Prevalence Of Dental Caries In Mexican-American Children And Adolescents Attending Rawlings Pediatric Dental Clinic In El Paso, Texas

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PREVALENCE OF DENTAL CARIES IN MEXICAN-AMERICAN CHILDREN
AND ADOLESCENTS ATTENDING RAWLINGS PEDIATRIC DENTAL
CLINIC IN EL PASO, TEXAS

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Dean of the Graduate School
Dedication

To my parents.
PREVALENCE OF DENTAL CARIES IN MEXICAN-AMERICAN CHILDREN AND ADOLESCENTS ATTENDING RAWLINGS PEDIATRIC DENTAL CLINIC IN EL PASO, TEXAS

by

ANDREA AGUILA RN, BSN

THESIS

Presented to the Faculty of the Graduate School of
The University of Texas at El Paso
in Partial Fulfillment
of the Requirements
for the Degree of

MASTER OF PUBLIC HEALTH

Department of Public Health
THE UNIVERSITY OF TEXAS AT EL PASO
December 2016
Acknowledgements

To Dr. Delfina Dominguez who supported me through this thesis, to Dr. Gabriel Ibarra-Mejia for guiding me through my research, and to Dr. Kelley Brooks who allowed me to carry my investigation under her supervision.
Abstract

Background and significance: Dental caries is the most common infectious disease in childhood, causing negative long and short term effects in a child’s life. Children living in poverty are twice as likely to be affected by dental caries compared to those living above the poverty level. Of this poverty group, Mexican-American children are the most affected. In the US-Mexico border communities 83% of the population is Hispanic with the majority of them being of Mexican descent, and 30% of those live in poverty. The United States Mexico border is also characterized by a rapid population growth, high unemployment rates, and less access to healthcare than the general U.S population. Methods: This pilot research project explored the prevalence of dental caries in a sample of 121 Mexican-American children and adolescents, 5 through 17 years of age attending the Rawlings Dental Pediatric Clinic in El Paso, TX. A survey was developed and applied to parents/legal guardians of children/adolescents to identify key risks factors that may play a role in the development of dental caries. The survey addressed sociodemographic and behavioral characteristics such as age, gender, tooth brushing frequency and daily sugar intake. The survey was based on the Dental Risk Assessment Questionnaire from the Texas Department of State Health Services, and the Caries Risk Assessment Form from the American Dental Association. Results: (1) There was a positive correlation of daily sugary food/drinks intake and prevalence of dental caries; (2) there was a negative correlation of daily fruits and vegetables consumption and prevalence of dental caries; (3) there is a negative correlation between daily frequency of tooth brushing and dental caries prevalence; and finally, (4) there was no association between water source consumption and dental caries prevalence. Conclusion/Recommendations: The study findings have implications for oral health promotion and intervention design in low income settings and for minority populations. Based on the results
from this study we believe Mexican-American children and adolescents from the sampled population have a high prevalence of dental caries due to dietary factors such as increased sugar intake and low intake of fruits and vegetables. It was expected that participants who reported drinking water from the public water system had a lower prevalence of dental caries compared to the other sources. However, no association was detected. Further studies should address more closely the role of fluoride water consumption and prevalence of dental caries. The study also suggests the need for a comprehensive approach in addressing the role of dietary factors in creating oral health disparities among minorities. A multidisciplinary team (pediatricians, dentists, dietitians, nurses) should be utilized to provide dietary advice and education to the parents/caretakers of children in order to moderate sugar intake, and provide appropriate and cultural sensitive dietary guidelines to prevent dental caries.
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Chapter 1: Introduction

Dental caries is the most common chronic infectious disease of childhood in the US, with approximately 24% of children 2 to 4 years of age, 53% of children 6 to 8 years of age, and 56% of 15 years old having experienced dental caries in their life (Segura et al., 2014). Dental caries are caused by a breakdown of the tooth enamel. This breakdown is the result of bacteria on the teeth metabolizing foods and producing acid that destroys the tooth enamel, resulting in tooth decay (Culyer, Brown, Kelly, 2014). The term caries originated from the Latin word for rotten, which evolved to mean the condition of having cavities or holes in the teeth (Culyer, Brown, Kelly, 2014). Streptococcus mutans is the main bacterium that cause dental caries, although there are other species of bacteria that can also cause dental caries (Segura et al., 2014). These types of bacteria have the ability to ferment sugars and produce acid, reducing the pH of the mouth. This process causes the demineralization of the tooth enamel. Constant long periods of low pH and demineralization of the enamel will result in cavitation (Segura et al., 2014).

High consumption of carbohydrates and especially of dietary sugars is significantly associated with increased dental caries risk (Mobley et al., 2009). However, there are many other risks factors associated with dental caries such as: inappropriate infant and childhood feeding practices, lack of availability of quality food stores in poor neighborhoods, changing dietary beliefs resulting from acculturation, insurance coverage, access to oral health care specialty services, and cultural perceptions of need for care (Mobley et al., 2009).

Dental caries is considered a multifactorial disease because of the complex interaction of cultural, social, behavioral, nutritional and biological risk factors (Jain et al., 2015). Children’s brushing habits, frequency of brushing, exposure to fluoride, and consumption of dietary sugars were identified as some of the most important contributing factors for the development of the...
disease (Jain et al., 2015). In addition, the education level of parents has been shown to be correlated with the occurrence and severity of caries in their children, while a lower prevalence has been associated with higher levels of education (Jain et al., 2015).

