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The Correlation of Childhood Obesity and Dental Caries in South Central Kentucky

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THE CORRELATION OF CHILDHOOD OBESITY AND DENTAL CARIES IN SOUTH CENTRAL KENTUCKY

A Capstone Experience/Thesis Project

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By:

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ABSTRACT

The Correlation of Childhood Obesity and Dental Caries in South Central Kentucky

Does obesity have an effect on dental caries in South Central Kentucky? Previous research has presented information stating a high prevalence of tooth decay found within the state of Kentucky. In addition, studies have indicated an elevated rate of childhood obesity found within the region. As a future dental hygienist in Kentucky, it is important to understand if a correlation exists between tooth decay and childhood obesity to better educate both patients and caregivers. The investigation will utilize a sample of patient records through a retrospective collection process. A correlation of dental caries and childhood obesity is expected to be seen as a result of the study. Previous studies have shown each factor as being prevalent in the state of Kentucky, yet limited research has not combined the two entities. The primary goal of this study is to examine these characteristics within this immediate region. If a correlation is found, it will impact how dental hygienists in South Central Kentucky will educate patients and caregivers.

Keywords: Dental Hygiene, Dental Caries, Childhood Obesity, Childhood Caries

Dedicated to

My two daughters Georgia and Alexandria.

Be Who You Really Are, Do Not Change For Anyone, and Always, Always, Dream Big Enough to Achieve--Unknown
All Our Dreams Can Come True, If We Have The Courage To Pursue Them--Walt Disney

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VITA

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FIELDS OF STUDY

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CHAPTER 1

INTRODUCTION

Does obesity have an effect on dental caries in South Central Kentucky? Previous research has presented information stating a high prevalence of tooth decay can be found within the state of Kentucky (Centers For Disease Control, 2014). In addition, studies have indicated an elevated rate of childhood obesity found within the region (CDC, 2014). It is important for dental personnel in Kentucky to understand if a correlation exists between tooth decay and childhood obesity to better educate both patients and caregivers. This investigation will utilize a sample of patient records through a retrospective collection process. Previous studies have shown each factor as being prevalent in the state of Kentucky, yet there has been limited research concerning the relationship between the two entities.

CE/T Statement

A correlation of dental caries and childhood obesity is expected to be seen as a result of the study. The primary goal of this study is to examine these characteristics within this immediate region. Through the review of the medical/dental history of individual patient charts, data will be collected to analyze specific characteristics including: age, weight, height, sex, zip code, total number of permanent and primary teeth present, and the number of permanent versus primary teeth with decay. BMI will then be calculated using each child's age, weight, height, and sex. Decayed teeth and

BMI will then be compared to determine if a relationship exists among the two factors. If a correlation is found, it will impact how dental hygienists in South Central Kentucky will educate patients and caregivers.

Definitions

Early Childhood Caries (ECC): as the presence of one or more decayed (noncavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a preschool-aged child between birth and 71 months of age (American Dental Association, 2000)

Caries: formation of cavities in the teeth by the action of bacteria, also known as tooth decay

DS/ds Index: decayed surfaces of permanent dentition/decayed surfaces of primary dentition

BMI: Body Mass Index

CHAPTER 2

LITERATURE REVIEW

Dental caries and obesity are increasing among children in the United States (CDC, 2014). Although dental caries is a preventable problem, it is one of the most common chronic diseases found in children. Early childhood caries (ECC) can cause problems with a child's oral and systemic health as well as social development and intellectual health. Early childhood caries is defined as the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a preschool-aged child between birth and 71 months of age (American Dental Association, 2000). The American Academy of Pediatrics of Dentistry states that by age 5 about 60% of U.S. children will have had caries at some point, including the 40% of children who have it when they enter kindergarten (AAPD 2014). Obesity in children is increasing at an alarming rate in this country and all over the world. This is a public health concern for future generations. According to Elamgovan, Mungara, and Joseph (2012), changes in lifestyles and economic growth have led to a sedentary lifestyle and altered dietary patterns for many individuals. The CDC (2008) ranked Kentucky as the second highest state in the nation for missing teeth due to decay. Additionally, the CDC (2014) reported Kentucky as the sixth most obese state in the nation. Another study stated 35.7% of children in Kentucky are obese (F as in Fat, 2014). With both dental caries and obesity on the rise, it is important to

understand if there is a correlation between dental caries and obesity.

