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Association between diet, dental caries and body mass index among grade six learners at selected primary schools in Pretoria, Gauteng province – South Africa

By

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DECLARATION

I declare that every aspect of the dissertation entitled “Association between diet, dental caries and body mass index among grade six learners at selected primary schools in Pretoria, Gauteng province – South Africa” was undertaken by me. It has not been submitted for any degree or examination at any university, and all the resource materials used and quoted have been duly acknowledged

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DEDICATION

This dissertation is dedicated to the memory of my late mom Florence Radebe for leaving behind an education foundation seed in me. My late dad Naphtal Radebe for showing his selfless love, care and raising me alone as a single parent from the age of eleven years.

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ABSTRACT

Introduction: Childhood obesity and dental caries (DC) have increased worldwide and are continuing to pose challenges to public health. The increasing risk of obesity for children is of particular concern because research has suggested that childhood obesity predicts adult obesity. Children experiencing DC early in their lives have a much greater probability of subsequent caries in their permanent dentitions and adulthood. Studies have reported a strong association between the nutritional intake and DC and reported a direct link between DC, sugar consumption and obesity.

Objectives: to assess the association between dental caries (DC), the Body Mass Index (BMI) and diet among grade six learners at selected primary schools in Tshwane West District.

Methods: A cross-sectional analytical study of grade six learners was carried out in Tshwane. The data collection consisted of a questionnaire, clinical oral examination and anthropometric measurements. All clinical data was collected by a single calibrated examiner. A validated questionnaire was used to collect the demographic data and the type of diet consumed. The SPSS version 23 software was used for analysis. Descriptive statistics, Chi-Square test to test for significance for categorical data and logistic regression analysis were used to determine statistical significance.

Results: The response rate was 83% (440) and of these 53% were male. The mean age of the participants was 11.8yrs. The majority of the participant's fathers (71%) and 50% of mothers were employed. The DC prevalence was 43% with a mean DMFT score of 1.19 (*SD*= ±1.79). The PUFA score was zero. Less than half (47%) of the participants reported to brush their teeth twice daily. The majority (71%) claimed

to drink between one and one and a half glasses of sugar-sweetened beverages (SSBs) with 67% eating between one and three sweets per day. While most of the participants reported having a balanced meal at supper, a third reported eating junk food. The majority (71%) of participants had a BMI score that was within the normal range with 19% being overweight. There were no significant associations between the mean DMFT, BMI scores and the SES of the participants.

Conclusion:

The DMFT was low, but the decayed component was relatively high. The PUFA score was zero. Most participants were classified as having a “normal” BMI with almost a quarter being classified “overweight”. There were no significant associations between the DMFT and the mean BMI scores and SES of the learners. More than half of the participants were from a medium SES and had a slightly high DMFT score than their counterparts. Less than half reported to brush their teeth daily, most of them had a balanced diet at supper.

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LIST OF ABBREVIATIONS AND ACRONYMS

BMI:	Body Mass Index
DC:	Dental caries
DMFT:	Decayed, Missing**,** Filled Teeth (for the permanent dentition)
NCOHS:	National Children Oral Health Survey
NSNP:	National School Nutrition Program
PUFA:	Pulpal involvement, Ulceration, Fistula and Abscess
SA:	South Africa
SES:	Socioeconomic status
SiC:	Significant caries index
SSBs:	Sugar-sweetened beverages
SM:	Streptococcus Mutans
WHO:	World Health Organisation
SANHANES:	South African National Health and Nutrition Examination Survey

CHAPTER 1: INTRODUCTION

1.1 Introduction and study rationale

Childhood obesity and dental caries (DC) has increased worldwide and is continuing to pose challenges to public health.[1-3] Many studies have demonstrated that excess weight is associated with precursors of adult illnesses including cardiovascular disease and type 2 diabetes.[4-7] The increasing risk of obesity for children is of particular concern because research has suggested that childhood obesity predicts adult obesity.[8, 9] South Africa (SA) is reported to have the highest prevalence of people classified as overweight and obese (29% of men and 56% of women) of all countries in Africa and so, the need for immediate preventive action is warranted.[2, 7] The 2013 South African National Health and Nutrition Examination Survey (SANHANES-1) reported a high prevalence of overweight and obesity among children and adolescents, particularly from urban areas.[10.] The prevalence among 15 to 17 year old girls and boys was 9% and 27% respectively and between 10% and 23% among 10 to 14 year olds.[10]

Studies have reported a strong association between the nutritional intake and DC status and reported a direct link between caries, sugar consumption and obesity.[2, 3, 11] DC is an infectious and transmissible disease, which is multifactorial and strongly modified by diet. The process involves a chronic imbalance between multiple risk factors and protective factors, each of which must instantaneously be present to initiate and progress the disease.[12] These include immunological factors, fermentable carbohydrates, reduced saliva flow, immature enamel and defects of tooth tissues.[12, 13] The dental hard tissues is destructed by acidic by-products from bacterial fermentation of dietary carbohydrates.

A decrease in the prevalence of DC has been reported in many developed countries whilst there has been an increase in the prevalence in some developing countries.[14-16] Children experiencing caries early in their lives have a much greater probability of subsequent caries in their permanent dentitions and adulthood.[17] Untreated caries in both dentitions is of major concern in developing countries with consequences of such untreated cases in children found to include delayed physical growth and development, loss of school days, restricted daily activities and a diminished ability to learn.[18]

Several studies have been done on the association between DC and BMI among children in developed countries while few studies have been done in developing countries, including SA.[3, 19-23] Therefore this study sought to assess the association between diet, DC and BMI among grade six learners at selected primary schools in the Tshwane West District.

CHAPTER 2. LITERATURE REVIEW

2.1 Dental caries: Aetiology

DC is an infectious, multifactorial and transmissible disease. DC requires a susceptible tooth, cariogenic bacteria and specific dietary factors (fermentable carbohydrates) to initiate and progress. It is influenced by numerous genetic, oral environment and behavioural risk factors strongly modified by diet.[13, 22, 24] The bacteria implicated in DC are of the group termed *Streptococci Mutans (SM)* and they have been shown to have a positive correlation with DC.[25, 26] Davies and Wan et al demonstrated that in the pre-dentate mouth of infants SM is absent, but soon after eruption of infant's first primary tooth, the concentration of SM level increases.[27, 28] It requires a non-shedding surface like enamel to adhere onto and as a result, once the tooth erupts, the bacteria have an ideal environment to thrive.[27] Since SM are found in the mouth, transmission occurs vertically mediated via the saliva of siblings, caregivers, mothers and guardians serves as a reservoir and it is how SM is acquired.[29] *SM* is part of the normal flora and as a result cannot be completely illuminated. However, it can be controlled by adequate oral hygiene, removal of plaque, reduction of salivary *SM* in mothers and care givers by providing education and relevant information during and after pregnancy.