Kim et al. (2016) indicates that oral health problems tend to occur more frequently among individuals with lower income and lower education levels. This is due to a decrease availability and accessibility of dental care treatment compared to those that have higher incomes and education levels (Kim et al., 2016)

Children who have early childhood caries may experience different symptoms. Some of the symptoms include pain, difficulty chewing, problems sleeping, trouble concentrating, depressive symptoms, behavioral issues, reduced self-esteem, and even reluctance to smile or laugh. Early childhood caries if untreated can also cause early tooth loss, which may affect speech development, nutrition, and permanent tooth eruption patterns (Colak et al., 2013).

Data from the National Health and Nutrition Examination Surveys (1999-2004) showed that among children aged 2 to 4 years, the prevalence of untreated caries was 35.5% in Mexican Americans and 20.5% among non-Hispanic whites (Dye et al., 2010). The study also found that in poor children aged 2 to 4 years, the prevalence was 43.8% among Mexican Americans and 34.7% among non-Hispanic whites (Dye et al., 2010). According to the Surgeon General's Report on Oral Health in America released in 2000, “Nearly one in three children aged 2–5 years living in families with incomes of <$10,000 had untreated dental caries compared with one in ten children living in families where the income was $≥35,000”. In the US-Mexico border communities 83% of the population is Hispanic, and 30% of those live in poverty, making them susceptible for the development of oral health problems (Tiwari et al., 2014).
Chapter 2: Background and Significance

The US Census Bureau using information from the American Community Survey (2014) indicates that Hispanics comprise 11.3% of the U.S population with 6.7% being of Mexican origin. Table 1 indicates the percentage of Hispanics ages 5-19 for the average US state, the four U.S.-Mexico border states, and El Paso County, which is the region of interest. The United States-Mexico border is characterized by a rapid population growth, high unemployment rates, and less access to healthcare than the general U.S population (Mier et al., 2008). Three out of the ten poorest counties in the United States are located in the Texas-Mexico border region (Hidalgo, Cameron and El Paso) (Mier et al., 2008). According to the U.S. Census Bureau (2000), statistics indicate that in the U.S. border counties, 25%-30% of the population are uninsured and inhabitants have a 40% less private health insurance coverage, compared to a 60% private health insurance coverage for the state average. In addition, Hispanic children under 18 are much more likely than non-Hispanic White children to be living in poverty (30.3% versus 9.4%). Hispanic children represent 16.2 % of all children in the United States but constituted 29.0 % of all children living in poverty (Therrien & Ramirez, 2000).

<table>
<thead>
<tr>
<th>Table 1. Demographic Characteristics of Regions (2014)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US 50 States</td>
</tr>
<tr>
<td>% of Total Hispanic Population Ages 5-19</td>
</tr>
<tr>
<td>% of Total Population that are Hispanic (Any Race)</td>
</tr>
<tr>
<td>% of Total Population that are Hispanic (Any Race)</td>
</tr>
</tbody>
</table>

Source: US Census Bureau-American Community Survey.
According to Hoeft et al. (2010) dental caries does not affect the population equally. Children living in poverty are twice as likely to be affected as those living above poverty level. Of this poverty group, they found that particularly Mexican-American children are the most affected (Hoeft et al., 2010).

The population of interest for this study are the parents/legal guardians of Mexican-American children/adolescents of both genders ranging in ages 5 to 17 years old treated at the Rawlings Pediatric Dental Clinic. The Rawlings Pediatric Dental Clinic is a program created by El Paso Department of Public Health. Their mission is to provide prevention, educational outreach and clinical/mobile services to underserved children and young adults, ages 6 months until their 21st birthday. This is one of the few nonprofit organizations in El Paso Texas that do not discriminate patients based on immigration status or health insurance. Patients are not required to have a social security number nor a private health insurance in order to obtain dental services. In addition, the payments for the services rendered are based in a sliding scale according to the patient family income. This clinic is also funded under Title V, which is a federal grant also known as the Developing-Hispanic Institutions Program that provides grants to assist Hispanic serving institutions to enhance their program quality and stability.
Chapter 3: Literature Review

Dental Caries in Hispanic Children

Minority and low income children in the United States experience poorer oral health and dental services access than the majority and high-income US children (Edelstein et al., 2009). In 2007, 28.6% of Hispanic children lived in poverty compared with 10.1% on Non-Hispanic white children, and 12.5% of Asian Children in the United States (Edelstein et al., 2009). In the same fashion the Centers for Disease Control and Prevention reported in 2005 that Hispanic children have a higher prevalence of dental caries compared to either non-Hispanic whites or blacks, and also have a higher prevalence of untreated tooth decay (CDC; 2005).

According to Edelstein et al. (2009) income disparities are also seen in terms of utilization of dental services nationally. Hispanic children have the lowest rate of receiving preventive dental services among all racial and ethnic groups (Kurshid, 2010). Children that are not Hispanic and come from higher income families are 60% more likely to have received a dental sealant than an ethnic minority child and those from lower income families (Khurshid, 2010). Flores et al. (2002) concludes that Hispanic children are also reported to experience barriers to dental care more often than other ethnic groups. Some of the barriers include: poor knowledge about dentistry and oral health, lack of or insufficient dental insurance, low income, and lack of transportation among others. This seems to be a recurrent argument in the literature. Hispanic children tend to have less access to dental care because of several circumstances, and are therefore prone to having higher oral problems, among them dental caries (Khurshid, 2010).
Dental Caries in Mexican-American Children and the US-Mexico Border

Khurshid (2010) indicated there is a disproportional burden of poverty among Hispanic children living in the US-Mexico border region. As shown in Table 1 the border states Arizona, California, New Mexico, and Texas tended to have a higher concentration of Mexican-Americans than the average U.S. state. Additionally, Culyer et al. (2014) found that Mexican-American children, among other groups, lack dental care programs and preventive treatments. According to the Annie E. Casey Foundation (2005) due to high poverty rates, higher school drop-out rates along with a shortage of dental health professionals, Hispanic children in the U.S.-Mexico border are at increased risk for having untreated dental caries.