Also interested in the correlation between weight and dental caries was Dr. Andres Pinto and colleagues (2007) who conducted a study on the association between weight and dental caries among pediatric patients in an urban dental school. The study evaluated 135 children at their initial visit to The University of Pennsylvania School of Dental Medicine. The decayed surfaces of the permanent dentition/decayed surfaces of the primary dentition (DS/ds) index was used to evaluate caries while the Body Mass Index (BMI) was calculated using height, age, weight, and sex. The findings did not support a connection between dental caries and obesity. Pinto does suggest that further longitudinal studies need to be completed including dietary assessments and oral hygiene status.

In 2012, Elamgovan, Mungara, and Joseph conducted an observational cross-sectional study to find out if there was a relationship between BMI, dental caries, and the role of diet contributing to both problems. They examined school children between the ages of 6-12, using both genders, for a 3-month period. Children who had a systemic illness were excluded from the study. With parents' written permission, 600 children were randomly picked. Using the World Health Organization (WHO) criteria for dental caries, the children were examined. Each child's weight and height were measured and the BMI was calculated. The children and parents recorded a diet sheet that was statistically analyzed. Elamgovan, Mungara, and Joseph concluded that being overweight and/or obese is not a statistically significant factor in the development of caries even though caries scores in both dentitions increased as the BMI for age increased.

A cross sectional study conducted by Kandel and colleagues in 2008 examined childhood caries in the state of Kentucky. Caries were assessed in a visual examination with the "Smile Kentucky" program while parents completed a survey. The survey gathered information on the child's age, sex, race, school name, grade in school, zip code, questions about the child's dental insurance, and the parent's assessment of the condition of the child's teeth. This study included 3,488 children aged 5 to 13 years old. Data was analyzed using univariate, bivariate, and multivariate statistical techniques. The results showed that 33% of the children had untreated caries. Those individuals with the highest risk factors were children living in metropolitan areas who had not visited a dentist in 3 years and did not have any insurance. This study also showed there was little change in the percentage of caries since a 2001 survey by the National Oral Health Surveillance System.

Researchers are continuing to study the correlation between dental caries and obesity in children. Currently, there is little emphasis placed on any correlation in dental practices or dental schools. More research needs to be conducted to determine the nature of any relationship which may exist between caries and an individual's BMI score. Additionally, caregivers need to be educated to help control both of these health issues. The next chapter will describe the methodology that was used to determine the nature of the relationship between caries and BMI in South Central Kentucky.

CHAPTER 3

METHODS AND METHODOLOGY

The investigation utilized a sample of patient records through a retrospective collection process. Records were reviewed and data collected within the dental office of a local pedodontist. The collection of data for each patient were obtained from the medical/dental history of each patient record and included the following: age, weight, height, sex, zip code, total number of teeth, total number of teeth with decay, total number of permanent teeth with decay, total number of primary teeth with decay, and total number of teeth without decay respectively for the permanent and primary dentitions (1). BMI was calculated for each patient using a formula to include height, weight, age, and sex in reference to the parameters of the Centers for Disease Control (CDC). All identifying factors of each patient were protected by assigning random numbers that were specific only for this study. SPSS® 22.0 software was used to interpret data collected. Descriptive statistics were then be used to analyze the data. IRB approval through WKU was obtained January 2015. The next section will present the findings of this study.

CHAPTER 4

RESULTS

Upon review of the 53 patients' charts, it was noted that the patient's ages ranged from 2-14. The amount of patients for each age were identified as the following: age 2-one patient (1.88%), age 3-one patient (1.88%), age 4-two patients (3.77%), age 5-twelve patients (22.64%), age 6-fourteen patients (26.41%), age 7-three patients (5.66%), age 8-four patients (7.54%), age 9-four patients (7.54%), age 10-four patients (7.54%), age 11-five patients (9.43%), age 12-zero patients, age 13-one patient (1.88%), age 14-two patients (3.77%). Of the 53 charts reviewed, 21 patients (39.62%) were male and 32 patients (60.37%) were female.