Diet; fermentable carbohydrates and time

There is evidence that sugars and other fermentable carbohydrates (such as highly refined flour) play a role in the initiation and development of DC. Sucrose, the most common sugar is the only one, that when metabolized, produces dextran which

promotes superior bacterial adhesion to teeth. Because of this, it is considered the most important substrate in the establishment of cariogenic bacteria.[12] The frequency of sucrose has been shown to be more important than the total amount consumed.[12, 13.] An increased frequency decreases the pH of the oral cavity which enhances the establishment and the dominance of SM. The duration that the sugar is in the mouth increases the potential for enamel demineralization and reduces the time for remineralization by saliva, with the result that demineralization becomes the predominant mechanism.[12, 13] Under-nutrition is associated with enamel hypoplasia and salivary gland atrophy which increases the risk of DC, and the effect of this is pronounced during the pre-eruptive stages of tooth development.[30] On the other hand, over-nutrition, manifesting as obesity, has also been associated with DC.[31]

Another protective factor is saliva, through its special properties compositions of ions, enzymes, antibodies. pH, flow rate and buffering capacity has been considered as protective against dental caries.[12] The ions include calcium, fluoride and magnesium, all of which are essential for the remineralisation of the tooth.[32] As long as the saliva is saturated with these ions, it has the ability to remineralize the tooth and reverse the initiation of early DC. Saliva also has the ability to buffer the pH of the oral cavity and shift it from an acidic (demineralization) to a basic environment which promotes remineralisation.[32] As a result, the saliva flow and composition is essential in the prevention of DC. [12]

2.1.1 Prevalence and trends of dental caries in developed and developing countries

Varying prevalence values of DC have been reported in developed and developing countries for different age groups. Individual studies amongst the 3-6year age group

from 2012-2016 in SA were from Gauteng and Kwazulu Natal (KZN) provinces. These studies showed the prevalence of dental caries in 3-6 year age group to be 49% for Gauteng and 73% for KZN.[72, 79] The last Children Oral Health Survey (NCOHS) done in SA was from the period 1999-2002. The results from the different provinces amongst the 3-5year age group showed the following percentages of prevalence: Gauteng, 49.%, KZN 52%, Western Cape 77%, Eastern Cape 59%, Free State 60%, North West 41, Mpumalanga 40 and Limpopo 31.[73] Comparing the recent studies with the NCOHS of 1999-2002, the prevalence at Gauteng province remained the same whilst there has been an increase in prevalence for the KZN province.[72, 79] Other studies from developing countries like Nigeria, Sri Lanka, Brazil and India reported prevalences ranging from 32% to 44%. Studies from developed countries like United State of America (USA), Germany, and Italy, reported the prevalence of DC in 3-5-year olds to be 6%, 9% and 19% respectively. For the ten to fifteen-year olds, the prevalence of DC in developing countries (SA, Kenya, India and Qatar) were 40%, 37%, 65% and 85% with an exception of Nigeria reporting a low (16%) prevalence, whiles in developed countries (Turkey (84%), Germany (55%), Italy (40%) and Sweden (32%).[33-36]

In this context, it is critical to determine factors like poverty, lack of oral health centres that may increase the incidence of DC. Studies conducted in other countries reported that the prevalence of DC among children has risen according to the availability or lack thereof of quality food and nutritional education.[37]

2.2 Dental caries indices

2.2.1 DMFT index

Decayed-Missing-Filled (DMF) Index was introduced by Klein et al in 1938 and modified by the World Health Organisation (WHO), has been used for more than 70 years and is well established as the key measure of caries experience in dental epidemiology.[38, 39]

The DMF index is applied to the permanent dentition and is expressed as the total number of teeth or surfaces that are decayed (D), missing (M), or filled (F) in an individual. When the index is applied to teeth specifically, it is called the DMFT index, and scores per individual can range from 0 to 28 or 32, depending on whether the third molars are included in the scoring. When the index is applied only to tooth surfaces (five per posterior tooth and four per anterior tooth), it is called the DMFS index, and scores per individual can range from 0 to 128 or 148, depending on whether the third molars are included in the scoring.[39]

When written in lowercase letters, the dmf index is a variation that is applied to the primary dentition. The caries experience for a child is expressed as the total number of teeth or surfaces that are decayed (d), missing (m), or filled (f). The dmft index expresses the number of affected teeth in the primary dentition, with scores ranging from 0 to 20 for children. The dmfs index expresses the number of affected surfaces in primary dentition (five per posterior tooth and four per anterior tooth), with a score range of 0 to 88 surfaces. Because of the difficulty in distinguishing between teeth extracted due to caries and those that have naturally exfoliated, missing teeth may be ignored according to some protocols. In this case, it is called the df index.[38, 39]

Traditionally, caries has been measured by DMFT/S index, where only teeth or surfaces with cavitated lesions extending into the dentine have been counted.[38, 39] Over the years, DMFT index has been criticized for several reasons.[40]

(1) diagnosis of caries lesions has been shown to be unreliable,

(2) the reason for extraction for caries is very difficult to confirm at the point of examination,

(3) secondary caries lesions which are only detectable with radiographs are not counted,

(4) the activity of the lesions is not determined,

(5) enamel caries lesions are not included,

(6) DMF values are not related to the number of teeth/surfaces at risk,

(7) DMF index gives an equal weight to missing teeth, untreated caries, or restored teeth,

(8) DMF index can overestimate caries experience by teeth with preventive resin restorations (PRR) or with cosmetic restorations,

(9) DMFT index is of a little use for estimating treatment needs,

(10) DMF index does not include sealants.

Additional problem with DMFT index has been the skewed distribution of caries experience, which could be measured by using the significant caries index (SiC).[41]

If the DMFT score is high, it suggests a higher prevalence of dental caries in which amongst other contributing factors is nutritional factors. These nutritional factors include higher levels of consumption of sweetened foods, SSBs, or consumption of

other unhealthy foods.[42] Low socio-economic status and low education also contributed to a higher prevalence of DMFT and poor health.[2, 22] Frequent clinical examination, and routine health care by a dental and other health provider, has been shown to lower the prevalence of dental caries, as they address factors including brushing frequency, physical activity, unhealthy diet and quitting unhealthy habits affecting oral hygiene, including smoking.[43] Low DMFT is not as often commented on in research; much of the research focuses on high DMFT. However, research available suggests that variables including community water fluoridation and access to routine health care including preventive programmes like application of sealants may be a reason for lower mean DMFT scores.[44]

2.2.2 Significant caries index (SiC)

The SiC index was introduced in 2000 to bring attention to the individuals with the highest caries values in each population.[45] It is calculated by taking the mean DMFT of the one third of the individuals having the highest of DMFT values in a given population.[46, 47] An analysis conducted by the WHO to report the prevalence of dental caries using SiC index, found that there was a skewed distribution of caries prevalence in many countries and there was a significant proportion of 12-year-olds that had high or even very high DMFT values even though a proportion was totally caries free.[46] This polarization of the caries picture had the effect of making the mean DMFT value less meaningful as a population descriptor in that it does not accurately reflect the burden of disease.[48] Thus it may lead to the incorrect conclusion that the prevalence of caries in the population is relatively low, whereas in reality population subgroups still suffer from high caries rates.[44] The use of the SiC index might solve the problem related to skewed caries distribution.[48]

2.2.3 PUFA Index

DMFT/dmft index has been used worldwide to collect prevalence data on DC for so many decades, however, this cumulative index fails to provide information on the clinical consequences and severity of untreated dental caries. The severity of DC manifests itself in the involvement of the pulp and the development of abscess, which is more jeopardous than the carious lesion itself.