In a more specific case, Hoeft et al. (2009) explored the relation between tooth decay and Mexican-American children in San Jose, Ca. The authors found that tooth decay in Mexican-American children 5 to 10 years of age is higher than the general population of school children in the United States. Moreover, they found that children whose parents are Mexican migrants (1st generation immigrants) have a higher tendency for tooth decay than Mexican-American children born of Mexican-American parents (2nd or more generation immigrants). The main finding here is that Mexican migrant parents have a poor knowledge of effective preventive measures, and do not understand the relation between a child’s diet and oral disease.

Hoeft et al. (2009) conducted interviews with a convenient sample of 48 low income Mexican-American mothers in urban neighborhoods in San Jose California. They wanted to understand the mother’s habits and beliefs regarding their young children’s tooth brushing and oral hygiene. Hoeft et al. (2009) found that 87% urban Mexican-American mothers do not initiate oral hygiene practices in compliance with American Dental Association (ADA) recommendations. Despite half of the mothers engaging in infant oral hygiene practices, the average age of regular
tooth brushing initiation was 1.8 years of age, and only 13% of mothers followed ADA recommended oral hygiene guidelines for their children and initiated regular tooth brushing by age 12 months (Hoeft et al., 2009).

Mexican immigrant parents face language barriers when communicating to health professionals (Masterson et al., 2014). This may play a role in delaying oral care for their children, since terms related to oral health and dentistry may differ from dental health professionals. Another important factor identified by Masterson et al. (2014) is that Mexican immigrant parents do not recognize the seriousness of changes in tooth color or structure and therefore, do not necessarily seek professional advice or dental care for their children (Masterson et al., 2014).

Furthermore, Mexican-American children from families with a low annual income have about two times more decayed teeth than children from high-income families. They also have high percentages of mild gingivitis (Ismail et al., 1987). Some of the causes that account for these disparities include: infrequent use of dental services by Mexican-American parents and/or use of these services only when continual pain was experienced (Ismail et al., 1987).

**Water Flouridation and Dental Caries**

According to the Centers for Disease Control and Prevention (1999) community water flouridation has been one of the top 10 public health achievements of the 20th century. This intervention resulted in substantial progress for oral health by providing a safe and cost-effective strategy that reduces incidence of dental caries in all people regardless of age, income, socioeconomic status and educational level (White & Gordon, 2014).

Fluoride consumed during tooth development makes the tooth enamel harder, and more resistant to cariogenic bacteria. Some of the most important benefits of fluoride in drinking water are: preventing tooth decay (dental caries) and contributing to bone mineralization and bone matrix integrity (White & Gordon, 2014)
Clark et al. (2014) found that low exposure to fluoride from the public water systems have reduced tooth decay by a 29% in the overall U.S population. They state that fluoride has 3 main mechanisms of action. First it promotes enamel remineralization, second, it reduces enamel demineralization caused by an acidic enviroment, and finally inhibits bacterial metabolism and acid production in the mouth (Clark et al., 2104).

Carey (2014) indentified fluoride as the only compound recognized by the US Food and Drug Administration (FDA) for the prevention of dental caries. The author also identifies community water as the main source of fluoride for caries prevention, although there are many other sources such as toothpastes and mouth rinses. According to Carey (2014) the intake of water from a public system and processed beverages in the United States provides approximately 75% of a person’s fluoride intake.

**Tooth Brushing and Dental Caries**

A study done by Tinanoff et al. (2002) found that children between ages 3 to 6 that brushed their teeth at least once per day with fluoride toothpaste, significantly reduced their caries incidence. In addition, they found it is also important to apply a specific brushing technique. First, brushing needs to be supervised by an adult in order to prevent fluorosis (cosmetic changes in the tooth enamel) from excessive swallowing of the toothpaste (Tinanoff et al., 2002). Second, toothpaste should be spread evenly on the teeth, brushing for 2 minutes in order to have greater contact with the fluoride (Tinanoff et al., 2002). Finally, it is important to reduce mouth rinsing since they find that restricting rinsing reduces caries by an average of 26% compared to a control group that also brushed with a fluoride toothpaste, but received no instructions restricting rinsing (Tinanoff et al., 2002).
In a more recent study, Gil et al. (2015) indicated that 12 year old adolescents that had higher tooth brushing frequency had a lower risk for developing dental caries. Gil et al. (2015) indicate that poor oral hygiene leads to the accumulation of bacterial plaque, thus higher tooth brushing frequency seems to reduce the risk of this condition.

There are different stages before a dental cavitation is formed. Dental plaque which contains acidogenic bacteria present in the early stages of tooth decay causes mild, infrequent demineralization of the teeth. However, when there is a gradual increase of such bacteria in the oral environment, it causes an imbalance in the de-mineralization/mineralization process in the dental tissue, consequently causing tooth decay (Gil et al., 2015).