When reviewing the zip codes of residence for each patient, the following areas were identified: Bowling Green, KY-26 patients (49.05%), Franklin, KY-3 patients (5.66%), Owensboro, KY-2 patients (3.77%), Morgantown, KY-5 patients (9.43%), Hawesville, KY-1 patient (1.88%), Alvaton, KY-1 patient (1.88%), Huff, KY-2 patients (3.77%), Woodburn, KY-2 patients (3.77%), Golden Pond, KY-1 patient (1.88%), Roundhill, KY-1 patient (1.88%), Glasgow, KY-3 patients (5.66%), Drakesboro, KY-1 patient (1.88%), Scottsville, KY-1 patient (1.88%), Mayfield, KY-2 patients (3.77%), Beaver Dam, KY-1 patient (1.88%).

The number of teeth was then analyzed from the patient pool to determine total number of teeth, total number of decayed teeth, total number of decayed primary teeth,

and total number of decayed permanent teeth. It was determined there was a total of 1171 teeth present. Of the total number of teeth, 474 (40.48%) were permanent teeth while the remaining 697 (59.52%) were primary teeth (2). Of the 1171 teeth, 562 (47.99%) had decay present which included 89 (7.60%) decayed permanent teeth and 473 (40.39%) decayed primary teeth. Finally, the percentage of decayed teeth in relation to each dentition was calculated. It was found that 89/474 (18.78%) of all permanent teeth were decayed while 473/697 (67.86%) of all primary teeth were decayed (3, 4). Body Mass Index (BMI) was then calculated to determine if the patient was under weight, ideal weight, overweight, or obese. There were 3 patients (5.66%) who were classified as underweight, 35 patients (66.04%) classified as being at ideal weight, 6 patients (11.32%) classified as being overweight, and 9 patients (16.98%) were classified as obese. The underweight group had 53 teeth present with 34 of these decayed (64.15%). The group classified as being ideal weight had 774 teeth present with 378 of these decayed (48.84%). The overweight group had 135 teeth present with 57 decayed (42.22%). Finally, the group identified as being obese had 209 teeth present with 93 decayed teeth (44.50%).

Next the data were put into SPSS® 22.0 software to interpret the data. A Pearson Chi-Square test (5) was performed to examine an association between BMI and number of decayed primary teeth. The p value was 0.05 and the obtained asymptotic significant value was 0.032. Thus, it indicated that the test was statistically significant ($p = 0.05$) and an association between BMI and the number of decayed primary teeth was shown. From the cross tabulations, it could be inferred that the overall caries rates in the ideal weight

and underweight patients were higher as compared to the overweight and obese individuals.

CHAPTER 5

CONCLUSION

The previous chapters have discussed childhood obesity and dental caries increasing in the United States (CDC 2014) and a possible association between the two in the South Central Kentucky region. Based on the background knowledge of dental caries and childhood obesity as individual entities, the research presented is an essential indicator to promote knowledge about these factors among dental hygienists in order to educate caregivers and patients in South Central Kentucky.

The study sample (n=53) is a comparatively small population. Of the 53 patients, 26 (49.05%) were in the age range of 5-6 years. The sample is not evenly distributed for all ages as the majority of the data collected involved patients ranging in age from 5-6 years. Examples of this include single samples for ages 2, 3, and 13. No samples were taken for the age of 12 years, which limits the sample size. As a patient and parent, this is important information to know because this particular age group would have their second permanent molars erupting at this time. As permanent molars erupt at approximately the ages of 6 and 12, it is important to impart education to both patient and parent to prevent caries of these molars. Due to their location in the oral cavity and difficult access for cleaning, it is essential to educate an individual about the importance of the permanent molars and the subsequent preservation for their lifetime.

Upon analyzing the geographical distribution of the study sample, it was noted that 49.05% of the cases were from Bowling Green, KY. Apart from Bowling Green, other areas of South Central Kentucky seemed to exhibit an even geographical dispersion of the remaining patients among the regional area.

Of the 1171 total teeth, 59.52% were primary teeth and 40.48% were permanent teeth. The percentage of total decayed teeth (primary + permanent) was 47.99% of the total number of teeth evaluated. Of the total number of primary teeth, 67.86% had caries present (6). Of the total number of permanent teeth, 18.78% had caries present. The high rate of caries seen with the primary teeth indicates that education needs to be promoted within South Central Kentucky to prevent these caries rates.