To determine the severity and extensiveness of oral conditions that result due to untreated dental caries, the PUFA index was developed.[49] When used in conjunction with DMFT index, it helps in projecting the clinical consequences of untreated carious lesions.[50] The PUFA index records the presence of grossly decayed teeth with, P/p: visible pulpal involvement, U/u: ulceration due to trauma from tooth fragments, F/f: fistula and A/a: abscess. Uppercase letters are used for the permanent dentition and lowercase letters used for the primary dentition. The PUFA/pufa score per person is calculated in the same cumulative way as for the DMFT/dmft and represents the number of teeth that meet the PUFA/pufa diagnostic criteria. The PUFA for permanent teeth and pufa for primary teeth are reported separately.[49]

A study conducted in West Rand, SA among four to five and six to eight-year-old reported the prevalence of pufa to be 49% and 46% respectively. These meant that for the four to five-year olds, more than one in three children presented with pulpitis, ulceration, fistular or abscess and for the six-year-old the figure was almost one in 2.5 children. The Pufa scores implied that more advanced treatment options such as endodontics, pulpotomy, or pulpectomy were to be considered if more teeth were to be saved from extraction.[51] Studies done in Pakistan and India reported the

prevalence of PUFA be 49% indicating half the decay had progressed to involve the pulp.[52, 53] This implies the cost implication that may be needed to save those teeth which could be underestimated by the low DMFT prevalence. Untreated dental caries may result in a higher risk of hospitalisation, loss of days at school with diminished ability to learn and poor child development.[54, 55]

2.3 Diet and dental caries in rural and urban areas

Empirical data exists demonstrating that dietary sugar and increased carbohydrate consumption has a negative impact on health including an increase in the BMI and increased risk for DC[37, 56]. In rural areas, the risk for consumption of sugar may be reduced, depending on the level of agricultural investment and fresh produce available to children and adults living in these areas. [57] In urban areas, particularly in regions where individuals experience high rates of income, the risk for consumption of sugary sweets and other unhealthy foods increase. This could lead to the development of DC if good oral hygiene habits are not practiced.[37] Urban areas are characterized by markedly different food supply environments. Options for eating outside of the house or buying processed or prepared food are more abundant in urban areas, in part because food-manufacturing sectors are often based nearby.[58] Moreover, the ongoing expansion of supermarket and fast food chains in the developing world is still mainly concentrated in urban areas.[59] Urbanization also coincides with increases in wealth, which in turn can be expected to significantly change dietary patterns.[60]

2.4 Prevention and management of dental caries

Prevention and management of caries occurs at the individual, professional and/or community levels. Identification of the groups at risk is important since the disease is widespread but not uniformly distributed.[61] Observing good dental hygiene and control of consumption of the cariogenic sticky foods are the initial approach in the prevention of caries. Dental restoration, endodontic treatment and extraction is needed when caries have progressed to destroy the tooth structure. For Prevention the use of fluoride containing toothpaste, topical application of fluoride vanishes and placement of fissure sealants is recommended.

2.5 BMI

BMI is a widely used screening tool to estimate individual's total amount of body fat, based on two anthropometric parameters, height and weight.[62] It is calculated by dividing the weight in kilograms by height in metres squared (m). Differences in BMI between people of the same age and gender are usually due to body fat. However, there are exceptions to this rule, which means a BMI figure may not be accurate.[62] Since the calculation requires only height and weight, it is inexpensive, easy to use for clinicians, general public and children do not find it uncomfortable.

2.5.1 BMI and children

The healthy BMI range for adults is 18.5 to 24.9. However, children are constantly growing, which makes it difficult to have set values for BMI cut-offs. For adults who have stopped growing, an increase in BMI is usually caused by an increase in body fat. But as children grow, their amount of body fat changes and so will their BMI. For example, BMI usually decreases during the preschool years and then increases into

adulthood. For this reason, a BMI calculation for a child or adolescent is interpreted differently from an adult's and takes into account the age and sex of the child or adolescent.[63]

Some exceptions to the BMI rule

BMI does not differentiate between body fat and muscle mass. This means there are some exceptions to the BMI guidelines, including:

Muscles – body builders and people who have a lot of muscle bulk will have a high BMI, but are not overweight.

Physical disabilities – people who have a physical disability and are unable to walk may have muscle wasting. Their BMI may be slightly lower, but this does not necessarily mean they are underweight

Height – BMI is not totally independent of height and it tends to overestimate obesity among shorter people and underestimate it among taller people.

People of different ethnic groups – Asians and Indians, for example, have more body fat at any given BMI compared to people of European descent. Therefore, the cut-offs for overweight and obesity may need to be lower for these populations.[63]

The WHO has developed recommendations on the reference values (cut-off points), to classify the weight condition of individuals into underweight, normal, overweight and obese. A healthy BMI range is between 19 and 25, and a BMI between 25 and 29 is considered moderately overweight and over 29 indicates obesity for adults. For children the following categories are used; underweight (<13.25 kg/m^2), normal (13.26-18.59 kg/m^2), overweight (18.60-21.59 kg/m^2) and obese (≥21.60 kg/m^2).[64, 65] These universal cut-off points for BMI of classified as overweight and obese

correlate with body fat and with cardiovascular risk factors and the probability to acquire diabetes. It is known that diabetes is only a possible consequence, among many other disorders, associated with obesity, which has increased its prevalence worldwide among young population in recent years and it has been recognized as epidemic in almost all countries.[66] Being overweight or underweight can affect an individual's health.[66]

If an adult person is overweight (with a BMI over 25) and physically inactive, they may develop: cardiovascular (heart and blood circulation) disease, gallbladder disease, high blood pressure (hypertension), type 2 diabetes, osteoarthritis, certain types of cancer, such as colon and breast cancer, depression and other mental health disorders. If an adult person underweight, (BMI less than 18.5), they may be malnourished and develop compromised immune function, respiratory disease, digestive diseases, cancer and osteoporosis.[66]

Contributing factors

There are numerous factors that can influence body weight. The individual has no control over some of these factors, including developmental determinants, genetic makeup, gender and age. Other factors that influence body weight over which the individual has potential control include educational background, socioeconomic status, cultural and some environmental and social factors.[67]

Eating habits of individuals, duration and the frequency of food consumption also has an effect on body weight.[68] A high-energy intake or an energy intake that is not adjusted downward with declining physical activity or age-related decreases in lean body mass is associated with the development of overweight or obesity in susceptible individuals. High-fat diets may promote increased energy intake or may

be associated with metabolic changes that promote the deposition of adipose tissue.[68] BMI does have limitations in its ability to assess adiposity. It has long been recognized that elevation of BMI does not always equate to increased adiposity.[68] Because it is a weight-for-height measure, BMI does not distinguish between fat mass and lean body mass. Thus, individuals with increased muscle mass may also have increased BMI.[68]

As previously mentioned SA battles with an increase in prevalence of obesity and hence measuring BMI in a school setting will assist identifying those children at high risk and therefore allow for early intervention.[69, 70]