Wigen et al. (2015) found tooth that brushing frequency at 1.5 year of age was related to having caries experience at 5 years of age. They found that the probability for having caries at 5 years of age was 2 to 1 for children who had their teeth brushed less than twice daily at 1.5 year age, compared with children who had their teeth brushed twice daily. Also, they found that parents who establish brushing twice daily regularly in early childhood have been shown to continue the behavior throughout preschool age and even adulthood (Wigen et al., 2015; Park et al., 2015).

**Consumption of Sugary Foods/ Drinks and Dental Caries**

According to Tinanoff et al. (2002) there is abundant epidemiological evidence that identifies dietary sugars as the major factor affecting dental caries prevalence and progression. Tinanoff et al. (2002) indicates that the high rates of caries in preschool children may be due in part to the frequent consumption of sugary drinks and foods. High frequency sugar consumption enables acid production by cariogenic bacteria that adheres to teeth, causing demineralization of the tooth structure (Tinanoff et al., 2002).
In a different study Mobley et al. (2009) reported that increased consumption of sugar sweetened beverages and foods (candy, cookies) in combination with poor intake of fruits and vegetables increases a child’s risk for developing dental caries. In addition, it provides the child with excessive calorie intake, and deprives them from nutrients that are essential for proper growth and development (Mobley et al., 2009).

Park et al. (2015) indicates that when sugars are metabolized by cariogenic oral bacteria, it produces acid that dissolves the enamel of the tooth. Thus, higher and longer consumption of sugary foods and drinks increases the acidic environment in the mouth, causing dental caries (Park et al., 2015).

**Consumption of Fresh Fruits and Vegetables and Dental Caries**

Moynihan (2002) identified dietary recomendations for oral health that are aligned with dietary advice from the United Kingdom Department of Health report *The Balance of Good Health*. The author indicates that in order to reduce dental caries patients should be advised to eat more starchy staple foods and vegetables, since there is no epidemiological evidence that shows that these staple starchy foods and vegetables are harmful to teeth (Moynihan, 2002).

Moynham (2005) states there is epidemiological data that supports that high intake of starchy staple foods, fruits and vegetables are associated with low levels of dental caries, and will protect both your overall health and oral health (Moynham, 2005).

The literature has provided a reason for exploring dental caries in underserved communities of Mexican-American children in the U.S. and Mexico border. The examination in specific cities along the border has a potential to be further investigated. This study will investigate this gap in the literature by examining Mexican-American children and adolescents in the city of El Paso, TX, attending the Rawlings Pediatric Dental Clinic. The results of this paper will hopefully contribute to the literature on oral health in the U.S.-Mexico border.
Chapter 4: Goals and Objectives

Goal

Provide insights on the prevalence and risk factors associated with dental caries present in a sample of Mexican-American children attending Rawlings Dental Clinic in El Paso, Texas.

Objectives

a) Develop and apply a survey to identify key factors that influence the development of dental caries.


c) Compare results of the study to the general Hispanic population of children/adolescents in the United States.
Chapter 5: Study Aims and Research Questions

The aim of this study is to estimate the prevalence of dental caries in Mexican-American children attending Rawlings Pediatric Dental Clinic in El Paso, Texas. As well as, finding what factors are correlated with a higher prevalence of dental caries. Prevalence is the number of already existing caries in the population sample.

Research Questions:

1- What is the estimated prevalence of dental caries for the sample of Mexican-American children in El Paso, TX? (Dye et al., 2010).

2- Do Mexican-American children and adolescents in the sample have a larger prevalence of dental caries compared to the general Hispanic population in the United States? (Hoeft et al., 2010).

3- Is there a correlation between sugary foods and drinks consumption and a higher prevalence of dental caries? (Mobley, Marshall et al., 2015).

4- Is there an association between consumption of water from the public water system and a lower prevalence of dental caries? (Colak et al., 2013), (Khurshid, 2010).

5- Is there a correlation between higher frequency of tooth brushing and a lower prevalence of dental caries? (Segura et al., 2014).

6- Is there a correlation between higher consumption of fresh fruits and vegetables and a lower prevalence of dental caries? (Zaki et al., 2015).
Chapter 6: Methods and Materials

Study Population

The investigator recruited 121 participants at the Rawlings Pediatric Dental Clinic located in Central El Paso at 3301 Pera Street that meet the inclusion criteria through convenient sample until the quota was met. Participants were the parents/legal guardians of Mexican-American children and adolescents, representing both genders, ranging from 5 to 17 years of age, attending the Rawlings Pediatric Dental Clinic. This study was approved by the University of Texas at El Paso (UTEP) Institutional Review Board prior to data collection (IRB Protocols # 564493-1 and #79085-14).

Study Participants

Participants were recruited at the lobby of the clinic while waiting for their dental appointment. Inclusion criteria for participation included parents/legal guardians of children/adolescents that attend the Rawlings Pediatric Dental Clinic, self-identified as Mexican-Americans from both genders, ranging from 5 to 17 years of age. Exclusion criteria included refusal to participate, children not self-identified as Mexican-Americans, and not within the age range. The researcher explained and read the purpose of the study in the language of the participant preference, and asked at the end of the explanation their willingness to participate. Before applying the survey, researcher asked the participants their children/adolescent ethnicity/race and their age to identify if inclusion criterion was met. If criterion was met, the researcher asked participants to fill out a survey. The surveys as well as the consent forms were available in both English and Spanish. The researcher asked participants in what language they preferred to fill out the survey and consent form. The researcher participating in this study is bilingual and interacted with participants in their preferred language throughout the course of the study. Participants were asked
to sign the consent form to participate in the study. Participants were provided with the survey that assessed the children/adolescent risk for the development of dental caries. The survey was based on the Dental Risk Assessment Questionnaire from the Texas Department of State Health Services, and the Caries Risk Assessment Form from the American Dental Association. The survey was internally validated by seven experts on Health Sciences: one dentist, four medical Doctors and two registered nurses. The survey addressed sociodemographic and behavioral characteristics such as age, gender, daily tooth brushing frequency, daily intake of sugary foods/drinks, daily intake of fresh fruits and vegetables, history of treatment for dental caries, and the parent’s history of dental caries among others. The survey took approximately 5 to 10 minutes to administer. The prevalence of caries was self-reported, as there is no way of confirming this information other than the declaration of the patient. Needless to say, the participants in the survey did not receive any form of monetary retribution for their participation.