The statistical analysis of the study data indicated an association between BMI and the number of decayed primary teeth. However, the caries rate of ideal and underweight cases was comparatively higher than the overweight and obese cases because larger portions of the study sample were reported as having an ideal or underweight BMI. High caries rates were seen with the underweight BMI classification, which contained a small sample size of patients.

The findings of this study do differ from the hypothesis as there was no correlation found between dental caries and BMI. There was a high rate of primary tooth decay found within South Central Kentucky. With 15 (28.30%) of the 53 patients being overweight and obese does suggest an elevated rate of obesity in this area. Pinto and colleagues (2007) and Elamgovan, Mungara, and Joseph (2012) also discovered high rates of caries and elevated rates of BMI, yet found no correlation between the two entities.

Future studies should include a larger sample size of individual ages and total participants to provide more accurate findings that could be generalized for a larger population. Focus could be directed upon a larger sample size of obese cases to better compare caries rates within the population. As a dental hygienist in South Central Kentucky, it is important to educate patients, care givers, and dental professionals about the large number of caries in primary teeth found in this study. Education needs to be provided at the pre-kindergarten, kindergarten, and first grade levels with children and their caregivers. Dental personnel should make every effort to go into programs such as Head Start, local schools, and the Boys and Girls Club in this area to educate children regarding the importance of oral health and healthy eating. As a hygienist, supplying this information to dentists in the area would help to raise awareness of the problems with decay in primary teeth found within the region. An ideal model would include hygienists and dentists working together to provide dental screenings to educate both patients and parents on the importance of caring for primary teeth before damage occurs to permanent teeth.

REFERENCES

Childhood obesity facts. (2014, Sept. 3). Retrieved March 6, 2015, from http://www.cdc.gov/obesity/data/childhood.html

Determining your body mass index. (2014, April 6). Retrieved March 6, 2015, from http://healthand wellness.bluecrossmn.com/Search/85,P00200

Elangovan, A., Mungara, J., & Joseph, E. (2012). Exploring the relation between body mass index, diet, and dental caries among 6-12-year-old children. *Journal of Indian Society of Pedodontics and Preventive Dentistry,* 30 (4), 293-300.

F as in Fat Report 2014. (2014, January 1). Retrieved April 5, 2015 from http://healthyamericans.org/report/108/

Hong, L. (2008). Obesity and dental caries in children aged 2-6 in the United States: National Health and Nutrition Examination Survey 199-2002. *Journal of Public Health Dentistry, 68*(4), 227-233.

Kandel, E., Richards, J., & Binkley, C. (2012). Childhood caries in the state of Kentucky, USA: A cross-sectional study. *BMC Oral Health 5,* 38-38.

Mathu-Muju, K. (2008). Kentucky rates second in U.S. in poor oral health. *Advances & Insights*.

Pinto, A. (2007). Is there an association between weight and dental caries among pediatric patients in an urban dental school? A correlation study. *Journal of Dental Education, 71*(11), 1435-40.

Policy on early childhood caries (ECC): Classifications, Consequences, and Preventive Strategies. (2014). Retrieved February 13, 2015, from http://www.aapd.org/

Statement on early childhood caries (2000) Retrieved March 6, 2015, from http://www.ada.org/

APPENDIX

Chart	Age	Weight	Height	Sex	Zip Code	# of Primary Teeth Present	# of Permanent Teeth Present	Total # of Decayed Teeth	A-T Decayed	1-32 Decayed
1										
2										
3										
4										
5										
6										
7										
8										
9										

