Oral Health Beliefs and Behavior of Indian Origin Parents

BY

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THESIS

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RP
DEDICATION

This thesis is dedicated to my adorable nephew, Neev Patel and my beautiful niece Kaeya Patel. May you continue to light up every room with your wonderful smiles and remain caries free!
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<tr>
<td>AAPD</td>
<td>American Academy of Pediatric Dentistry</td>
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<td>ABPD</td>
<td>American Board of Pediatric Dentistry</td>
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<td>ADA</td>
<td>American Dental Association</td>
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<tr>
<td>ECC</td>
<td>Early Childhood Caries</td>
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<td>IRB</td>
<td>Institutional Review Board</td>
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<td>NHANES</td>
<td>National Health and Nutrition Examination Survey</td>
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<td>SECC</td>
<td>Severe Early Childhood Caries</td>
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<td>SES</td>
<td>Socio-Economic Status</td>
</tr>
<tr>
<td>S. Mutans</td>
<td>Streptococcus Mutans</td>
</tr>
<tr>
<td>UIC</td>
<td>University of Illinois at Chicago</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
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<td>WHO</td>
<td>World Health Organization</td>
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SUMMARY

A cross-sectional study was conducted amongst parents of Indian origin in five suburban pediatric dental offices to investigate their oral health beliefs and behaviors. The survey instrument concentrated on three major aspects of the infant oral health care guideline by the American Academy of Pediatric Dentistry (AAPD); Oral Hygiene, Diet and Fluoride. The research was conducted in order to assess the parents’ beliefs and behaviors with regards to their children’s oral health, and to see if SES and level of acculturation affected their responses. The data were obtained through anonymous questionnaires administered to parents at their child’s dental visit. A total of 131 parents of Indian origin took part in the study.

Data analysis revealed that the majority of respondents were female (N=87) and born in India (N=100). They were mostly U.S. citizens (66%) or permanent residents (33%). Subjects were mostly college educated (96%). Most (75%) reported household incomes greater than $100,000. Acculturation was measured by amount of time in the U.S and immigration status, and SES was measured by both income and parental education. Analysis found that acculturation played a greater role than SES in this sample. Acculturation was associated with beliefs regarding importance of dental visits, flossing, drinking fluoridated water and disallowing bottles in bed. SES was associated with beliefs about flossing and breastfeeding and with allowing children to carry a bottle/sippy cup containing cariogenic beverages.

These findings suggest subjects’ beliefs were consistent with AAPD guidelines, but their oral hygiene and diet behaviors were not consistent with those beliefs. This is consistent
The main findings from this study are that beliefs and behaviors are not associated. The beliefs appear to be affected by cultural elements, SES and acculturation. Also, there is a notable difference between the beliefs of more recent immigrants to those who are prior immigrants. Behaviors do not correlate with any of the predictor variables.

Their beliefs are mostly consistent with guidelines, though not entirely. Home state SES and Acculturation appears to be associated with beliefs that are inconsistent with the guidelines. Regardless, compliance with guidelines is insufficient. There remains much work to be done to understand the problems and identify and test possible solutions. The results of this study can be viewed as preliminary findings that need to be explored in future studies on more representative samples.
1. **INTRODUCTION**

1.1 **Background**

Dental care is recognized as the most prevalent unmet health care need in children within the US (Newachek et al., 2000). The distribution of dental caries has become “increasingly polarized with disadvantaged groups suffering a disproportionately greater burden of disease” (Gussy et al., 2008). Several studies verify dental caries as most prevalent among lower-income households and minority adults and children (Vargas et al., 1998). Children from poor and/or minority families and those who lack health insurance are at an increased risk for unmet health care needs and together amount to 50% of US children (Newachek et al., 2000).

Dental caries is a common chronic infectious disease resulting from bacteria, primarily streptococcus mutans (S.Mutans) that break down sugars to produce acid, demineralizing tooth structure. Caries is the most common chronic disease of childhood in the US (National Institute of Health 2000). Early childhood caries (ECC) affects 28% of children two to five years of age, four million nationwide (Dye et al., 2007). The AAPD guidelines recognize that drinking fluoridated water and brushing with fluoride toothpaste at least twice daily are perhaps the most effective methods in reducing dental caries prevalence in children (AAPD, 2014).

Based on the 2010 US Census, nearly 1.9 million Indian immigrants are residing in the United States and signify the third largest immigrant group behind Mexico and China (igpa.uillinois.edu). Foreign born Indian immigrants within the United States grew from less
than 0.5% in 1960 to almost 5% in 2011. About one quarter of Indian immigrants live in three major urban areas; New York, Chicago and San Jose (igpa.uillinois.edu).

The Indian immigration to the United States increased dramatically during the 1990’s and 2000’s. In addition, people with Indian lineage have immigrated to the United States from the regions such as the Caribbean, East Africa, Canada and the United Kingdom. In comparison to their immigrant counterparts, the Indian foreign born individuals are more highly educated--nearly three-quarters of Indian-born parents’ have at least a bachelor’s degree (www.migrationpolicy.org (2010)). The 2010 Census also highlighted that Indian immigrants were less likely to live in poverty than the locals within the U.S (www.migrationpolicy.org (2010)).

Oral health of preschool children is affected by parental dental knowledge, attitudes, cultural beliefs and awareness about infant diet and feeding practices, oral hygiene habits, preventative regular dental visits, care of the primary teeth and concern for oral health (Wong et al., 2005). Knowledge and awareness are the basic fundamentals for changes in behavior, including behavior related to health and preventative measures (Green and Kreuter, 1999).

There is little research on the probable influence of cultural practices and beliefs on dental care access, especially for the infant population among U.S. ethnic minority groups. It has been stated extensively in the literature that African American, Hispanic and Native American populations are affected more than any other ethnicity (Dye, 2007).

Within Illinois, the Indian population is the fastest growing ethnic group (igpa.uillinois.edu). In spite of this, no studies were located addressing the issue of oral health beliefs and behaviors in this group.
Parental socioeconomic status, education and perceptions about oral health have been shown to have an effect on the child’s use of dental services (Rômulo Vaz Machry et al., 2013). Across a wide range of health measures, people from lower socio-economic backgrounds have higher rates of disease (including dental caries) and disability (Hamasha et al., 2006). Persons from lower socioeconomic groups often are more likely to take part in unhealthy behaviors such as eating less healthy diets (Hamasha et al., 2006).

As described in The Surgeon General’s Report on Oral Health, lower-socioeconomic status (SES) individuals are more likely to suffer from periodontal disease, oral cancer, and dental caries. There has been limited study of how health behaviors could be related to disparities in the occurrence of dental caries in children. (Hamasha et al., 2006). It is widely accepted that most caries experience is concentrated in a minority of children (Hamasha et al., 2006).

While identification of specific risk factors has been elusive, SES consistently has been identified as a general risk factor for caries in children. Most studies have only documented a relationship between lower SES and caries, however, and have not assessed why such relationships exist. Thus, there is very little known about specific behaviors in lower-SES families that place children at increased risk for dental caries. In fact, only one study was found in a literature search that assessed oral health-related lifestyle behaviors and food habits (Vereecken et al., 2004). This study found that children from lower-SES families had higher soft drink consumption rates and less frequent tooth-brushing.
Children less than 5 years of age tend to devote most of their time with parents, particularly with mothers, even when attending preschool of nurseries (Suresh et al., 2010). Childhood routines and habits are established early on in life during the years of “primary socialization.” The beliefs and behaviors of the parents and family influence the norms such as dietary and healthy behaviors established in their early years. (Suresh et al., 2010). Increased caries prevalence has been associated with parents with poor attitudes towards oral health of infants. (Hinds and Gregory, 1995).