**Study Design**

The study type is quantitative. The study design is epidemiologic, observational, descriptive and cross-sectional. The information collected was entered in the statistical software Excel to check for consistency and accuracy. Descriptive analysis where conducted according to each variable by building tables, graphs and contingency tables to identify possible risk factors for dental caries. Data analysis was performed using the IBM-SPSS Version 21 database management and analysis software. Univariate analysis for continuous variables included mean and standard deviation. Univariate analysis for categorical variables included frequencies and percentages. Different statistical tests were applied to carry the bivariate analysis. The Mann-Whitney U-test was utilized to explore the association between dental caries and sugar consumption, healthy snacks consumption, and frequency in tooth brushing. In order to test the relation between dental
caries and water source a Chi-Square test was used. In all statistical tests a p value of <0.05 was considered statistically significant. After determining the tests to indicate whether there is a statistically detectable relation among the variables, a correlation coefficient was calculated to observe the positive/negative association of the variables.
Chapter 7: Results

Of the 121 parents/legal guardians of Mexican-American children and adolescents age 5 to 17 years of age that participated in the study 79 (65.3 %) reported having dental caries. One of the aims of this study was to compare the percentage of caries prevalence of the population that was examined with the rest of the Hispanic population in the United States. Bruce et al. (2015) provides the percentages of the prevalence of dental caries for the overall Hispanic population in the United States. Bruce et al. (2015) obtained the data from the National Health and Nutrition Examination survey (2011-2012). Bruce et al. (2015) reported that Hispanic children ages 6 to 11 years old had a dental caries prevalence of 27.1 %. For Hispanic adolescents ages 12 to 19 had a dental caries prevalence of 60.6 %. It appears that prevalence of dental caries in the sample populations is higher than the rest of the Hispanic population in the United States. Although, there was not a study found that reported the prevalence of dental caries for the specific age range utilized in the sample of this study.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Max</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>12.13</td>
<td>12</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>Daily Intake of Glasses of Water</td>
<td>3.88</td>
<td>4</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Daily Frequency of Tooth Brushing</td>
<td>2.23</td>
<td>2</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Daily Intake of Sugary Foods/Drinks</td>
<td>2.28</td>
<td>2</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Daily Intake of Fruits and Vegetables</td>
<td>2.29</td>
<td>2</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Months Since the Last Dentist Visit</td>
<td>4.48</td>
<td>3</td>
<td>60</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 3. Frequencies and Percentages of Categorical Variables

\[ n = 121 \]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (Female=1, Male=0)</td>
<td>Male</td>
<td>39</td>
<td>32.2</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>82</td>
<td>67.8</td>
</tr>
<tr>
<td>Drink Water Regularly (Yes=1, No=0)</td>
<td>No</td>
<td>8</td>
<td>6.6</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>113</td>
<td>93.4</td>
</tr>
<tr>
<td>Source of Water (Private Pond=1, Public Water System=2; Bottled Water=3)</td>
<td>Private Pond</td>
<td>1</td>
<td>0.8</td>
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<tr>
<td></td>
<td>Public Water</td>
<td>44</td>
<td>36.4</td>
</tr>
<tr>
<td></td>
<td>Bottled</td>
<td>76</td>
<td>62.8</td>
</tr>
<tr>
<td>Water Consumed has Fluoride (Yes=1, No=0)</td>
<td>No</td>
<td>84</td>
<td>69.4</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>37</td>
<td>30.6</td>
</tr>
<tr>
<td>Aid Child in Tooth Brushing (Yes=1, No=0)</td>
<td>No</td>
<td>70</td>
<td>57.9</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>51</td>
<td>42.1</td>
</tr>
<tr>
<td>Use Toothpaste in Tooth Brushing (Yes=1, No=0)</td>
<td>No</td>
<td>3</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>118</td>
<td>97.5</td>
</tr>
<tr>
<td>Caries (Yes=1, No=0)</td>
<td>No</td>
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<td>79</td>
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<td>Any Other Sibling has Dental Caries (Yes=1, No=0)</td>
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<td>23</td>
<td>19</td>
</tr>
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<td>98</td>
<td>81</td>
</tr>
<tr>
<td>Parent with Caries (Yes=1, No=0)</td>
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<td>19</td>
<td>15.7</td>
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<td></td>
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Intake of Sugary Foods/Drinks and Dental Caries