Figure 1: Data Collection Chart

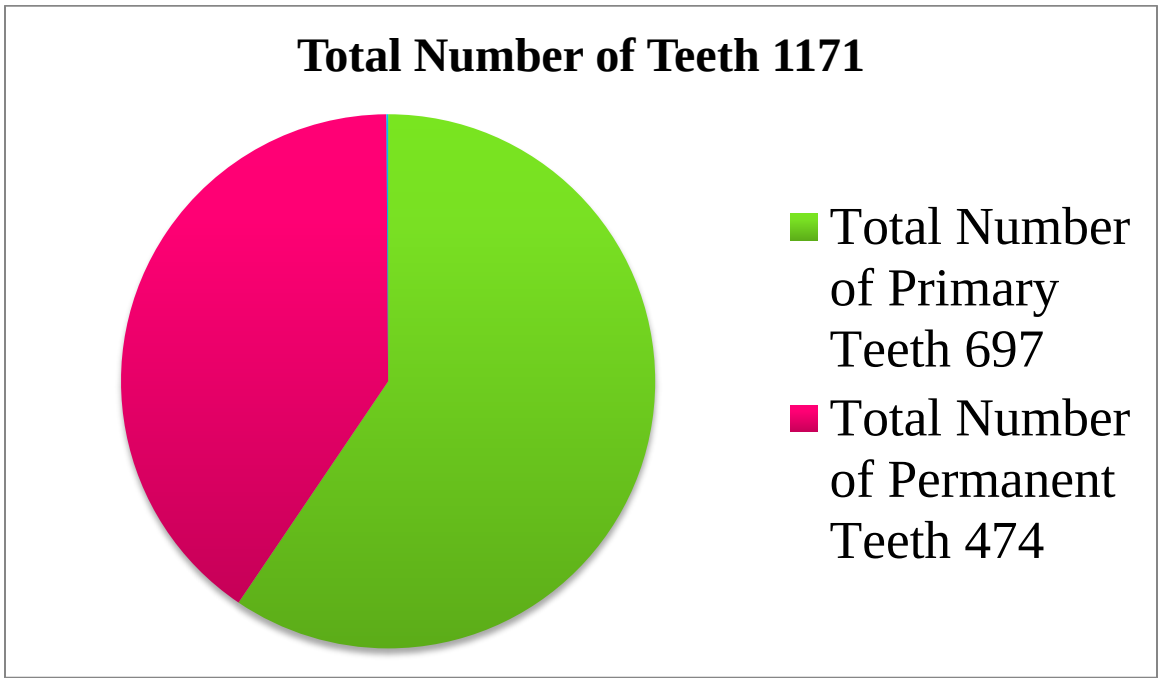

Figure 2: Total Number of Teeth Present for 53 Patients

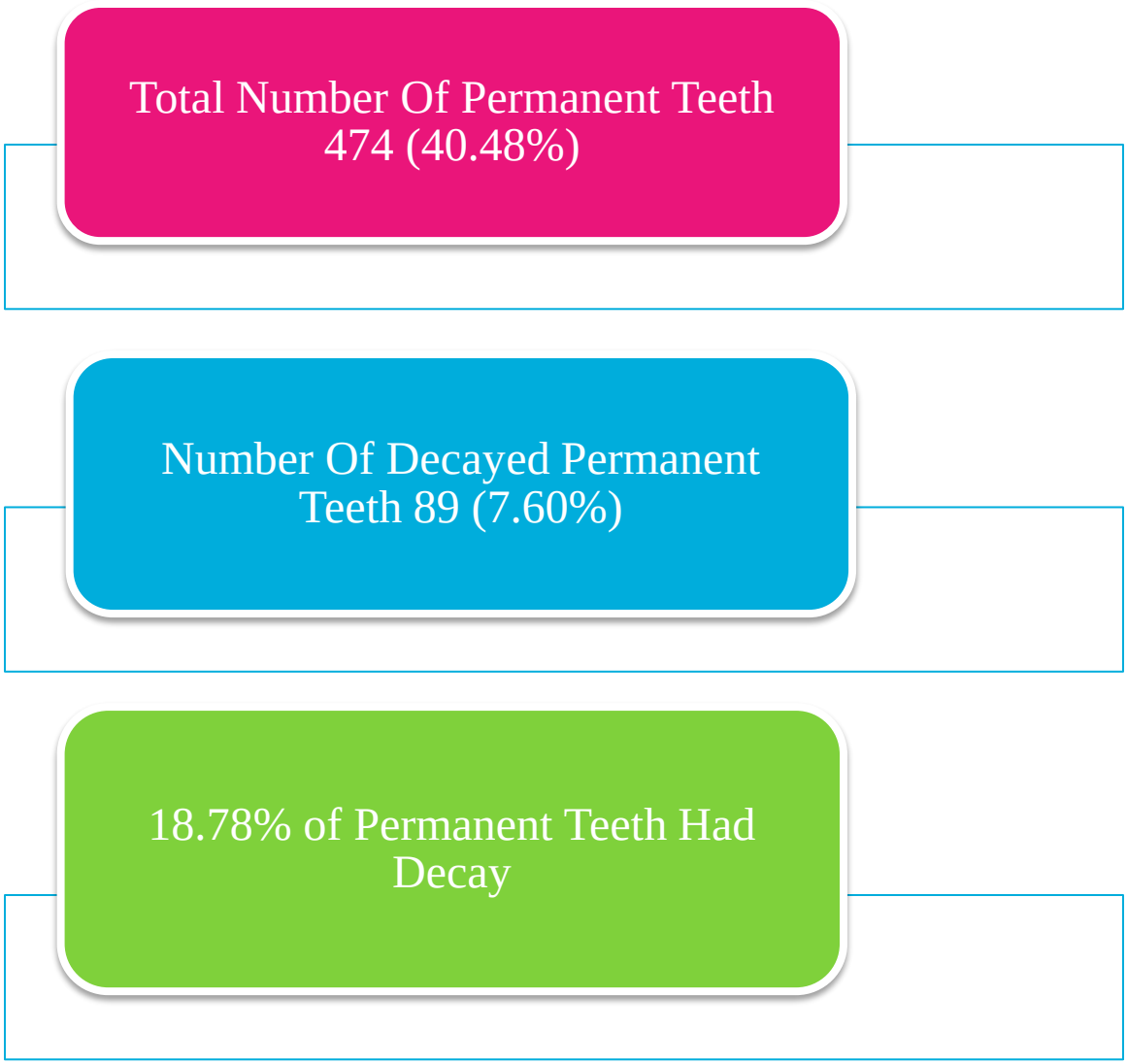

Figure 3: Analysis of Permanent Teeth