When immigrants arrive in a new country, they are exposed to new values and undertake a process of acculturation (Gao and McGrath, 2011). “There are four distinct possible outcomes of acculturation: assimilation (movement toward the dominant culture), rejection (reaffirmation of the traditional culture), integration (synthesis of the two cultures), or marginalization (alienation from both cultures) “(Berry, 2003). How fast and to what extent individuals acculturate vary and have practical consequences on their health. “Cultural norms and behaviors affect care seeking, prevention behaviors, and ultimately, health outcomes” (Lara et al., 2005). Widespread research has been carried out to see the impact of acculturation on systemic health and is viewed as an important illustrative factor for health inequalities. However, information relating oral health disparities to acculturation is limited and fragmented.

Immigration is usually from less developed to developed countries and acculturation is often “a cultural transition to modern lifestyles” (Lara et al., 2005). Reports in the literature have provided comprehensive indication on an encouraging effect of acculturation on the utilization of dental services by immigrants’. This is similar to findings of the medical studies, which have repeatedly shown that acculturated immigrants are
more likely to use health services (Lara et al., 2005). One can imply that acculturation may be influenced by the cultural norms and beliefs within the community and can affect people’s use of health care services, and other cures (Lee et al., 1993), and ethnic beliefs on disease causality and prevention (Zhang et al., 2009).

Following contact with a new culture, acculturation can have an effect on changes in belief, behaviors, and lifestyles; the impacts of acculturation on health are arbitrated by the variations of health behaviors (Perrin and Ver Ploeg, 2004). Measuring acculturation is a difficult task; birth country, age or year of immigration, timespan of residence and language are some of the measures which have been used.

Without fully understanding background cultures and beliefs, tailoring preventive advice to immigrants can be challenging and unsuccessful (Krueter et al., 2000). Petty and Cacioppo, (1981) suggest that educating people will be more effective if it is more personally relevant and tailored to them. Therefore, parents’ beliefs and positive attitude towards dental care are significant in prevention (Chhabra et al., 2012).

A clearer understanding of how and why cultural beliefs and practices form barriers will improve the development and implementation of cost-effective preventive strategies.

1.2 Objectives

The aim of this study was to assess factors affecting the Chicago Indian parent population’s understanding of and practices related to oral health issues, including socio-economic status and acculturation.

1.3 Hypotheses
We hypothesized that knowledge of appropriate practices, socio-economic status and acculturation are associated with oral health behavior, dietary practice and fluoride competency in the Indian origin population.

H₀: Socio-economic status is not associated with oral health behavior.
H₀: Acculturation is not associated with oral health behavior.

H₁: Higher socio-economic status is positively associated with recommended dietary practices.
H₁: Higher socio-economic status is positively associated with recommended oral hygiene behavior.
H₁: Higher socio-economic status is positively associated with fluoride competency.

H₁: Level of acculturation is positively associated with recommended dietary practices.
H₁: Level of acculturation is positively associated with recommended oral hygiene behavior.
H₁: Level of acculturation is positively associated with fluoride competency.
2. REVIEW OF LITERATURE

2.1 Early Childhood Caries

The American Academy of Pediatric Dentistry (AAPD) recognizes that “infant oral health is one of the foundations upon which preventive education and dental care must be built to enhance the opportunity for a lifetime free from preventable oral disease.” The AAPD proposes recommendations for “preventive strategies, oral health risk assessment, anticipatory guidance, and therapeutic interventions to be followed by dental, medical, nursing, and allied health professional programs.”

The recommendations from the American Academy of Pediatric Dentistry (AAPD 2014) are that oral hygiene practices be implemented when the first primary tooth arrives in the mouth, and that anticipatory guidance should be given within the first six months, no later than twelve months of age, of eruption of the first primary tooth (AAPD 2014). The guidelines emphasize the importance of providing a dental home for the child by the first birthday.

Early Childhood caries (ECC) 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 child 71 months of age or younger” (Kaste and Drury 1999). ECC is described by Ripa as a progressive pattern of decay that develops after the eruption of the primary teeth and can lead to the destruction and costly restoration of teeth (Ripa, 1988). Severe Early Childhood Caries (SECC) is the presence of any caries on the smooth surface of a primary tooth on a child less than 3 years of age or from ages 3-5 having any decayed, missing or filled tooth surfaces greater than or equal to the child’s
age. It continues to be a major health problem in children aged 5 or younger (Vargas et al., 1998) and is one of the major reasons for hospitalizations of children (Sheller, 1996).

ECC occurs in all racial types and socio-economic groups, but it is “32 times more likely to occur in infants who are of low socio-economic status, who consume a diet high in sugar and whose mothers who have a low education level” (Kaste and Drury, 1999 and Mobley et al., 2009). Kaste found that Non-Hispanic blacks or Mexican-Americans, 2-4 years of age, had higher caries prevalence in their primary dentition than Non-Hispanic white children (Kaste et al., 1996). From the National Health and Nutrition Examination Survey (NHANES) study conducted 1999-2004, dental caries in primary teeth of children aged 2 to 11 years old waned from the early 1970s until around the mid-1990s. The NHANES report (1999-2004) showed this trend had inverted: a small rise in primary decay was found. The prevalence of caries in primary teeth was found to be more severe. In general they found the families of lower socio-economic status Black and Hispanic children have more decay than their other ethnic counterparts. Therefore there is a disparity by race in the prevalence of dental caries.

Ismail (1998) discussed that ECC can be classified as a social, political and behavioral problem in society. It is a social problem because it affects more disadvantage groups of society. It is a political problem because its solution involves “changing and recognizing values and political priorities”. Lastly it is a behavioral problem because it involves daily mothers or family member’s routines and practices etc. (Ismail, 1998). Therefore it is important to educate these parents on the causes and effects of ECC higher up in the prevention chain.
Major risks factors affecting ECC include frequent or prolonged use of a baby bottle containing a fermentable liquid (Dilley et al., 1980), continual use of a sweetened pacifier (Lo, 1985) and on demand breast-feeding (Matee et al., 1994). Frequent consumption of foods and liquids containing fermentable carbohydrates throughout the day and night will increase the risk of caries due to the contact between oral bacteria (S.Mutans) and teeth (Soew, 1998). The AAPD recommends that children should not be put to bed with the bottle and that on demand breast feeding should be ceased by the time of eruption of the first primary tooth (AAPD, 2014). Early oral health promotion in high risk groups can play a pivotal role in preventing dental disease in children.

2.2 Consequences of Poor Oral Health

Poor oral health is disadvantageous for children since it can affect their overall growth the development and nutritional status. Childhood caries, if untreated, may have systemic health consequences and result in pain, dental abscess formation, destruction of bone, development of dentofacial anomalies and even septicemia (Bagramian et al., 2009). Socially, oral diseases can have a large impact on children. “More than 51 million school hours are lost every year to dental-related illness. Poor children have almost 12 times more restricted activity days due to dental–related illness than children from higher-income families” (Bagramian et al., 2009).

2.3 Oral Health Beliefs and Behaviors
There are some differences in the behaviors among ethnic groups. However there is little emphasis in the literature on the role that culture plays in influencing these behaviors among immigrants (Momin et al., 2014).

Oral health of the preschool children is affected by parental knowledge, attitudes, cultural beliefs and awareness about infant diet and feeding practices, oral hygiene habits, preventative dental visits, care for primary teeth and concern for oral health (Okada et al., 2002; Wong et al., 2005).