The first correlation examined was the consumption of sugary foods and drinks with prevalence of dental caries. Figure 1 illustrates that the greater number of respondents is clustered in the consumption of 1, 2, and 3 sugary snacks per day. The relationship observed indicates that as the consumption of sugar increases, there is a greater amount of dental caries. A Mann-Whitney U-Test was carried to see whether the consumption of sugary foods/drinks had a statistically significant association with dental caries. The histogram in Figure A10 of the appendix for daily intake of sugary foods/drinks suggested not a normal distribution. However, the Mann-Whitney U-Test is approximately standard normal for samples with more than 25 observations. Moreover, SPSS reports the Z-scores which can be compared to a cumulative normal standard distribution.
The test results indicate that the calculated Z-score is -2.40, which is higher than the critical Z-score of -1.96 at 0.05 level. The null hypothesis in the Mann-Whitney test establishes that the two groups (reported caries and not reported caries) are equal. The results indicated that we rejected the null hypothesis of equality between the two groups with a 95% confidence. This means that we find a statistically significant association between the consumption of sugary foods/drinks and prevalence of dental caries. A correlation coefficient was calculated indicating a positive association between both variables. Thus, the higher daily intake of sugary foods/drinks leads to a higher prevalence of dental caries. Children/adolescent that consumed two sugary foods/drinks per day had a dental caries prevalence of 74%, whereas children/adolescents that consumed only one sugary food/drink per day had a prevalence of 43%. In contrast, three children/adolescents that consumed zero sugary foods/drinks per day reported having dental caries. For this reason, sugar intake should not be the only variable considered to be associated with dental caries.

![Figure 1. Association of Sugary Foods/Drinks Intake and Dental Caries](image-url)
Water Source and Dental Caries

The second association examined is the type of water source and the prevalence of dental caries. It was expected that participants who reported drinking water from the public water system had a lower prevalence of dental caries compared to the other sources. As stated in the literature, the public water system is identified as the main source of fluoride for caries prevention (Carey, 2014). In addition, according to a report from the Centers for Disease Control and Prevention (2015), El Paso public water system has a fluoride concentration of 0.61 mg/L, which is enough fluoride from natural sources that is safe and effective for preventing dental caries. Figure 2 illustrates how participants who drank water from the public water system had a dental caries prevalence of 70 %, compared to a 63 % of participants who drank bottled water. Although, it is important to indicate that a greater number of participants was clustered as drinking bottled water in comparison with the ones who responded drinking water from the public water system. In order to determine a possible association between both variables a Crosstabs Chi-square analysis was performed. We failed to reject the null hypothesis with a 95 percent confidence interval and found no statistically significant association between the source of the water and the prevalence of dental caries. Thus, the proportion of those with dental caries does not differ by the type of water source they drink from.
Figure 2. Association of Water Source and Dental Caries

**Frequency of Tooth Brushing and Dental Caries**

The third correlation of interest is the frequency of tooth brushing with a lower prevalence of dental caries. Figure 3 shows that respondents are clustered in brushing their teeth twice or thrice a day. As the frequency of tooth brushing increased, there is a decrease in the amount of dental caries. The statistical relationship between these two variables was examined using a Mann-Whitney U-test. The Z-score was -2.32, which is larger than the calculated Z-score of -1.96 at 0.05 level. The null hypothesis in the Mann-Whitney test establishes that the two groups (reported caries and not reported caries) are equal. The results indicated that we rejected the null hypothesis of equality between the two groups with a 95 percent confidence. This means that we find a statistically significant association between the daily frequency of tooth brushing and prevalence of dental caries. A correlation coefficient was calculated and suggested a negative association between both variables. Higher frequency of tooth brushing per day is associated with lower prevalence of dental caries. Children/adolescent that reported brushing their teeth 3 times a day...
had a dental caries prevalence of 27%, compared to children/adolescents that reported brushing their teeth only 2 times per day and had a caries prevalence of 71%.

![Figure 3. Association of Frequency of Tooth Brushing and Dental Caries](image)

**Healthy Snacks (fruits and vegetables) Intake and Dental Caries.**

The fourth correlation of interest is the consumption of healthy snacks (fruits and vegetables) with a lower prevalence of dental caries. Figure 4 indicates that as the daily intake of healthy snacks (fruits and vegetables) increases, there is a decrease in the amount of dental caries. The statistical relationship between these two variables was examined using a Mann-Whitney U-test. The calculated Z-score is -2.15, which is larger than the critical Z-score of -1.96 at the 0.05 level of significance. The results indicated that we rejected the null hypothesis of equality between the two groups (reported dental caries and not dental caries) with a 95% confidence. Therefore, we find a statistically significant association between daily consumption of healthy snacks (fruits and vegetables) and prevalence of dental caries. A correlation coefficient was calculated indicating a negative association between both variables. Thus, a higher intake of healthy snacks per day is
associated with a lower prevalence of dental caries. Children/adolescents that reported eating 2 or 3 healthy snacks per day had a dental caries prevalence of 61 percent and 50 percent, respectively, compared to 77 percent of children/adolescents that reported eating only one healthy snack per day.

Figure 4. Association of Healthy Snacks (fruits and vegetables) Intake and Dental Caries
Chapter 8: Discussion

Of the 121 parents/legal guardians of Mexican-American children and adolescents age 5 to 17 years of age that participated in the study 79 (65.3%) reported having dental caries. This supports previous literature (Culyer et al., 2014; Hoeft et al., 2010) findings about high rates of dental caries in Mexican-American children and adolescents. Culyer et al. (2014) indicated that the highest number of untreated decayed primary teeth is found in poor Mexican-American children followed by poor non-Hispanic Blacks and non-Hispanic Whites. In another study Hoeft et al. (2010) indicated that dental caries does not affect the population equally. Children living in poverty are twice as likely to be affected as those living above poverty level. Of this poverty group, they found that particularly Mexican-American children are the most affected (Hoeft et al., 2010).