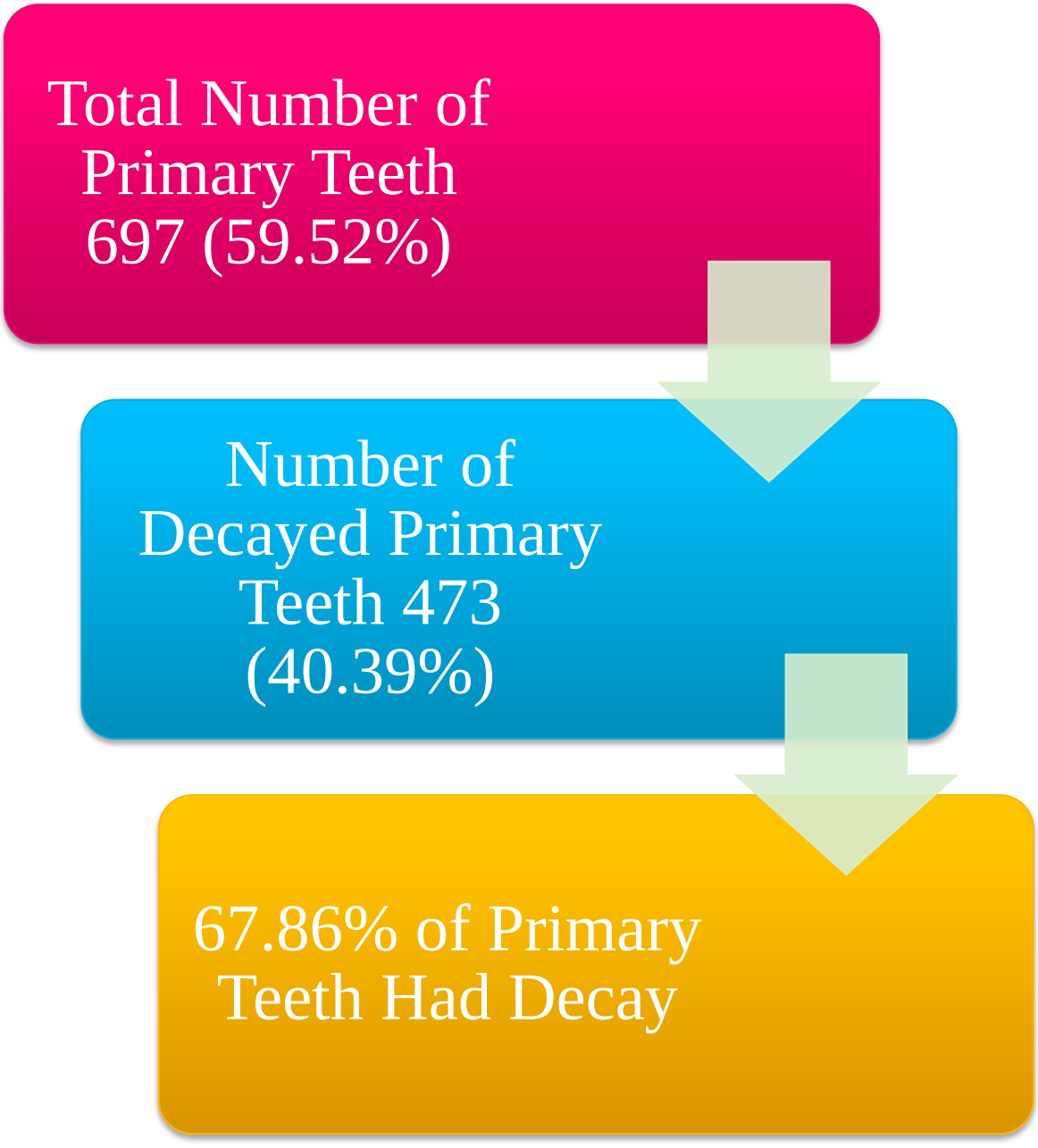

Figure 4: Analysis of Primary Teeth

Chi-Square Test	Value	df	Asymp. Sig.(2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.162 (a)	1	.032		
Continuity Correction (b)	3.385	1	.066		