2.4 Studies in India relating to oral health knowledge, beliefs and behavior

Currently there have been no studies on Indian immigrant parents regarding oral health beliefs and behaviors in the U.S. There is a paucity of literature available regarding parental knowledge, attitudes and cultural beliefs about oral health of their children in developing countries such as India. Moreover, most of the surveys reported in the literature are targeted at school age children due to easy accessibility. However, the existing studies indicate specific areas where Indian parents are lacking in knowledge (Chhabra et al., 2012). The Chhabra et al. study surveyed 620 parents of preschool children, who visited the dental collage in Ghaziabad, India. They found that approximately half of the parents interviewed said that brushing the teeth of children under the age of two years was not done at all or performed occasionally. Forty percent of the parents in this study never watched the brushing technique of their children nor gave them any instructions. Sixty five percent of parents denied that decayed primary teeth needed to be treated as they believed primary teeth are not as
important as permanent teeth. The study found that most of the parents (70%) were aware that frequent intake of sweet and sticky foods could cause decay of the teeth. However the awareness of the consequences of prolonged, frequent bottle feeding and the harm caused by nursing bottle at bed time was very low. The role of fluoride in preventing tooth decay was recognized by only 30% of the respondents. Less than 10% believed dental caries can be transmitted to their child via vertical transmission. Awareness that the first dental visit should occur by one year of age was reported by only 15% of the parents surveyed. When asked if social influences affected their decision regarding dental treatment, 60% of parents responded that elders, especially the grandparents, played a crucial role in taking decisions about dental treatment of their grandchildren.

Suresh et al., 2010, looked at the maternal knowledge on child’s oral health in preschool children. They also found the majority of mothers did not know that sharing utensils could result in the transmission of S. Mutans, causing dental cavities. These findings are similar to the study by Sakai et al., 2008. In regards to oral hygiene and diet, they also paralleled the study by Chhabra et al., 2012 who found that most mothers had favorable responses about diet, but knowing the importance of primary teeth and oral hygiene awareness was very poor. They also found that dietary decisions were heavily influenced by the elders of the family and that the dietary tradition is inherited.

A broad National Health Survey was conducted in 2004 across India in order to determine the oral health status and occurrence of dental disease in specific age
groups. Rates of dental caries were reported at 52% for 5 year olds and 12 year olds, and 63% for 15 year olds (Bagramian et al., 2009).

Various myths regarding dental treatments are still prevalent in certain cultures in India which can form a barrier in seeking treatment during illness (Vignesh, 2012). Rai et al., 2009, define myths as “stories shared by a group of people, which are a part of their cultural identity, and have a strong influence in seeking treatment during illness.” Most such beliefs interfere with good dental care (Vignesh and Priyadarshni, 2012). Some of these myths include; only chocolate is the cause of cavities, decay in primary teeth need not be treated as they will fall out anyway and it is best to extract a tooth rather than save it. Also, the harder people brush using hard bristles, the whiter the teeth will be and brushing the teeth with brick powder and charcoal cleans teeth better than toothpaste. It is better not to brush and floss the teeth as it causes more harm. You only visit the dentist when pain occurs in teeth (Vignesh and Priyadarshni, 2012). Social fallacies, cultural beliefs and poor education are normally inherited from one generation to the next and may be difficult to break as they are deep rooted within the culture (Vignesh, 2012). Understanding these myths is key to providing health education and effective care (Rai and Kishore, 2009).

In 2013, Nagarajappa et al., did a cross-sectional study looking at infant oral health practices, knowledge and attitudes of parents in Udaipur, India. A convenience sample of 470 people was obtained of parents from a pediatric department within a medical school. The results were consistent with the findings of Suresh et al., 2010 and Vignesh, 2012. The majority of the parents disagreed that tooth decay is a result
of sharing food and night time and frequent breast/bottle feeding did not cause dental caries. Regarding oral health practices, just under half of the respondents agreed to have chewed the food into smaller pieces before feeding their children and parents used a complete brush length of toothpaste to brush their children’s teeth. A significant association was observed in this study between outcome and socio-economic status. Studies by Suresh et al., 2010 and Williams et al., 2002, have also shown that parents with higher education were more likely to have positive health attitudes and render greater attention to the health of the child.

The studies in India have shown that there is a need for efforts by health care professionals to cultivate and support positive health attitudes among parents. Barriers to oral healthcare arising from myths and family influence could be minimized by emphasizing the importance of oral health, and provision of accessible and affordable oral health services at the primary level in India (Chhabra et al., 2012). Appropriate and specific oral health information for infants needs to be disseminated to expectant and new mothers, especially the importance of regular dental visits, effective oral hygiene measures and the detrimental effects of frequent nursing on-demand breastfeeding and bottle use at night (Nagarajappa et al., 2013).

So as these immigrants come to the U.S., it is important to recognize that they may be bringing with them cultural norms from back home and beliefs in certain myths. The literature has shown that there is a lack of health literacy in certain regions of India and the beliefs and behaviors are not consistent with the AAPD guidelines.
2.5 Studies relating to Socio-Economic Status and Acculturation of other Ethnic groups within the US

Racial, ethnic and socio-economic-related differences in children’s health are among the most serious public health problems in the United States (Kim, 2005). Among Hispanics, the prevalence of dental caries is disproportionately higher than for Caucasian or African Americans (Shiboski et al., 2003). Hispanic children are more likely to come from less affluent families, uninsured and have parents with limited education achievement (Flores & Vega, 1998). Kim, 2005, found that socio-demographic characteristics of poor immigrant populations prevent them from seeking care. They were more likely to lack education, speak a language other than English, have a low family income, or a low level of acculturation. In this diverse, urban, immigrant, low income sample, socio-economic status and acculturation were not predictive of dental service use. Maternal beliefs in preventative care were related to continuing care.

In 2007, Hilton et al. looked at cultural factors and oral health care within the Fillipino, Latino, African American and Chinese communities. They found that lack of beliefs and knowledge about primary teeth created obstacles to early prevention in all the communities studied. They also highlighted that multiple family members, especially grandparents, influence access to preventive care. For all four groups studied, the wisdom of elders is highly respected. Even when the parents are present, usually an elder (such as the grandparent) has a major influence on decisions such as health care (Hilton et al., 2007). This study also showed that regardless of age, ethnicity or immigrant status, that notion that “primary teeth will fall out anyway” was communal and influenced the belief that prevention for primary teeth was not of important (Hilton et al., 2007). This study also
found that among the non-US-born Chinese population, the influence of cultural beliefs is most evident. In this culture, they found that the first disease management protocol was herbal home remedy and if that failed they would seek dental care from a dentist (Hilton et al., 2007).

Immigrants often come from home countries with different disease profiles than those that they move to. New immigrants have been documented to have a more favorable health status or outcomes than their native born equivalents. Health behaviors and differential risk factors pre-migration have been suggested to explain this effect. The literature has shown that immigrants have a risk profile which is consistent of that of their host country or even increased. (Geltman et al., 2013). This risk may be linked to cultural barriers, language, diet and socio-economic status.

In summary, research has demonstrated that low SES, low parental education status and low level of acculturation have all been associated with higher caries disease prevalence. Extensive literature has been published about the Mexican and African American population in the US, in terms of their disease status and prevalence of disease. However, to date, literature on the Indian immigrant population is lacking. This study aims to identify whether SES and Acculturation influence the beliefs and behaviors of this population and whether they are consistent with the AAPD guidelines.
3. MATERIALS AND METHODS

The data were collected through questionnaires concerning the beliefs and behaviors of Indian origin parents attending pediatric dental offices in the Chicago area. The aim was to collect 250 surveys (50 from each of five pediatric dental practices). The questionnaires were distributed to parents coming to their child’s regularly scheduled dental appointments.

3.1 Sample Selection

The inclusion criteria were Indian origin parents who accompanied their children to dental appointments at the five selected pediatric dental offices within the Chicago suburbs. The suburbs are among those where the majority of Indian origin parents in the Chicago area reside. All other racial and ethnic groups were excluded, as were parents who could not read or write English.