2.5 Association between diet, DC and BMI

Evidence of the association between the nutritional status and DC is inconsistent. While some studies have reported a positive correlation between caries and obesity, others have shown that underweight children tend to have a higher prevalence of caries compared to their overweight counterparts.[2, 11] Globally DC affects 600 million children and adolescents while the prevalence of obesity ranged between 8% and 24%.[71, 72] Studies suggest that both contribute to significant health expenditures.[73, 74] For example, the annual cost of obesity in Australia was recently quoted as high as $58.2 billion Australian dollars, with obesity and overweight considered among the three highest contributions to disability and poor quality of life.[73] Dental disease is also increasingly costly, with expenses rising as high as six to fourteen percent of current healthcare expenses.[73, 74] Obesity is also a multifactorial disorder, influenced by environmental and genetic risk factors, where a sustained imbalance between energy intake and energy expenditure facilitates storage of excess energy as fat.[75] Diet is a primary determinant of obesity. Consumption of energy-dense low nutrition

foods, which tend to be high in saturated fats and sugars, and low fruit and vegetable consumption have been linked with increased weight gain and obesity.[76-80] Poor diet can also impact negatively on health through effects on immune functioning, growth, development, ageing and oral health. Poor oral health is typified by the onset of DC, presently the most common chronic disease found in children.[81] Children with caries may present with pain and ultimately tooth loss. This could result in a reduction in food intake, which in turn may lead to stunted growth.[64] On the contrary, an increase consumption of fermentable carbohydrates can result in an increase in both weight and in the prevalence of dental caries.[82] Alswat et al., reported a positive association between DC and BMI, whilst Bhayat et al., and Frias-Bulhosa et al., reported a non-significant association.[43, 83, 84] Although the eating pattern among overweight and obese children may represent a risk of dental caries, systematic reviews has revealed contradictory results, mainly in paediatric populations.[22, 85-87]

A systematic review by Kantovitz et al., (2006), which focused on obesity and dental caries studies among all age groups. Out of 33 papers only 7 met the inclusion criteria.[86] Of these, one study by Willerhausen et al. (2004) showed that children with normal weight had significantly less caries than overweight children.[88] However, the Willerhausen et al. studies used BMI scores which are not as meaningful as BMI-for-age percentiles in growing children and adolescence.[89] BMI can be interpreted using WHO categories for growing children and adolescents.[90] It has been used in the past and has been proven to be a reliable and accurate classification of normal, underweight, overweight and obese individuals.[39]

A recently published systematic review of studies done between 2004-2011 reported that two studies had found overweight and obese adolescents to have more caries

than normal-weight individuals. Out of 47 studies, only two had associated overweight and obese with dental caries.[22] One study concluded that only 12-year-old children with caries was associated with high BMI and the other reported an association only in the primary dentition.[22] These inconsistencies may be caused by differences in study design, study location, methods of assessment of nutritional status and of DC, and the age of the participants and their socio-economic background.[91] The review also reported that high BMI was associated with high caries experience in developed, industrialised countries but not in developing, newly industrialised countries such as Brazil, India and Thailand.[2] This might be due to increased affluence and access to high caloric carbohydrate-rich foods and drinks, increasing consumption of animal products and refined foods at the expense of vegetables and fruits and lack of physical activity.

Although there is still no consensus on the association of BMI and DC, from the literature, there is enough evidence on dietary factors that can lead to an in increase in BMI and development of caries

CHAPTER 3: METHODOLOGY

3.1. Aim of the study

The aim of the study was to determine the relationship between diet, dental caries and the BMI among grade six learners at selected primary schools in Tshwane West District, Pretoria.

3.2. Objectives

There were two key objectives in this study:

A. To determine the;

1. Dental caries prevalence and severity using the DMFT and PUFA indices respectively

2. Body mass Index, and

3. Association between diet, DC and BMI

B. To assess the diet and oral health practices of the children in this study cohort

3.3. Methods

3.3.1 Study design

A quantitative cross sectional analytical study design was used.

3.3.2 Study Population

The study was conducted amongst all grade six learners enrolled at the selected public primary schools in Tshwane West District, Pretoria

3.3.3 Study Setting

Four public primary schools located in Tshwane West district, Pretoria were selected using a convenience sampling strategy. All schools were classified as quintile 1-3, according to Department of education, which denotes low SES. These schools are non-paying fee, learners qualify to eat in a National School Nutrition Program (NSNP), and learners are provided with school uniform if parents cannot afford to buy it.

3.4 Inclusion criteria

All learners who were enrolled in grade six for the year 2017. The oral health of children 12 years old is the object of several epidemiological studies conducted around the world. According to the World Health Organization (WHO, 1997), the importance given to this age group is due to the fact that it is this age that children leave primary school.[39] Thus, in many countries, is the last age at which data can be easily obtained through a reliable sample of the school system. Moreover, it is possible that at this age all the permanent teeth except third molars, have already erupted. In this study the majority of 12 year olds were found to be at grade six

3.3.5. Exclusion criteria

Grade six learners who did not give consent. Learners who were enrolled from grade 1 to 5, and grade 7 for the year 2017.

3.4 Sampling

The sample size was calculated from a total population of 11265 grade 6 learners who were enrolled for 2016 at all public primary schools in Tshwane West District.

Assuming the prevalence of obesity to be 23%[75] with a confidence level of 95% and a marginal error of ± 0.05, a minimum sample size of 372 learners was required. Tshwane West district has 93 primary schools, which were clustered into four areas (North, South, West and East) according to geographic location. One school was selected from each cluster using a convenience sampling technique. On average, the numbers of learners per school ranged between 94 and 130. Five hundred and twenty nine assent and consent forms were distributed, 440 were signed and returned. A Kappa score of 0.85 and 0.90 was obtained prior and during the study respectively to ensure intra examiner reliability.

3.5 Data collection tools

The data collection consisted of three parts: a questionnaire for diet and demographics, a clinical oral examination and the recording of the anthropometric scores (Appendix A). The questionnaire was developed based on previous studies and modified to suit the environment of this study.[83, 92] Two researchers administered the questionnaire. All the oral examinations was performed by a single calibrated dentist in a classroom under natural light with the participant sitting on a school chair. The primary dentition was excluded because at 12 years of age 90% of primary teeth had already exfoliated. Only teeth with cavitated caries was diagnosed as decayed while those with early white spot lesions or fissure sealants were recorded as sound. The World Health Organization (WHO) criteria was used to assess the caries status using DMFT and PUFA indices.[39] According to WHO, caries experience in 12 year old is classified into 5 categories; very low<1.2, low 1.2-2.6, moderate 2.7-4.4, high 4.5-6.5 and very high > 6.5.[39] For this study the categories were classified into three;(no caries = 0, low caries = 0.1- 2.6, and moderate ≥ 2.7) for ease of analysis.

The learners were assured that the natural light would not harm them nor cause any injury, side effect during and or after the examination period. The PUFA index was used to measure the severity of the DC. A single operator recorded height and weight and this was used to compute the BMI (weight in kilograms divided by height in metres squared (kg)/ m^2). The height of children, standing upright without shoes, was measured with a portable stadiometer to the nearest 0.5 cm. Weight was recorded with a calibrated portable electronic digital scale to the nearest 0.5 kg. A stadiometer and digital scale was recalibrated each day before data collection. No adjustments were made for clothing, but children were requested to remove shoes, jackets and jerseys prior to measuring the weight.

3.5.1 Calibration and training

In order to obtain an acceptable level of reliability, one examiner was calibrated to record the caries status. Calibration for the recording of caries was done using slides and mounted extracted teeth and a Kappa scores ranging from 0.85 and 0.90 was obtained prior and during the study and considered acceptable for intra-examiner reliability, respectively. Every tenth learner was re-examined to ensure intra-examiner reliability. Only one examiner recorded the weight and height of the learners and for every tenth learner the weight and height was re-recorded to ensure reliability

3.6 Data capturing and analysis of data

The data was captured using Microsoft Excel and imported into SPSS version 23 for analysis. Descriptive statistics including the percentages, means and standard deviations was performed. Inferential tests such as Chi-Square test to test for

significance for categorical data between the different BMI and DMFT groups and Kruskal-Wallis test for comparing continuous data was used. Linear regression analysis was used to assess significance levels after controlling for possible confounding variables.