Likelihood Ratio	4.627	1	.031		
Fisher's Exact Test				.063	.033
Linear-by-Linear Association	4.525	1	.033		
N of Valid Cases	53				

Figure 5: Chi-Square Test

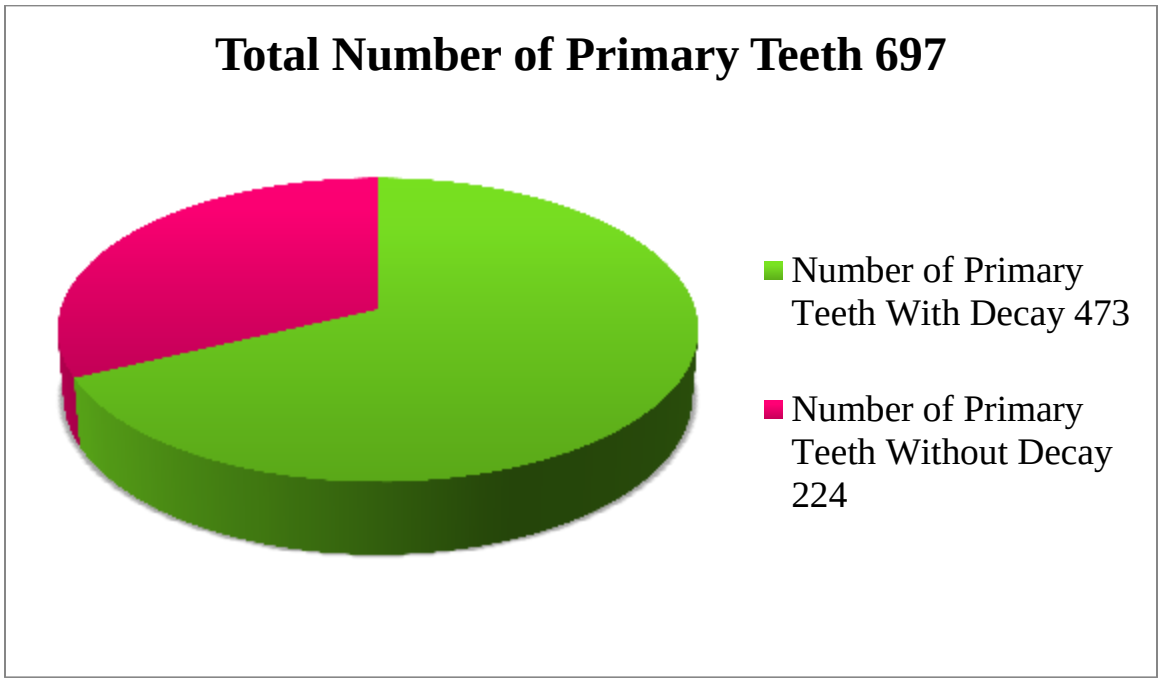

Figure 6: Primary Teeth