3.2 Survey Tool

Parents completed the questionnaire upon arrival at their child’s dental clinic, whilst waiting to be seen. The questionnaire included 34 questions eliciting demographic information and elements of acculturation, SES and parents' oral health beliefs and behaviors relating to fluoride use, cariogenic diet, and oral hygiene, based on the AAPD guidelines on infant oral health care. For parents with multiple children, the instrument asked them to answer questions as to the youngest child with them that day.
3.3 Data Collection

All eligible parents of Indian origin who attended the selected offices during the study period were requested to partake in the study. Participation in the study was voluntary and anonymous. Front desk staff of the selected pediatric dental offices identified qualifying parents and distributed the questionnaire upon arrival for their children’s appointments. Responses were collected between August 2014 and January 2015.

The survey was written in English and had a cover letter, which explained the purpose of the study and that it was completely voluntary with no reimbursement or incentive. Subjects were given the option to turn in blank surveys if they did not wish to participate. Front desk staff who received blank surveys placed an ‘X’ across the front page so that the completion rate could be measured. All blank and completed surveys were placed in a sealed collection box at the registration desk. Each parent/caregiver was asked by the registration desk whether they had completed a questionnaire at a previous visit in order to ensure that the parent answered the questionnaire only once.

Information about Home state GDP and literacy were obtained separately. The data collected by the survey were supplemented with Maps of India, 2011 Census data.

3.4 Data Preparation:

Data entry, cleaning and analysis were performed using SPSS version 22.0, IBM Corp., Amok, NY, USA. For scoring purposes and data analysis, respondent answers to questions about beliefs and behaviors were coded as “1” if answered correctly and “0” if answered incorrectly. For those participants who left a question blank or marked “don’t
know”, a value of “0” was assigned. For some questions, the correct response was age specific. Age appropriate brushing was ultimately dichotomized correct/not correct. Two variables were left as ordinal scales these were: type of water consumed and the frequency of snacking between meals. All the recoded belief variables and behavior variables were then separately summed to create Belief and Behavior scales. The Belief scale can range from 0 to 13 and the Behavior scale can range from 0 to 8.

Cases with missing data on some variables were imputed as follows. Income was measured in ranges (see questionnaire in Appendix B). Six subjects did not provide income data, so missing income values were set to the mean of value in the scale which was 3.70. This choice was supported by the education levels of at least one parent being college educated or higher and the clear pattern of more highly educated subjects reporting higher incomes. Because they did not immigrate, U.S. born subjects did not report a year of immigration. To ensure availability of this dimension of acculturation the year of immigration for those subjects was set to 1969, the oldest value reported by the respondents. Similarly, immigration status was recoded to set missing values (US born parents) to 1, the value for naturalized citizens. When the frequency distributions of all the variables were examined, it was observed that there were gaps where no subjects were associated with some values. Several of the variables were therefore further collapsed to distribute them more evenly prior to ordinal regression analysis. See Figures 1-5.

The Belief Scale (as shown in Figure 1) was collapsed to eliminate the outliers. All values with three or fewer cases were added to the next category with > 3 cases. Also collapsed were the year of immigration variable (4 equivalent values as shown in Figure
2), income (dichotomized) Figure 3, GDP Home State (3 categories) as shown in Figure 4 and Immigration status (dichotomized) in Figure 5.
FIGURE 1. BELIEF SCALE

FIGURE 2. IMMIGRATION VARIABLE (BEFORE AND AFTER)
FIGURE 3. INCOME VARIABLE (BEFORE AND AFTER)

FIGURE 4. GDP HOME STATE VARIABLE (BEFORE AND AFTER)
3.5 Data Analysis:

To identify associations among variables within the entire data set, bivariate correlations were run for all variables (data not shown). Significant (p<.05) and near significant (p<.10) correlates with the outcome measures were identified and further analyzed using multiple ordinal regression.

3.6 IRB Approval

The study was approved by the UIC Institutional Review Board (#2014-0589) see Appendix C.
4. **RESULTS**

4.1 **Number of Respondents and Response Rates**

A total of 131 completed surveys were received out of 145 distributed. The final response rate was 90% percent.

4.2 **Demographic Characteristics of the Respondents**

Table I summarizes the demographic characteristics of the respondents.
### TABLE I DEMOGRAPHIC CHARACTERISTICS OF INDIAN PARENTS OF CHILD DENTAL PATIENTS

<table>
<thead>
<tr>
<th>Category</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>87 (66%)</td>
</tr>
<tr>
<td>Male</td>
<td>44 (34%)</td>
</tr>
<tr>
<td><strong>Parent Mean Age in Years</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>37(NA)</td>
</tr>
<tr>
<td>Male</td>
<td>39(NA)</td>
</tr>
<tr>
<td><strong>Age of Child</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;6 years old</td>
<td>91 (70%)</td>
</tr>
<tr>
<td>6-8 years old</td>
<td>20 (15%)</td>
</tr>
<tr>
<td>&gt;=9 years old</td>
<td>19 (15%)</td>
</tr>
<tr>
<td><strong>Place of Birth</strong></td>
<td></td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>23 (19%)</td>
</tr>
<tr>
<td>Gujarat</td>
<td>21 (17%)</td>
</tr>
<tr>
<td>Karnataka/Bengal</td>
<td>11 (8%)</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>10 (8%)</td>
</tr>
<tr>
<td>Kerala</td>
<td>8 (6%)</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>7 (5%)</td>
</tr>
<tr>
<td>New Delhi*</td>
<td>7 (5%)</td>
</tr>
<tr>
<td>Punjab</td>
<td>7 (5%)</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>4 (3%)</td>
</tr>
<tr>
<td>Hyderabad*</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>USA</td>
<td>26 (19%)</td>
</tr>
<tr>
<td>Other**</td>
<td>4 (3%)</td>
</tr>
<tr>
<td><strong>Immigration Status</strong></td>
<td></td>
</tr>
<tr>
<td>U.S. Citizen</td>
<td>66 (50%)</td>
</tr>
<tr>
<td>Permanent Resident</td>
<td>33 (25%)</td>
</tr>
<tr>
<td>Visiting</td>
<td>7 (5%)</td>
</tr>
<tr>
<td><strong>Health Coverage</strong></td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>8 (6%)</td>
</tr>
<tr>
<td>Private Insurance</td>
<td>116 (89%)</td>
</tr>
<tr>
<td>No Health Insurance</td>
<td>7 (5%)</td>
</tr>
<tr>
<td><strong>Education Status with at least a College Degree</strong></td>
<td></td>
</tr>
<tr>
<td>Maternal</td>
<td>122 (93%)</td>
</tr>
<tr>
<td>Paternal</td>
<td>128 (98%)</td>
</tr>
<tr>
<td><strong>Approx. Annual Household Income</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;$100,000</td>
<td>33 (25%)</td>
</tr>
<tr>
<td>&gt;$100,001</td>
<td>98 (75%)</td>
</tr>
</tbody>
</table>

* New Delhi and Hyderabad are cities, and the values for their states were used.
The remaining subjects were born in Norway, South America, Pakistan and Tanzania.

The majority of the respondents were female, born in India and U.S citizens with private insurance. Most all of the respondents were highly educated (maternal and paternal) with a high average household income reported. Nine states of origin were identified with the majority coming from Andhra Pradesh and Gujrat. The modal age of their youngest child was < 6 years old.