A variable that was highly correlated with increased dental caries was the consumption of sugary drinks and foods. As there was a greater consumption of sugary foods and drinks there was a higher number of reported dental caries. Children/adolescent that consumed two sugary foods/drinks per day had a dental caries prevalence of 74 %, whereas children/adolescents that consumed only one sugary food/drink per day had a prevalence of 43 %.

A study by Liu et al. (2010) found similar results to the ones in this study, since they reported that children that consumed sugary liquids during main meals and in between meals showed a significant association with a higher presence of dental caries. In that study they also found that children that consumed sweet milk and dairy products, fruit and foods without sugar at main meals had a lower prevalence of dental caries (Liu et al., 2010).

The second correlation of interest was the type of water source and the prevalence of dental caries. It was expected that participants who reported drinking water from the public water system had a lower prevalence of dental caries compared to the ones who drank from private ponds and
bottled water. As previously stated, the public water system is identified as the main source of fluoride for caries prevention (Carey, 2014) However, no association was found between this variable and the prevalence of dental caries.

Moreover, the consumption of healthy snacks such as fruits and vegetables was correlated with a lower prevalence of dental caries in the sample population. Children/adolescents that reported eating 2 or 3 healthy snacks per day had a dental caries prevalence of 61 percent and 50 percent, compared to 77 percent of children/adolescents that reported eating only one healthy snack per day. These findings support previous studies by Moynihan (2005) which identified that a diet that is high in fruits, vegetables, wholegrain starchy foods, and low in free sugars and fat will have a benefit in the prevention of caries, periodontal conditions and oral infectious. In a more recent study Mobley et al. (2009) identified inappropriate infant and childhood feeding practices and dietary behaviors associated with limited access to fresh fruits and vegetables and nutrient dense foods as risk factors for childhood caries and obesity.

Furthermore, daily frequency of tooth brushing was correlated with a lower prevalence of dental caries. Children/adolescent that reported brushing their teeth 3 times a day had a dental caries prevalence of 27 %, compared to children/adolescents that reported brushing their teeth only 2 times per day and had a caries prevalence of 71 %. Previous studies have identified the relationship between tooth brushing and dental caries prevalence. Gil (2015) found that poor oral hygiene habits are associated with dental caries experience in adolescents. Poor oral hygiene leads to the accumulation of bacterial plaque causing an imbalance in the demineralization/mineralization process damaging the dental tissue (Gil, 2015).
Potential Limitations and Strengths

Strengths of this study include expanding on existing findings by looking more closely at factors that increase the development of dental caries in Mexican-American children/adolescents. There is no study to our knowledge that has estimated these factors for such population in El Paso, Texas and in this particular location. Limitations of this study include a small convenient sample from a single location in El Paso, TX. Another limitation is possible recall biases due to self-reported answers, where the participants may not accurately remember some facts about past occurrences. In addition, comparison of caries prevalence between the examined population and the rest of the Hispanic population in the United States could not be properly estimated since there was not a study that reported caries prevalence for the specific age range utilized in the sample of this study. Finally, findings of this study cannot be generalized to other geographic settings and other populations groups.
Chapter 9: Conclusion

This paper explored the prevalence of dental caries in a sample of 121 Mexican-American children and adolescents, 5 through 17 years of age attending the Rawlings Dental Pediatric Clinic in El Paso, TX. A survey was developed and was applied to identify risks factors that play a role in the development of dental caries. The correlations of interest with dental caries were the following: daily intake of sugary foods/drinks, tooth brushing frequency, water source, and daily intake of healthy snacks (fruits and vegetables). Children/adolescents that consumed more sugary foods/drinks per day had a higher prevalence of dental caries than their peers. Children/adolescents that brushed their teeth 3 times per day had a lower prevalence of dental caries than those who brushed their teeth less than 3 times per day. Moreover, it was expected that participants who reported drinking water from the public water system had a lower prevalence of dental caries compared to the other sources. However, no association was detected. Further studies should address more closely the role of fluoride water consumption and prevalence of dental caries. Finally, children adolescents that consumed more fresh fruits and vegetables had a lower caries prevalence than their peers.

The study findings have implications for program planning and policy development for reducing health disparities in minority populations. The study results shed light on the factors associated with oral health problems among Mexican-American children/adolescents and consequently inform public health programs design for this population.

Based on the results of this study, a comprehensive approach addressing the role of dietary factors and how these help create oral health disparities among minorities should be implemented. A multidisciplinary team (pediatricians, dentists, dietitians, nurses) should be utilized to provide dietary advice and education to the parents/caretakers of children in order to moderate sugar intake,
and provide appropriate dietary guidelines to prevent dental caries. Education should be provided in a culturally sensitive manner, taking into consideration the individual cultural/ethnic practices, family demographics and food related environmental issues. Special education should be given to pregnant women in regards to healthy diets and appropriate infant feeding practices to reduce dental caries. Moreover, public health policy must address the lack of access to healthy foods among minority populations. Health care providers, local organizations and the community in general should work together to advocate for policy change in order to establish fresh fruit and vegetables supermarkets in poor neighborhoods.


**Strategic Frameworks**

Healthy People 2020 is a program that sets science-based goals and objectives that are updated every ten years with the intention of promoting health, and preventing disease in the American population. Healthy People 2020 objectives that pertain to oral health in children and adolescents are addressed in this study. Under the Oral Health topic objectives that focus in the oral health of children and adolescent include: (a) reducing the proportion of children who have dental caries in their primary teeth or untreated dental decay, (b) increase the proportion of low-income children and adolescents that received any preventive dental service and (c) increase the proportion of children and adolescents who use the oral health care system (Healthy People, 2012).
**MPH Core Competencies**

**Biostatistics:** Biostatistics is the development and application of statistical reasoning methods in addressing, analyzing and solving problems in public health; health care and biomedical, clinical and population-based research.