3.7. Reporting of findings to study subjects

Parents or legal guardians of all learners examined were notified of their child's oral health status, including presence of caries. If treatment was required, a referral letter was given to them. (Annexure B)

3.8. Socioeconomic status (SES)

After thorough review of the literature, various questions were developed and modified to suit the current study. Data was categorized for comparison between various variables for ease of analysis. Socioeconomic status was determined by scoring the parents employment status, last school grade, owning DSTV and home type. High scores were given for parents who were employed, those with a high education, those who owned a DSTV and those living in a home rather than a shack or flat. The total score was categorised into low, medium and high with the highest score referring to high SES.

3.9. Oral hygiene practices

The participants received a 15-minute presentation regarding oral hygiene practices and healthy eating habits after data collection to modify their oral healthcare knowledge and practices. They were shown how to brush and floss their teeth and all participants received pamphlets containing information on brushing and oral hygiene practices, a toothbrush and a toothpaste.

3.10. Ethical considerations

Ethical clearance and permission to conduct the study was obtained from the University of Pretoria, Research Ethics Committee of the Faculty of Health Sciences (442/2016) (Appendix E), assent form (Appendix B), consent form (Appendix C), Gauteng Department of Education (Appendix F) and the manager at Department of Education, Tshwane west district (Appendix G). All information was strictly confidential.

CHAPTER 4: RESULTS

4.1 Response rate and demographic characteristics

A total of 529 consent and assent forms were distributed to grade six learners at the four-selected public primary schools located in Tshwane West district. Of these, 440 (83%) learners returned the signed consent forms and were included in the study. Those who did not have signed consent forms or who were absent on the day of the clinical examination were excluded from the study. The demographic information is summarized in (Table 1). The mean age of the participants was 11.8yrs (SD= ±0.98yrs; range 10-15years) and more than half (53%) were males. Some of the learners did not know the employment status or the last school grade that their parents had passed and as a result, they were not included in the analysis. The majority (71%) of fathers and half (50%) of the mothers were employed. Most of the parents completed high school. Almost two thirds (60%) were classified as being from a medium SES, whilst 30% were classified as being from a high SES. (Table 2)

Table 1. Participant's demographic characteristics

Gender (%)		Mean age in years (±SD)	Mean age (±SD)
Female	207 (47)	11.61 (±0.93)	11.8 (±0.98)
Male	233 (53)	11.93 (±1.01)	
Mother (n=420) (%)		Father (n=381) (%)	
Employed 208 (50)	Unemployed 212 (50)	Employed 273 (72)	Unemployed 108 (28)
Mother (n=272) (%)		Father (n=219) (%)	
Primary school 9 (3)	High school 234 (86)	Tertiary 29 (11)	Primary school 9 (4)	High school 186 (85)	Tertiary 24 (11)

Table 2. Participant's socioeconomic status (SES)

Category	N %
Low	40 (10)
Medium	266 (60)
High	134 (30)
Total	440 (100)

4.2 DMFT

The prevalence of DC was 43% (189/440) with a mean DMFT score of 1.19 (*SD*= ±1.79). The mean D component was significantly higher (p=0.00) compared to the M and the F. The mean decayed component comprised 90% of the mean DMFT score with the remainder comprising of both missing and filled at 5% respectively. Although there was no statistical difference between the males and females (p=0.31) with

regards to prevalence and mean DMFT score, males tended to have a higher mean DMFT and prevalence score compared to females (Table 3).

Table 3. The mean DMFT and prevalence of caries among the participants (n=440)

Gender	Caries prevalence n (%)	Decayed Mean (±SD)	Missing Mean (±SD)	Filled Mean (±SD)	Total DMF Mean (±SD)
Females	84 (40%)	1.01 (±1.58)	0.02 (±0.15)	0.01(±0.15)	1.04 (±1.64)
Males	105 (45%)	1.12 (±1.60)	0.06(±0.36)	0.11(±0.76)	1.29 (±1.91)
Total	189 (43%)	1.07 (±0.58)	0.05 (±0.28)	0.07 (±0.34)	1.19 (±1.79)

The PUFA index was used to determine the consequences of untreated dental caries. None of the participants presented with pus, ulceration, fistula and abscess, therefore the PUFA index was not reported

4.3 BMI

The mean BMI was 17.74 (±3.00) kg/m^2. The majority (71%) of participants had a BMI score that was within the normal range with 19% being overweight (figure 1).

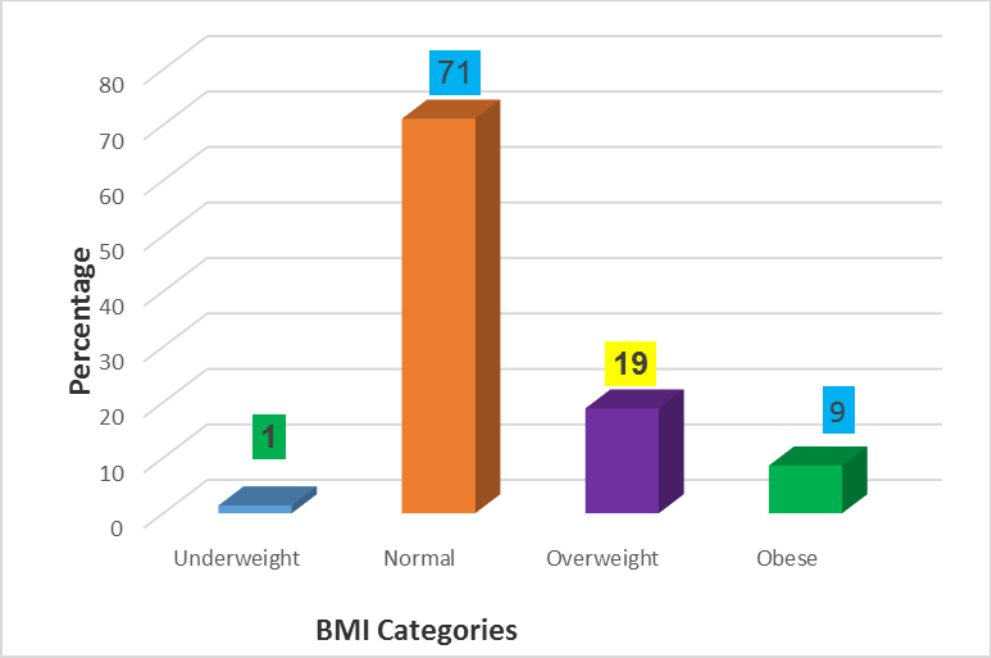

Figure 1. Distribution of participants according to their BMI classification (n=440)

There were no significant associations between the mean DMFT (p=0.51) and BMI (p=0.20) scores and the SES categories of the participants (Anova test). While there was no significant association, participants from medium SES tended to have a higher DMFT than their counterparts.

