav@wits.ac.za.

Your cooperation in this regard will be highly appreciated.

Dr. Abdalraof Kalil

Appendix D- Parental Consent Form

Please complete this form after you have read the information sheet and/ or listened to an explanation about the research.

Title of study: **Caries Experience of Preschool Children in Johannesburg**.

- Thank you for considering taking part in this research. The person organizing the research must explain the project to you before you agree to take part.
- If you have any question arising from the information sheet or explanation already given to you, please ask the researcher before you decide whether to join in. you will be given a copy of this consent form to keep and refer to at any time.
- I understand that if I decided at any other time during the research that I no longer wish to participate in this project, I can notify the researchers involved and be withdrawn from it immediately.
- I consent to the processing of my personal information for the purposes explained to me.

Participant's Statement:

I……

……

Agree that the research project named above has been explained to me to my satisfaction and I agree to take part in the study. I have read both the notes written above and the Information Sheet about the project, and understand what research study involves.

Signed **Date**

Investigator's Statement:

I……

Confirm that I have carefully explained the nature, demands and any foreseeable risks (where applicable) of the proposed research to the volunteer.

Signed **Date**

Appendix E- Oral Health Survey

Name: …….

Region: ……

Date: ……

Code no. | | | |

General information:

Age | | | |

Sex | |

Dental status:

Dmft

Teeth	DECAYED (d)	MISSING (m)	FILLED (f)
1ST Quadrant			
2nd Quadrant			
3rd Quadrant			
4th Quadrant			

TOTAL dmft =

Pufa

Teeth	Pulp exposure (p)	Ulceration (u)	Fistula (f)	Abscess (a)
1ST Quadrant				
2nd Quadrant				
3rd Quadrant				
4th Quadrant				

TOTAL pufa =

Appendix F- Ethical Clearance

R14/49 Dr Abdalraof Benaessa Kalil

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M160308

NAME: (Principal Investigator)	Dr Abdalraof Benaessa Kalil
DEPARTMENT:	Community Dentistry University of the Witwatersrand
PROJECT TITLE:	Caries Experience of Preschool Children in Johannesburg
DATE CONSIDERED:	01/04/2016
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Dr Mpho Molete
APPROVED BY:	Professor P. Cleaton-Jones,Chairperson, HREC (Medical)
DATE OF APPROVAL:	04/05/2016

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary in Room 10004,10th floor, Senate House/2nd floor, Phillip Tobias Building, Parktown, University of the Witwatersrand. I/We fully understand the the conditions under which I am/we are authorised to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated,from the research protocol as approved, I/we undertake to resubmit to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. in this case, the study was initially review in March and will therefore be due in the month of March each year.

Principal Investigator Signature Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix G- Title Approval

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Mrs Sandra Benn
E-mail: sandra.benn@wits.ac.za

06 January 2017
Person No: 752168
PAG

Dr AB Kalil
304 Juliana Court 4 Princess Place Johannesburg
2193
South Africa

Dear Dr Kalil

Master of Science in Dentistry: Approval of Title

We have pleasure in advising that your proposal entitled *Caries experience of preschool children in Johannesburg* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

Appendix H- Plagiarism Report



Dr

by Abdalraof Kalil

FILE	RESEARCH_REPORT.DOCX (643.33K)		
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