1. Describe the roles biostatistics serves in the discipline of public health.
2. Describe preferred methodological alternative to commonly used statistical methods when assumptions are not met.
3. Distinguish among the different measurement scales and implications for selection of statistical methods to be used based on these distinctions.
4. Apply descriptive techniques commonly used to summarize public health data.
5. Apply common statistical methods for inference
6. Apply descriptive and inferential methodologies according to the type of study design for answering a particular research question.
7. Apply basic informatics techniques with vital statistics and public health records in the description of public health characteristics and in public health research and evaluation.
8. Interpret results of statistical analyses found in public health studies.
9. Develop written and oral presentations based on statistical analyses for both public health professionals and educated lay audiences.

**Environmental:** Environmental health sciences represent the student of environmental factors including biological, physical and chemical factors that affect the health of a community.
1. Specify approaches for assessing, preventing and controlling environmental hazards that pose risks to human health and safety.

**Epidemiology:** Epidemiology is the study of patterns of disease and injury in human populations and the application of this study to control the health problems.

1. Identify key sources of data for epidemiologic purposes.
2. Describe a public health problem in terms of magnitude, person, time and place.
3. Explain the importance of epidemiology for informing scientific, ethical, economic and political discussion of health issues.
4. Draw appropriate inferences from epidemiologic data.
5. Evaluate the strengths and limitations of epidemiologic reports.

**Health Policy and Management:** Health policy and management is a multidisciplinary filed of inquiry and practice concerned with the delivery, quality, and cost of health care for individuals and populations. This definition assumes both a managerial and a policy concern with the structure, process and outcomes of health services including the cost, financing, organization, outcomes and accessibility of care.

1. Demonstrate leadership skills for building partnerships.

**Social and Behavioral sciences:** This social and behavioral sciences in public health address the behavioral and cultural factors related to individual and population health and health disparities over the life course. Research and practice in this area contributes to the development, administration and evaluation of programs and policies in public health and health services to promote and sustain healthy environments and healthy lives for individuals and populations.
1. Identify the causes of social and behavioral factors that affect health of individuals and populations.

2. Identify individual, organizational and community concerns, assets, resources and deficits for social and behavioral science interventions.

3. Describe the role of social and community factors in both the onset and solution of public health problems.

**Hispanic and border health concentration competencies:**

1. Identify the major chronic, infectious, and other public health challenges that face Hispanic and border communities.

2. Identify and access the major sources of public health data that pertain to Hispanic and border communities (e.g., vital statistics and disease registries, health and nutrition surveillance databases, census data, and national surveys).

3. Effectively communicate information to the public and policy makers regarding the special public health challenges and needs of Hispanic and border communities.

4. Act as an effective resource person for Hispanic and border residents, organizations, and communities.
References


http://doi.org/10.15171/joddd.2014.023


March 24, 2016.


Appendix 1

Dental Survey

Age  _______________  Date  _______________
Child’s sex  _______________

1- Does your child usually drinks water?  
   Yes  No

2- How many glasses of water does your child drink per day?  

3- What is the source of the water your family drinks from?  
   Private well  Public water system  Bottled water

4- Do you know if the water your child consumes has fluoride?  
   Yes  No

5- Do you help your child when he/she is brushing his/her teeth?  
   Yes  No

6- How many times a day does your child brush his/her teeth?  

7- Do you use toothpaste to clean your child’s teeth?  
   Yes  No

8- How many times per day does your child eat acidic and sugary foods, or drinks? (Juice, soda, energy drinks, candy, chips)  

9- How many times per day do you provide healthy snacks for your child? (Fresh fruits, vegetables, fluoridated water)  

10- Is there a fresh fruit and vegetable market near your house?  
   Yes  No

11- When was the last time your child visited the Dentist?  

12- Does your child have dental caries?  
   Yes  No

13- Have any of your children ever had dental caries?  
   Yes  No
14- In the last year, how many new caries have your child had?

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<th>15- Did you seek treatment for them?</th>
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<tr>
<td>16- As the parent, do you have a history of dental caries?</td>
<td>Yes</td>
<td>No</td>
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Appendix 2

IRB Approval Letter

THE UNIVERSITY OF TEXAS AT EL PASO
Office of the Vice President for Research and Sponsored Projects
Institutional Review Board
El Paso, Texas 79968-0587
phone: 915 747-8848  fax: 915 747-5031

FWA No: 00001224

DATE: November 23, 2015

TO: Andrea Aguila, BSN

FROM: University of Texas at El Paso IRB

STUDY TITLE: [825662-1] Prevalence and Incidence of Dental Caries in Hispanic Children and Adolescents from El Paso, Texas

IRB REFERENCE #: College of Health Sciences

SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS

DECISION DATE: November 23, 2015

REVIEW CATEGORY: N/A
Vita

Andrea Aguila was born on January 3, 1988 in El Paso, Texas. She is the fifth daughter of Alicia Blanco and Jaime Aguila. She completed her Bachelor of Science in Nursing at the University of Texas at El Paso on May 15th, 2011. She has been working as a psychiatric nurse since January 2012. Subsequently, she joined the Masters of Public Health at the University of Texas at El Paso on the Fall of 2014.

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This thesis was typed by Andrea Aguila.