4.4 Oral health practices

Less than half (47%) of the participants reported to brush their teeth twice daily. The majority (71%) claimed that they drank between one and one and a half glasses of sugar sweetened beverages (SSBs) daily and more than half 67% reported to eat

one to three sweets per day. Regarding the type of meals, half reported to eat only starch (e.g soft porridge and bread) for breakfast. For lunch and supper, the majority consumed a combination of starch (pap, potatoes and rice) and proteins (beef meat, fish and cheese) and almost a third reported to eat junk food (atchar, fried potato fries and, bread) during lunch. (Table 4)

Table 4. Participants diet and oral health practices

Brushing teeth (n= 434)	**N (%)**			
Once a day	159 (37)			
Twice a day	203 (47)			
More than twice a day	72 (17)			
Number of glasses of sugar sweetened beverages consumed (n = 435)				
1 to 1.5 glasses	307 (71)			
2 and more glasses	128 (30)			
Number of sweets consumed (n= 395)				
1 to 3 sweets	264 (67)			
4 or more sweets	131 (33)			
Meals	**Starch**	**Proteins**	**Combination**	**Junk**
Breakfast (n= 373)	185(50)	4 (1)	172 (46)	12 (3)
Lunch (n = 430)	98 (23)	5 (1)	203 (47)	124 (29)
Supper (n=436)	14 (3)	2 (1)	415 (95)	5 (1)

4.4 Association between dental caries, mean age, BMI, SSBs and sweets

The participants with a moderate DMFT were significantly more likely to be older, had a higher BMI and consumed more SSBs compared to those with no or low DMFT scores (Table 5).

Table 5. Association between dental caries, mean age, BMI, SSBs and sweets

DMFT	Age years mean (±SD)	p-value	BMI mean (±SD)	p-value	SSBs mean (±SD)	p-value	Sweets mean (±SD	p-value
No caries (DMFT=0)	11.69 (±0.96)	**0.00***	17.70 (±3.20)	0.56	1.48 (±0.89)	0.34	2.59 (±2.11)	**0.01***
Low caries (DMFT=0.1-2.6)	11.69 (±0.97)		17.50 (±2.35)		1.54 (±0.77)		3.44 (±2.74)	
Moderate (DMFT ≥2.7)	12.13 (±0.98)		18.00 (±3.58)		1.64 (±1.15)		3.19 (±3.44)	

*Level of significance at p<0.05

CHAPTER 5: DISCUSSION

5.1 Dental caries prevalence

The caries prevalence in the current study was 43% with a mean DMFT score of 1.19 which is considered "low" by the WHO. Although considered low, the decayed component made up 90% of the DMFT score. This was similar to other studies done both in South Africa and in other developing countries which ranged between 83% and 96%.[93-98] This high proportion of unrestored teeth in developing countries could be due to a lack of public oral health facilities and resources (dental restorative materials, personnel, dental equipment etc.) which could lead to an overburden of the current structures.[99] This often results in dental personnel not being able to provide restorative and preventive dental services. Furthermore, lack of dental awareness and low priority placed on oral health care compared with other needs could be responsible for not restoring teeth.[97, 99] Another reason could be due to accessibility to oral health service due to either lack of transport, bad roads and cost of transport.

5.2 Body Mass Index

BMI has been widely used in the field of dentistry, especially in studies related to obesity and DC.[100] About 71% of the current study participants had a BMI score within the "normal range" while 19% were "overweight". This was similar to other studies that reported that 88% and 78% had normal weight and between 3% and 19% being overweight (Nigeria and India respectively).[18, 101] The prevalence of overweight in these studies was higher than the global prevalence in children aged 5-17 years as estimated by the WHO to be approximately 10%[102]. However, authors

agree that the WHO value is unequally distributed due to the combination of first, third world countries, and the combination of the various ages of participants. In this study, only 1% of the participants were categorised as underweight compared to a 2005 study, which showed that the school age children showed signs of nutritional problems in the form of stunting (18%), wasting (4%) and overweight (6%).[103] The reason might be that many children were now receiving fruit and vegetables through NSNP, and an increase in the average meal cost allowance per student per day and the addition of a guideline to allow for fresh vegetables or fruit to be served daily.[104] There were no differences in BMI of the participants in relation to parental employment status and parental level of education. The reason might be that the NSNP could be reducing the disparity between the children who would normally bring food and those who would not afford it.

5.3 Oral Health Practices

Less than half (47%) of participants reported to brush twice daily with a fluoride toothpaste and this has been widely promoted by the dental profession since it plays a pivotal role in the prevention and control of DC.[24, 105]

This was similar to a Chinese study which reported 44% of school children brushed their teeth twice a day.[106] Possible reasons for the low rate of frequent brushing in this current study could be attributed to the low SES of the participants. The schools where the study was performed were classified as quintile 1-3, which denotes low SES, and this meant that most learners were from a low SES. The purchase of toothpaste might not be a first priority for the participant's parents. Additionally, it might be lack of knowledge from both parents and participants.

5.4 Dietary Intake

The majority (67%) of participants ate between one and three sweets per day and this could be as a result of easy access to shops that were located around all the schools that were visited. This was in contrast to a study done in China where almost 70% of school learners consumed more than 4 sweets per day.[106] This could be due to lack of knowledge about the danger of consumption of sweets and that the sweets that are sold at the school are considered to be cheaper than nutritious food in the current study. Almost all of the participants (96%) reported to eat breakfast, which consisted of starch and proteins. In SA, the staple food is mealie-meal, which is composed of starch. Most households have mealie meal, which can be served as soft porridge. During lunch, less than half (47%) ate a combination of starch and proteins while 29% reported eating junk food. Participants that ate lunch provided by the National School Nutrition Program (NSNP) are served a balanced meal prescribed by the dietitian according the SA basic education policy, whilst those that were not participating in the NSNP could have been eating junk food that was purchased from the school vendors or brought it from home.[107, 108] For supper, the majority (95%) ate a combination of starch and proteins. The reason might be that this could be the only time parents of the participants are able to get to prepare a balanced nutritious meal and at that time most of the participants are at home because of fear of danger to be at the streets at night. Also, it could be only time where all family members are present.

5.5 Diet, DC and BMI

Older participants were more likely to have a higher prevalence of DC as compared to younger participants. The possible reason could be that teeth were present in the mouth for a longer period in the older participants and therefore were exposed to risk factors like SSBs and sweets. Similar to other studies, there was a statistically significant association between the DMFT score and the number of sweets eaten daily.[109] Those with moderate DMFT scores consumed more sweets and SSBs compared to those with no or low DMFT scores. Although there was no significant association between the DMFT score and the BMI, those with moderate caries were more likely to have a higher BMI. This could be as a result of consuming junk foods such as fried food loaded with fat and refined carbohydrates as reported in the diet analysis. There was no statistical significance between SES, DMFT and BMI. This could be due to the sample of this study being similar in socioeconomic status.

5.6 Limitations

Only self-reported qualitative and not quantitative analysis of diet was done. This might be a reason why findings reported a weak association between DC, diet and the BMI. Another limitation could be response bias because the data was collected by using an interview method and participants may have been reluctant to answer honestly. Additionally, although the employment status was reported, participants at that age were not aware of their parent's employment status and educational levels. The study also did not include the salary of the parents.

5.7 Conclusion

The DMFT was low, but the decayed component was relatively high. The PUFA score was zero. Most participants were classified as having a “normal” BMI with almost a quarter being classified “overweight”. There were no significant associations between the DMFT and the mean BMI scores and SES of the learners. More than half of the participants were from a medium SES and had a slightly high DMFT score than their counterparts. Less than half reported to brush their teeth daily, most of them had a balanced diet at supper.