4.3 Belief Variables

Table II describes the frequencies of the correct and incorrect responses of the belief variable questions. The majority of parents believed regular dental visits are important and that 6-month recall visits are recommended. However, an overwhelming number did not know when the child’s first dental visit should be by one year old. Frequency of brushing and parental role during brushing was well understood. Just over half of the respondents did not identify the correct time for flossing their child’s teeth when the primary molars touch together, and that vertical transmission of S. Mutans can occur. Also, a high percentage incorrectly believed that on-demand breast feeding ad libitum does not cause dental cavities. The majority of respondents correctly identified that frequent snacking between meals of sweet and sticky foods cause’s dental cavities and that taking a bottle to bed is not encouraged.
TABLE II. NUMBER AND PERCENT OF CORRECT AND INCORRECT BELIEFS OF INDIAN PARENTS OF CHILDREN ATTENDING DENTAL VISITS

<table>
<thead>
<tr>
<th>Behavior Variable</th>
<th>Correct N (%)</th>
<th>Incorrect N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First dental visit</td>
<td>32 (24%)</td>
<td>99 (76%)</td>
</tr>
<tr>
<td>Importance of regular dental visits</td>
<td>124 (95%)</td>
<td>7 (5%)</td>
</tr>
<tr>
<td>Frequency of dental visit</td>
<td>94 (72%)</td>
<td>37 (28%)</td>
</tr>
<tr>
<td>Brushing commencement</td>
<td>83 (63%)</td>
<td>48 (37%)</td>
</tr>
<tr>
<td>Frequency of brushing</td>
<td>118 (90%)</td>
<td>13 (10%)</td>
</tr>
<tr>
<td>Parental role during brushing</td>
<td>108 (82%)</td>
<td>23 (18%)</td>
</tr>
<tr>
<td>Flossing</td>
<td>54 (41%)</td>
<td>77 (59%)</td>
</tr>
<tr>
<td>Bottle to Bed</td>
<td>120 (92%)</td>
<td>11 (8%)</td>
</tr>
<tr>
<td>Nighttime Bottle feeding causes cavities</td>
<td>87 (66%)</td>
<td>44 (34%)</td>
</tr>
<tr>
<td>On-demand Breastfeeding</td>
<td>17 (13%)</td>
<td>114 (87%)</td>
</tr>
<tr>
<td>Frequent sweet/sticky foods causes dental cavities</td>
<td>122 (93%)</td>
<td>9 (7%)</td>
</tr>
<tr>
<td>Snacking between meals</td>
<td>115 (88%)</td>
<td>16 (12%)</td>
</tr>
<tr>
<td>Vertical transmission of S. Mutans</td>
<td>60 (46%)</td>
<td>71 (54%)</td>
</tr>
</tbody>
</table>

4.4 Behavior Variables

Table III summarizes the frequencies of the correct and incorrect responses of the behavior variable questions. Hardly any parents gave their child a sweetened pacifier or a bottle/sippy sup with sugary beverages during the day and the majority disallowed a bottle to bed. Although the majority identified that they use a fluoride containing toothpaste, they did not brush their child’s teeth at least twice a day. Just over half of the respondents...
reported using an amount of toothpaste that is age appropriate and playing the appropriate role in brushing.

TABLE III. NUMBER AND PERCENT OF CORRECT AND INCORRECT BEHAVIORS (DICHOTOMIZED) OF INDIAN PARENTS OF CHILDREN ATTENDING DENTAL VISITS

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Correct N (%)</th>
<th>Incorrect N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of toothpaste</td>
<td>77 (59%)</td>
<td>54 (41%)</td>
</tr>
<tr>
<td>Frequency of brushing</td>
<td>41 (31%)</td>
<td>90 (69%)</td>
</tr>
<tr>
<td>Fluoride toothpaste</td>
<td>88 (67%)</td>
<td>43 (33%)</td>
</tr>
<tr>
<td>Sweetened Pacifier</td>
<td>130 (99%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Bottle to Bed</td>
<td>116 (89%)</td>
<td>15 (12%)</td>
</tr>
<tr>
<td>Bottle/Sippy cup with sugary beverage throughout the day</td>
<td>123 (94%)</td>
<td>8 (6%)</td>
</tr>
<tr>
<td>Age appropriate parental role in brushing</td>
<td>78 (60%)</td>
<td>53 (41%)</td>
</tr>
</tbody>
</table>

4.5 Behavior Variables in Ordinal Scale

Table IV describes the frequencies of the responses of two behavioral variables measured on an ordinal scale, 0 = incorrect, 0.5 = less correct, and 1 = correct. The largest number of respondents reported that their child drinks fluoridated tap water (correct) while a fewer reported either tap or bottled water (less correct), and the rest exclusively bottled water (incorrect). The overwhelming majority reported that their child consumes one-two snacks per day between meals (moderate snacking). Snacking per se is not considered cariogenic if foods such as carrots, cheese etc. (non-cariogenic foods) are being consumed, However, most snacks are considered cariogenic and still act as a substrate
for S. Mutans to produce acid, increasing the risk of dental cavities the more times the teeth are challenged by a drop in pH below 5.5 (critical pH).

TABLE IV. NUMBER AND PERCENT OF CORRECT BEHAVIORS (ORDINAL SCALE) OF INDIAN PARENTS OF CHILDREN ATTENDING DENTAL VISITS

<table>
<thead>
<tr>
<th>Water</th>
<th>Correct N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tap water containing Fluoride (Correct)</td>
<td>58 (44%)</td>
</tr>
<tr>
<td>Either tap/bottled water (Less correct)</td>
<td>54 (41%)</td>
</tr>
<tr>
<td>Bottle water (Incorrect)</td>
<td>19 (15%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Snacks between meals</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>None (correct)</td>
<td>7 (5%)</td>
</tr>
<tr>
<td>Moderate snacking (Less correct)</td>
<td>109 (83%)</td>
</tr>
<tr>
<td>Frequent snacking (Incorrect)</td>
<td>15 (12%)</td>
</tr>
</tbody>
</table>

4.6 Beliefs and Behavior Correlations

Table V shows that two of five pairs have no association and the others have weak associations. Regarding whether it is acceptable putting a baby to bed with a bottle and whether the baby is put to bed with a bottle, the association was weak. \((r=0.24), p<.05\). Only 6% of the variance in the behavior was predicted by expressed beliefs, which is not clinically significant. The beliefs and behavior of tooth brushing showed a moderate, positive correlation that allows very limited (25%) prediction of behavior from belief. There is little shared variance with the other paired variables, when would one expect strong correlations.
TABLE V. BELIEF AND BEHAVIOR CORRELATIONS OF INDIAN PARENTS OF CHILDREN ATTENDING DENTAL VISITS

<table>
<thead>
<tr>
<th>Paired Beliefs and Behaviors</th>
<th>Pearson’s r</th>
<th>Sig (p value)</th>
<th>r square</th>
</tr>
</thead>
<tbody>
<tr>
<td>How freq should you brush your child’s teeth and how freq do you brush your child’s teeth</td>
<td>0.50</td>
<td>0.00</td>
<td>0.25</td>
</tr>
<tr>
<td>Is it acceptable to put baby to bed with a bottle and is the baby put to bed with a bottle/sippy cup with sugary beverage</td>
<td>0.24</td>
<td>0.01</td>
<td>0.06</td>
</tr>
<tr>
<td>Does prolonged bottle feeding cause dental cavities and does your child carry a bottle throughout the day with a sugary beverage</td>
<td>0.09</td>
<td>0.31</td>
<td>0.01</td>
</tr>
<tr>
<td>Should parents play a role in brushing their child’s teeth and what role do they play</td>
<td>-0.01</td>
<td>0.24</td>
<td>0.00</td>
</tr>
<tr>
<td>Does freq of snacks cause cavities and how often does your child snack between meals</td>
<td>0.17</td>
<td>0.05</td>
<td>0.03</td>
</tr>
</tbody>
</table>

4.7 Bivariate Correlations

Two notable correlations were found among explanatory variables. Year of immigration correlated with Home State GDP and Home State Literacy. The correlations are strong and negative: GDP r=-.728, p=.000, Literacy r=-.537, p=.000. The Belief scale and the Behavior scale were moderately correlated with each other: r=.376, p=.000.