5.8 Recommendations

Primary schools should be used to promote oral health by provision of oral health education and by highlighting harmful dietary practices. Harmful dietary practices must not only be taught to learners but the schools should take a step further by regulating the type of food sold at the cafeteria and with vendors outside the school premises. This will assist learners in making healthy choices when purchasing food and drinks. These recommendations are made in light of results of this study where participants reported to be consuming up to three sweets daily and consuming up to almost two glasses of SSBs that are bought at schools. While prevention and oral health promotion is important, curative services have to be rendered to participants with decayed teeth.

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Appendix A: Data collection sheet

Association between dental caries and body mass index among 6th grade leaners at selected primary schools in Tshwane West District, Pretoria, Gauteng province – South Africa

Demographics		
1. Age in years		
2. Gender	Male	
	Female	
3. Parents:	Employed	Unemployed
Mother		
Father		
4. What is the last grade or standard your parents passed?		
Mother		
Father		
5. Type of home where you stay	Tick the applicable one	
	Flat	
	House	
	Shack	
6. How many rooms does your family house comprise of?		
7. How many brothers of sisters do you have?		
8. How many people are living in the house?		
	Yes	No
9. Does your home have DSTV/ any satellite TV?		
10. Height (meters)?		
11. Weight (kg)?		
Diet history		

Food type and amount	**Breakfast**	**Lunch**	**Supper**
1. What kind of food do you eat			

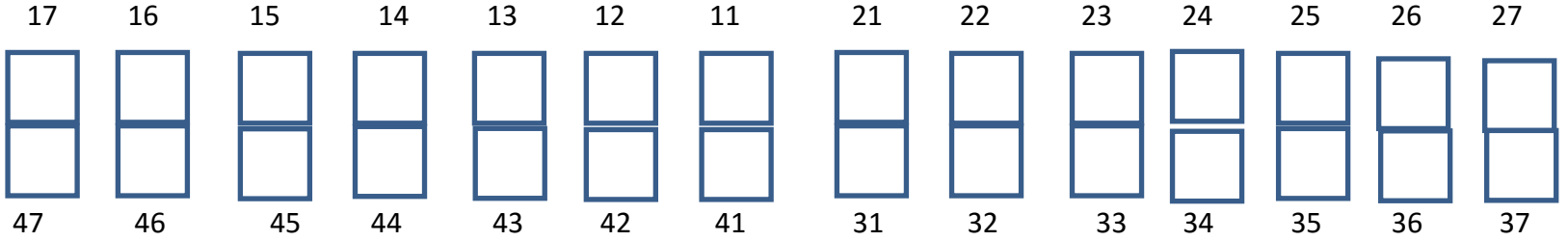
		Yes	**No**
2. Do you drink any soft drinks beverages for an example Coke, Fanta orange or juice			
If yes how many cans do you drink per day			
		Yes	**No**
3. Do you suck lollipop/eat sweets and chocolate?			
If yes how many per day?			
4. Do you eat from the feeding scheme at your school?	**Breakfast**	**Lunch**	
	Yes	**No**	
5. Do you participate in any sport activity e.g soccer, netball, rugby	**Yes**	**No**	
How many days in a week do you participate			

Oral Health Practices

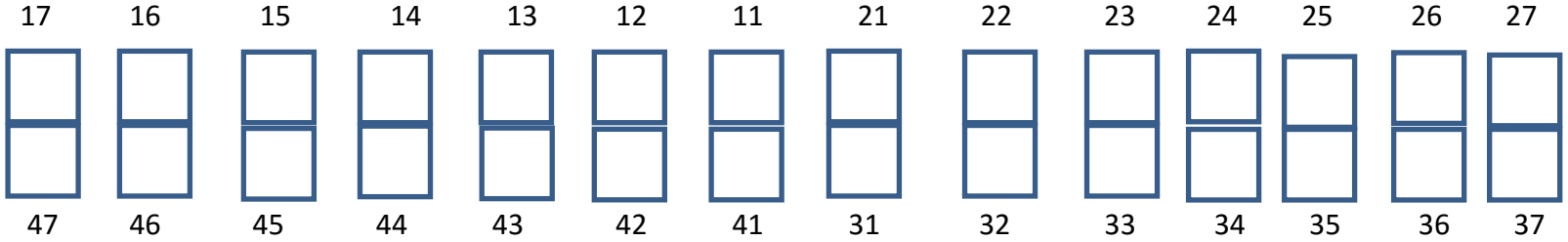
	Yes	**No**
1. Do you brush your teeth?		
2. If yes times do you brush your teeth	**Once daily**	
	Twice daily	
	More than twice daily	
	Other	
	Yes	**No**
3. Do you use a toothpaste		
4. If yes, what type do you normally use		

DMFT AND PUFA INDEX

DMFT: 0=Sound, D=decayed, M=missing, F=filled



PUFA: 0=Healthy, P=pulpal involvement, U=ulcer, F=fistula, A=abscess



Appendix B: Assent form

INFORMATION LEAFLET AND ASSENT FORM

PROJECT TITLE: Association between dental caries and body mass index among 6th grade leaners at selected primary school in Pretoria, Gauteng province – South Africa

Dear learner

I am **Dr NR Nkambule** a dentist specializing in Community Dentistry at the School of Dentistry, University of Pretoria. I am planning to conduct a study at your school on all the grade 6 learners and I would like you to participate. **The aim of this study is to determine the relationship between diet, decayed teeth, weight and height among the grade 6 leaners at selected primary school in Pretoria.** I will ask you a few questions regarding your diet and oral hygiene. I will look into your mouth and will then write down what I see in your mouth. I will also note how much you weigh and how tall you are. There are no risks or pain involved for you in participating in this study. A letter will be written to your parents explaining your oral health status and whether you need to undergo dental treatment or not. If you need treatment, you will be given a referral letter that can be taken to a dentist or oral health centre of your choice to carry out the dental treatment if you choose to. The results of the study might help to improve your oral and dental health.

No names will be written on the results and all the information will be kept confidential. No one will force you to carry on or be cross or upset with you if you don't want to. Take your time before deciding if you want to participate in this study. If you sign at the bottom it will mean that you have read this document, and that you would like to be in this study. If you have any questions that this leaflet does not fully explain please do not hesitate to ask the me at this number 082 7725135 / 012 319 2447

I, …….. (print full name), Date……. understand that my parent(s)/guardian(s) have given permission (said it is okay) for me to take part in the research project. I am taking part because I want to and not because I'm forced to do so. I have been assured that I can stop at any time I want to without getting into any trouble (nothing bad will happen to me and nobody will be mad at me if I want to stop). Also, I can always ask the dentist any question about the study.

School Name:……Grade……

Researcher's name: Dr NR Nkambule:

Signature……..Date:……

Appendix C: Consent form

INFORMATION LEAFLET AND CONSENT FORM

PROJECT TITLE: Association between dental caries and body mass index among 6th grade leaners at selected primary schools in Tshwane West District, Pretoria, Gauteng province – South Africa

Dear Parent / Guardian

I am **Dr NR Nkambule** a dentist specializing in Community Dentistry at the School of Dentistry, University of Pretoria. I am planning to conduct a study at your child's school on all the grade 6 learners. **The aim of this study is to determine the relationship between decayed teeth, weight and height among the grade 6 leaners at selected primary school in Tshwane West District, Pretoria**. I will ask your child a few questions regarding his/her diet and oral hygiene. I will have a look into your child's mouth then write down oral conditions that I see in your child's mouth and also note how much your child weigh and how tall he/she is. There are no risks or pain involved for your child in participating in this study. A letter will be written to you explaining the oral health status of your child. If dental treatment is needed for your child, you will receive a referral letter that can be taken to a dentist or oral health centre of your choice to carry out the dental treatment if you want to. The results of the study might help the clinics and hospitals to improve the dental services they offer to your child and other children and also to improve their oral health.

No names will be written on the results and all the information will be kept confidential. Take your time before deciding if you want your child to participate in this study by allowing a dentist to look at your child's mouth. If you sign at the bottom it will mean that you have read this document, and that you would like your child to be in this study. If you have any questions that this leaflet does not fully explain please do not hesitate to ask the me at this number 082 7725135 / 012 319 2447

Parent/Guardian's name: ----------(Please print)

Parent/Guadian's signature……: Date……

Child's Name……..Grade……....

Signature……..Date:……

Researcher's name: Dr NR Nkambule:

Signature……..Date:……

Appendix D: Referral Letter

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Department of Community Dentistry

University of Pretoria

Contact details: (012) 3192419

Patient:

Dear service provider

Thank you for seeing the above-mentioned patient.

The learner was screened during a community outreach programme and it was found that he/she has carious teeth that either need to be restored or extracted.

Please manage the patient further.

Name of Doctor: Dr NR Nkambule

Signature: 

Date: 22 May 2017

Appendix E: Ethics Clearance certificate

The Research Ethics Committee, Faculty Health Sciences, University of Pretoria complies with ICH-GCP guidelines and has US Federal wide Assurance.
- FWA 00002567, Approved dd 22 May 2002 and Expires 28 August 2018.
- IRB 0000 2235 IORG0001762 Approved dd 22/04/2014 and Expires 22/04/2017.

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Health Sciences Research Ethics Committee

24/11/2016

Approval Certificate
New Application

Ethics Reference No.:442/2016

Title: Association between diet, dental caries and body mass index among 6th grade learners at selected primary schools in Pretoria, Gauteng province – South

Dear Dr Ntombizodwa Nkambule

The **New Application** as supported by documents specified in your cover letter dated 14/10/2016 for your research received on the 17/10/2016, was approved by the Faculty of Health Sciences Research Ethics Committee on its quorate meeting of 23/11/2016.

Please note the following about your ethics approval:
- Ethics Approval is valid for 2 years
- Please remember to use your protocol number (**442/2016**) on any documents or correspondence with the Research Ethics Committee regarding your research.
- Please note that the Research Ethics Committee may ask further questions, seek additional information, require further modification, or monitor the conduct of your research.

Ethics approval is subject to the following:
- The ethics approval is conditional on the receipt of **6 monthly written Progress Reports**, and
- The ethics approval is conditional on the research being conducted as stipulated by the details of all documents submitted to the Committee. In the event that a further need arises to change who the investigators are, the methods or any other aspect, such changes must be submitted as an Amendment for approval by the Committee.

Additional Conditions:
- Approval is conditional upon the Research Ethics Committee receiving the permissions from relevant schools and the Department of Education.

We wish you the best with your research.

Yours sincerely

*** Kindly collect your original signed approval certificate from our offices, Faculty of Health Sciences, Research Ethics Committee, Tswelopele Building, Level 4-60*

Dr R Sommers; MBChB; MMed (Int); MPharMed,PhD
Deputy Chairperson of the Faculty of Health Sciences Research Ethics Committee, University of Pretoria

The Faculty of Health Sciences Research Ethics Committee complies with the SA National Act 61 of 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 and 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes, Second Edition 2015 (Department of Health).

☎ 012 356 3084 deepeka.behari@up.ac.za / fhsethics@up.ac.za http://www.up.ac.za/healthethics
✉ Private Bag X323, Arcadia, 0007 - Tswelopele Building, Level 4, Room 60, Gezina, Pretoria

Appendix F: Permission from Gauteng Department of Education

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

For administrative use:
Reference no. M2017/403

GDE RESEARCH APPROVAL LETTER

Date:	09 February 2017
Validity of Research Approval:	06 February 2017 – 29 September 2017
Name of Researcher:	Nkambule N
Address of Researcher:	P O Box 1533
	Rosslyn
	0200
Telephone Number:	012 319 2447 082 772 5135
Email address:	zdnkambule@gmail.com
Research Topic:	Association between diet , dental caries and body mass index
Number and type of schools:	Four Primary Schools
District/s/HO	Tshwane 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:

09/02/2017

1

Making education a societal priority

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

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.*
3. *A copy of this letter must be forwarded to the school principal and the chairperson of the School Governing Body (SGB) that would indicate that the researcher/s have been granted permission from the Gauteng Department of Education to conduct the research study.*
4. *A letter / document that outlines the purpose of the research and the anticipated outcomes of such research must be made available to the principals, SGBs and District/Head Office Senior Managers of the schools and districts/offices concerned, respectively.*
5. *The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials, principals, and chairpersons of the SGBs, teachers and learners involved. Persons who offer their co-operation will not receive additional remuneration from the Department while those that opt not to participate will not be penalised in any way.*
6. *Research may only be conducted after school hours so that the normal school programme is not interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.*
7. *Research may only commence from the second week of February and must be concluded before the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.*
8. *Items 6 and 7 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and be paid for by the Gauteng Department of Education.*
9. *It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.*
10. *The researcher is responsible for supplying and utilising his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institutions and/or the offices visited for supplying such resources.*
11. *The names of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may not appear in the research report without the written consent of each of these individuals and/or organisations.*
12. *On completion of the study the researcher/s must supply the Director: Knowledge Management & Research with one Hard Cover bound and an electronic copy of the research.*
13. *The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned.*
14. *Should the researcher have been involved with research at a school and/or a district/head office level, the Director concerned must also be supplied with a brief summary of the purpose, findings and recommendations of the research study.*

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards

.....

Ms Faith Tshabalala
CES: Education Research and Knowledge Management

DATE: 09/02/2017

Making education a societal priority

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
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Website: www.education.gpg.gov.za

Appendix G: Permission from Tshwane West District

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

Enq: ED Setshedi
Tel: 012 725 1358
Ref no: 11/1/3/1

To: The Principals
Thaba Primary School
Thorntree Primary School
Lowe Primary School
Botsalo Primary School

From: KG Mooke (Ms)
Acting District Director

Date: 13th February 2017

Subject: Request to Conduct Research

Please note that Nkambule N has been granted permission by Head Office to conduct research at the above mentioned primary schools. The exercise is scheduled for the academic year 2016.

The school principals and SGB members are kindly requested to welcome the researcher.

Please ensure that teaching and learning process is not negatively affected.

KG Mooke (Ms)
Acting District Director
Tshwane West

"Going for excellence in the Classroom"
Office of the Director – Tshwane West District
(Mabopane, Winterveldt, Ga-Rankuwa, Soshanguve, Kameeldrift, Rosslyn, Akasia, Pretoria North, Mountain View, Roseville, Capital Park, Hercules, Pretoria West, Lotus Garden)
Private Bag X38, ROSSLYN 0200. Tel (012)725 1300 Fax. (012) 725 1346
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