Table VI reports correlations between explanatory variables and the two outcome scales of Beliefs and Behaviors. Home State Literacy, Home State GDP, Year of Immigration, Immigration Status and Household Income were all significant correlates with
the Beliefs scale. However, none of the associations was strong. Home State GDP approached significance as a correlate with Beliefs. Only Home State Literacy correlated with the Behavior scale. Again, the association was weak.

### TABLE VI. CORRELATIONS BETWEEN PREDICTOR VARIABLES AND OUTCOME MEASURES (BELIEFS AND BEHAVIORS)

<table>
<thead>
<tr>
<th></th>
<th>Beliefs</th>
<th>Behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pearsons r</td>
<td>P value (p&lt;0.05)</td>
</tr>
<tr>
<td><strong>Demographic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home State GDP</td>
<td>0.20</td>
<td>0.02</td>
</tr>
<tr>
<td>Home State Literacy</td>
<td>0.22</td>
<td>0.01</td>
</tr>
<tr>
<td><strong>Acculturation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year of Immigration</td>
<td>-0.25</td>
<td>0.00</td>
</tr>
<tr>
<td>Immigration Status</td>
<td>-0.30</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>SES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household Income</td>
<td>-0.17</td>
<td>0.05</td>
</tr>
<tr>
<td>Maternal Education</td>
<td>-0.04</td>
<td>0.62</td>
</tr>
<tr>
<td>Paternal Education</td>
<td>-0.06</td>
<td>0.49</td>
</tr>
</tbody>
</table>

4.8 Final Regression Analysis for the Beliefs Scale:

Because only one of the predictor variables correlated with the Behavioral Scale, a multivariate regression model was not developed for behaviors. The variables that approached significance (p<0.10) in bivariate correlation with the Beliefs Scale were entered into a multivariate, ordinal regression model. Because the dependent variable
was slightly left skewed the link function “complementary log log” was chosen. This was the final model (Table VII).

**TABLE VII. MUTIVARIATE ORDINAL REGRESSION MODEL SUMMARY OF CORRELATES WITH ORAL HEALTH BELIEFS OF INDIAN PARENTS**

<table>
<thead>
<tr>
<th>Model</th>
<th>-2 Log Likelihood</th>
<th>Chi-Square</th>
<th>df</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept Only Final</td>
<td>373.215</td>
<td>19.566</td>
<td>5</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>353.649</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Goodness-of-Fit

<table>
<thead>
<tr>
<th></th>
<th>Chi-Square</th>
<th>df</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Deviance</td>
<td>497.604</td>
<td>395</td>
<td>0.000</td>
</tr>
<tr>
<td>Deviance</td>
<td>264.076</td>
<td>395</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Co efficient estimate</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immigration Status</td>
<td>0.48</td>
<td>0.06</td>
</tr>
<tr>
<td>Year of Immigration</td>
<td>-0.08</td>
<td>0.51</td>
</tr>
<tr>
<td>Home State Literacy</td>
<td>0.15</td>
<td>0.20</td>
</tr>
<tr>
<td>Home State GDP</td>
<td>-0.13</td>
<td>0.61</td>
</tr>
<tr>
<td>Household Income</td>
<td>-0.50</td>
<td>0.03</td>
</tr>
</tbody>
</table>

The model was significant and fit the data well, although only one of the variables, Income, was significant. Immigration status approached significance. Both coefficients indicated only a marginal effect on subjects’ understanding of children’s oral health. Notably, the higher the family’s income, the less likely they were to hold correct beliefs about children’s oral health with the other variables held constant.
5. **Discussion**

5.1 **Summary of findings**

The main findings from this study were that beliefs and behaviors were not strongly associated. Beliefs were marginally affected by cultural elements (Acculturation) and SES. Also, there was a notable difference between the beliefs of more recent immigrants to those who are prior immigrants.

5.2 **Influencing Factors**

5.2.1 **Gross Domestic Product and Literacy**

There were notable correlations between year of immigration, home state GDP and literacy. The recent immigrants came from states which have lower GDPs and literacy rates (see Appendix E). Although the majority of the sample indicated a high income and educational level, it is important to appreciate that the more recent immigrants came from areas known for behavior inconsistent with the guidelines. In this case, cultural norms may have more influence than education, important information for those practicing with the U.S. immigrant population.

5.2.2 **Demographics and Recency of Immigration**

Home state GDP and Literacy are associated with beliefs. Because more recent immigrants are coming from states with lower GDP and literacy rates, the data suggest that they should be targeted for education to improve their understanding of oral health for
children. However, education alone cannot be expected to translate into compliant behavior. Nevertheless, if changing attitudes is a necessary first step, there is more work to be done with the incoming immigrants just to get them to the same belief level as prior immigrants. Further investigation is needed.

5.3 Beliefs

The stated beliefs of the subjects in the present study were mostly accurate and consistent with the AAPD guidelines. However some areas of weaknesses were demonstrated. These included age of first dental visit, the risks of on-demand breastfeeding, and vertical transmission of S. Mutans. Beliefs were found in this study to be associated with acculturation. The most recent immigrants may carry cultural norms and traditional practices with them from India.

The majority of parents believed regular dental visits are important and recognized the importance of regular care. This is in contrast to the study by Hilton et al., 2007, who found lack of knowledge about primary teeth in ethnic minority populations. The subjects demonstrated good understanding of frequency of brushing and parental role during brushing, in contrast to the findings by Suresh et al., 2010 and Chhabra and Chhabra, 2012.

Parents in this study did not know when a child’s first dental visit should be. This was also noted by Chhabra and Chhabra, 2012, among Indians. This suggests that the perinatal period may provide an educational opportunity for physicians and nurses, as they are more likely to see mothers while the children are very young or not yet born. Also, the roles of on-demand breast feeding and vertical transmission of S. Mutans dental caries
was not understood by the subjects in the current study, consistent with the studies by Suresh et al., 2010, and Sakai et al., 2008. Earlier dissemination of this information during pregnancy by obstetric practitioners could improve this.

This study found that the majority of the respondents believed that frequent intake of sweet and sticky foods could cause decay, and dipping a pacifier in sweetened substance is not favorable, similar to findings of Chhabra and Chhabra (2012). However, the respondents in this study recognized that taking a bottle to bed and frequent bottle feeding through the day can cause dental cavities, unlike the subjects studied by Chhabra and Chhabra, 2012.

5.4 Behaviors

Although beliefs appear to be consistent with the guidelines, behaviors were somewhat inconsistent with stated beliefs and guidelines. Almost all of the parents did not give their child a bottle/sippy cup with sugary beverages during the day between meals and disallowed a bottle to bed. This is consistent with their stated beliefs. Despite knowing that fluoride toothpaste is important, subjects did not brush their children’s teeth twice a day, using the age appropriate amount of toothpaste, nor did they play an age-appropriate role in brushing. Pediatric dentists can play an important role by providing the correct age-specific anticipatory guidance to these parents and to identify possible barriers to correct behavior.

The discrepancy between expressed beliefs and behavior may be attributable to the recency of immigration in this sample. Their high education levels may influence their
beliefs more than their behavior, which may be influenced more by cultural norms. The Theory of Planned Behavior suggests that cultural norms as well as beliefs shape behavioral intent (Appendix D). Social fallacies may be inherited from one generation to the next (Vignesh, 2012). Family influences such as respect for elders’ decisions regarding oral health care, may be prevalent in first generation immigrants (Chhabra and Chhabra, 2012).

5.5 Strengths and weaknesses of the study

Children of immigrant families are understudied in health services in the US (for exceptions, see Kim, 2005, and Hilton, 2007). To our knowledge, this study is the first to investigate the beliefs and behaviors of Indian origin parents in the USA.

This study had several limitations. Firstly the sample was drawn only from parents of Indian origin who attended their child’s dental appointments at the pediatric dentist in affluent suburbs. We do not know whether they represent the larger population in Chicago area, but it seems unlikely. Still unknown is whether less affluent Indian immigrants, with less access to dental care, display the same behavioral patterns as this sample. Therefore, further research is needed with different sample strategies to target non clinical samples. Due to the lack of heterogeneity in education and income, we were not able to adequately test for influences of SES in this study. If there is an association, we do not have data to show this; this would require further investigation with a more varied sample.

This study’s exclusion criteria eliminated sampling respondents who were not English literate. Language barriers have been shown to create a barrier to care and
access (Ver Ploeg, 2004). It is reasonable to posit that first generation; recent immigrants may not speak English due to their limited acculturation. If local Indian populations include persons who aren’t fluent in English, then studies of those people should accommodate the language of the subjects.

5.6 Implications for future research

This project has broken new ground and opens opportunities for further research. This study suggests that providers of perinatal and post-natal care may be positioned along with pediatric dentists to provide advice to Indian mothers. Studies should examine whether those providers are willing or knowledgeable enough to provide such guidance, and should also examine whether such guidance is effective in influencing parents’ behavior.

Study subjects were all highly educated and expressed the correct beliefs for the most part, but revealed a disconnect between knowledge and behavior. Research is needed to test efficacy of interventions to support healthier behavior among Indian parents regarding their children’s oral health. It is possible that caregivers who aren’t parents (for example, grandparents) may be influential in the oral health behaviors applied to children, so interventions with non-parental caregivers are warranted. In addition, the cultural norms of this group ought to be studied to better understand their behavior.
6. **CONCLUSIONS**

Indian origin parents’ beliefs are mostly consistent with guidelines, though not entirely. Home state, income and acculturation may all have something to do with the inconsistencies. Regardless, compliance with guidelines is insufficient. There remains much work to be done to understand the problems and identify and test possible solutions. The results of this study can be viewed as preliminary findings, needing to be explored in future studies on more representative samples.
7. **CITED LITERATURE**


Institute of Government Affairs, last modified 2014, igpa.uillinois.edu

Indo-American Centre, last modified 2015, http://www.indoamerican.org/


Migration Policy Institute, as of 2010, http://www.migrationpolicy.org/


“WHO 2013” as of May 19, 2015, http://www.who.int/about/en/


Dear Parent or Caregiver,

My name is Reena Patel, and I am a Pediatric Dental resident at the University of Illinois at Chicago. I am interested in learning more about oral health in relation to preschool children within the Indian population.

I would like to invite you to help in this research project. If you agree, you will answer some questions about yourself and the youngest child that you bring with you today. This survey is anonymous, so we will NOT be able to identify you or your child.

Your help in this study is completely voluntary and should take no more than 10 minutes of your time to complete. By answering the questions, you will provide us with helpful information on what your personal beliefs and behaviors are towards the oral health of your child.

Your help in this project is very valuable to us and would help us understand and tailor oral health education and provide effective interventions to children and their parents for this particular population more effectively.
If you choose not to answer the questions, please place the blank survey in the appropriate collection box. Please remember that whether you choose to participate or not, this will not affect your child’s relationship with the clinic.

If you have any questions or concerns about this study, please contact the Office for the Protection of Research Subjects of University of Illinois at Chicago at (312) 996-2862. You may also call me or my advisor, Dr Indru Punwani at (312) 996-7531 or email me at rpate207@uic.edu.

Thank you for your co-operation in this project!

Reena Patel, DDS
Second Year Resident
Department of Pediatric Dentistry
APPENDIX B

(Please circle the correct responses or fill in the blanks as appropriate.)

1) What is your gender?
   1 Male
   2 Female

2) What is your age? _______________

3) Where were you born?
   1 USA ➔ Skip to Question 5
   2 India ➔ Go to Question 3A
   3 Other (please specify)_______________________ ➔ Skip to Question 4

   3A) In what State were you born? _______________

4) In what year did you come to the U.S.? _______________

   4A) Which of the following best describes your immigration status?
       1 U.S. Citizen
       2 Permanent Resident
       3 Visiting

5) Regarding the child or children that you brought with you today, what is the age of the youngest child?__________
If you have brought more than one child with you, the following questions will be about the **youngest** child that you have brought with you today.

6) Who does the child live with?
   1 Just parents
   2 Parents and Grandparents
   3 Other (please specify) _________________________

7) Who does the child spend most of his/her daytime with?
   1 Parents
   2 Nanny/Babysitter
   3 Grandparents
   4 Other (please specify)________________________

8) What is your relationship with the child?
   1 Parent  ➔ Go to Question 9
   2 Grandparent  ➔ STOP HERE
   3 Foster parent/Guardian➔ STOP HERE
   4 Other (please specify) __________________________➔ STOP

If you answered a response other than ‘parent’ for Q8, please **stop here** and return the questionnaire into the collection box. Thank you for your time.

9) What type of health coverage does your child have?
   1 Medicaid
2 Private Insurance
3 No health insurance
4 Don’t Know

10) At what age, do you believe, should children first be examined by the dentist?
1 Age 1
2 Age 2
3 Age 3
4 More than 3 years old

11) Do you believe that regular dental visits are important for children the age of your child?
1 Yes
2 No
3 Don’t Know

12) How frequently do you think children the age of your child should visit the dentist?
1 Every 6 months
2 Once a year
3 When there is a problem
4 Never

13) When do you believe parents should first start brushing a child’s teeth?
1 When the first tooth appears → Go to Question 14
2 When all the baby teeth are in → Go to Question 14
3 No need to brush baby teeth → Go to Question 20
4 Don’t know → Go to Question 14

14) When brushing your child’s teeth, which of the following amount of toothpaste do you use?

1 A smear 2 Pea size amount 3 Regular 4 Don’t Know

15) How frequently do you believe children the age of your child’s should have their teeth brushed?

1 Once daily 2 Twice daily 3 More than twice daily 4 Don’t know

16) How frequently are your child’s teeth brushed?

1 Once daily 2 Twice daily 3 More than twice daily 4 Occasionally 5 Never → Skip to Question 21
17) Do you believe that parents or other caregivers should be involved in brushing children’s teeth?
   1  Yes
   2  No
   3  Don’t Know

18) What role do you play in brushing your child’s teeth?
   1  Assist
   2  Supervise/watch
   3  No role (They brush by themselves)

19) Do you use a fluoride-containing toothpaste to clean your child’s teeth?
   1  Yes
   2  No
   3  Don’t Know

20) When do you believe parents should start flossing a child’s teeth?
   1  When baby molar teeth first touch together
   2  When adult teeth come in
   3  Never
   4  Don’t know

21) What kind of water does your child drink most often?
   1  Tap water containing fluoride
   2  Bottled water
   3  Either tap or bottled water
22) If your child is using a pacifier, is it sometimes dipped in honey or other sweet substances?
   1  Yes
   2  No
   3  Does not use a pacifier
   4  Don’t Know

23) Is your child sometimes put to bed with a bottle or sippy cup with milk or juice?
   1  Yes
   2  No
   3  Don’t Know

24) Do you believe it is alright to put a baby to bed with a bottle of milk or juice?
   1  Yes
   2  No
   3  Don’t Know

25) Does your child carry a bottle or sippy cup throughout the day containing something other than plain water?
   1  Yes
   2  No
   3  Don’t Know

26) Do you believe prolonged and frequent bottle feeding can cause dental cavities?
<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>27) Some mothers breastfeed their babies whenever the baby expresses a desire to be fed. Do you believe that on-demand breastfeeding can be harmful for a child’s teeth?</td>
<td>1 Yes</td>
<td>2 No</td>
<td>3 Don’t Know</td>
</tr>
<tr>
<td>28) Do you believe frequent exposure to sweet and sticky foods can cause dental cavities?</td>
<td>1 Yes</td>
<td>2 No</td>
<td>3 Don’t Know</td>
</tr>
<tr>
<td>29) How often does your child have snacks or beverages (other than water) <strong>between</strong> meals?</td>
<td>1 None</td>
<td>2 Once or twice a day</td>
<td>3 More often (Please specify)_________________</td>
</tr>
<tr>
<td>30) Do you believe frequent snacking of sugary food or drinks (juice/formula/soda) <strong>between</strong> meals can cause dental cavities?</td>
<td>1 Yes</td>
<td>2 No</td>
<td></td>
</tr>
</tbody>
</table>
3) Don’t Know

31) Do you believe that bacteria causing decay can get transmitted from parents to children by sharing food or utensils?
1 Yes
2 No
3 Don’t Know

And now we would like to ask you a couple of questions about your household.

32) What is the highest level of education the child’s mother has completed?
1 Did not complete High School
2 High School Diploma
3 Technical or Community College Degree
4 University/College Degree
5 Advanced Degree
6 Don’t know

33) What is the highest level of education the child’s father has completed?
1 Did not complete High School
2 High School Diploma
3 Technical or Community College Degree
4 University/College Degree
5 Advanced Degree
6 Don’t know
34) What would you say is your annual household income?

1  Less than $30,000
2  $30,001-60,000:
3  $60,001-100,000
4  More than $100,000
5  Don’t know

Thank you for participating in this survey research study.

Please place the completed survey in the box.
APPENDIX C

UNIVERSITY OF ILLINOIS
AT CHICAGO

Office for the Protection of Research Subjects (OPRS)
Office of the Vice Chancellor for Research (MC 672)
203 Administrative Office Building
1737 West Polk Street
Chicago, Illinois 60612-7227

Exemption Granted

June 17, 2014

Reena Patel, DDS, BDS

Pediatric Dentistry

801 S Paulina Street, 248 DENT

Chicago, IL 60612

Phone: (847) 867-0413 / Fax: (312) 996-7530

RE: Research Protocol # 2014-0589
“Oral Health Beliefs and Behavior of Indian Origin Parents”
Dear Dr. Patel:

Your Claim of Exemption was reviewed on June 17, 2014 and it was determined that your research protocol meets the criteria for exemption as defined in the U. S. Department of Health and Human Services Regulations for the Protection of Human Subjects [(45 CFR 46.101(b)]. You may now begin your research.

**Exemption Period:** June 17, 2014 – June 17, 2017

**Performance Site:** UIC

**Non-Engaged Site(s):** All Bear Cub Pediatrics, Glen Ellyn Pediatric Dentistry, P.C., Russell S. Pollina, D.D.S., P.C., ABC Dentistry & Orthodontics, Irwin M. Seidman, D.D.S., P.C., Just for Kids Dentistry, LTD.

**Subject Population:** Adult (18+ years) subjects only

**Number of Subjects:** 400

**The specific exemption category under 45 CFR 46.101(b) is:**

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is
recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

You are reminded that investigators whose research involving human subjects is determined to be exempt from the federal regulations for the protection of human subjects still have responsibilities for the ethical conduct of the research under state law and UIC policy. Please be aware of the following UIC policies and responsibilities for investigators:

1. **Amendments** You are responsible for reporting any amendments to your research protocol that may affect the determination of the exemption and may result in your research no longer being eligible for the exemption that has been granted.

2. **Record Keeping** You are responsible for maintaining a copy all research related records in a secure location in the event future verification is necessary, at a minimum these documents include: the research protocol, the claim of exemption application, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to subjects, or any other pertinent documents.

3. **Final Report** When you have completed work on your research protocol, you should submit a final report to the Office for Protection of Research Subjects (OPRS).

4. **Information for Human Subjects** UIC Policy requires investigators to provide information about the research protocol to subjects and to obtain their permission prior to their participating in the research. The information about the research protocol should be presented to subjects in writing or orally from a written script. When appropriate, the following information must be provided to all research subjects participating in exempt studies:
   a. The researchers affiliation; UIC, JBVMAC or other institutions,
   b. The purpose of the research,
   c. The extent of the subject’s involvement and an explanation of the procedures to be followed,
   d. Whether the information being collected will be used for any purposes other than the proposed research,
   e. A description of the procedures to protect the privacy of subjects and the confidentiality of the research information and data,
   f. Description of any reasonable foreseeable risks,
   g. Description of anticipated benefit,
   h. A statement that participation is voluntary and subjects can refuse to participate or can stop at any time,
i. A statement that the researcher is available to answer any questions that the subject may have and which includes the name and phone number of the investigator(s).

j. A statement that the UIC IRB/OPRS or JBVMAC Patient Advocate Office is available if there are questions about subject’s rights, which includes the appropriate phone numbers.

Please be sure to:

➔ Use your research protocol number (listed above) on any documents or correspondence with the IRB concerning your research protocol.

We wish you the best as you conduct your research. If you have any questions or need further help, please contact me at (312) 355-2908 or the OPRS office at (312) 996-1711.

Please send any correspondence about this protocol to OPRS at 203 AOB, M/C 672.

Sincerely,

Charles W. Hoehne, B.S., C.I.P.
Assistant Director

Office for the Protection of Research Subjects

cc: Marcio Da. Fonseca, Pediatric Dentistry, M/C 850
APPENDIX D

Theory of Planned Behavior: Theoretical structure

The theory of planned behavior links behaviors and beliefs. The theory states that attitude toward behavior, subjective norms, and perceived behavioral control, ALL shape an individual's behavioral intentions and behaviors.

![Diagram of Theory of Planned Behavior]

The Theory of Planned Behavior: Theoretical structure

Behavior is viewed as flowing from intentions towards the behavior and is modified by three factors:

1) Perceived behavioral control is defined as the degree to which the behavior is under one’s control. That is an individual’s perceived ease or difficulty of performing the
particular behavior. The concept of perceived behavioral control is conceptually related to self-efficacy and facilitating conditions.

2) **Subjective norms** are defined as perceptions of social norms regarding the behavior. These norms are based on judgement of significant others (e.g. friends, peers, family, dentists) regarding whether they should or should not perform such behavior (normative pressures). These norms mainly influence the motivation to comply with the behavior.

3) **Attitudes** are defined as the positive or negative evaluations of the expected outcome of the behavior. This is governed by three key factors; relative advantage, compatibility and complexity. In this study, the attitudes of interest pertain to oral health and its import including diet and fluoride compliance to prevent dental caries.
APPENDIX E

Birth State GDP and Literacy Variables for India-Born Subjects:

The GDP and literacy variables for subjects born in India, were based on Maps of India taken from the Government of India’s statistical data (2011 Census of India).
Literacy by States of India

The variables for Birth State GDP and Literacy were created based on data reported by the Indian Government as reported by Maps of India (Census of 2011).
APPENDIX F

VITA

Reena Patel, D.D.S

EDUCATION

Certificate in Pediatric Dentistry
*University of Illinois at Chicago*, Chicago, IL
Expected June 2015

Master of Science in Oral Sciences (MS)
*University of Illinois at Chicago*, Chicago, IL
Expected June 2015

Doctor of Dental Surgery (DDS)
*University of Illinois at Chicago*, Chicago, IL
May 2013

Bachelor of Dental Surgery (BDS)
*Kings College London*, London, U.K.
May 2007

PROFFESIONAL EXPERIENCES

Kids Dental – Bartlett, IL
*Dental Assistant, January 2011 – 2013*

Castelnau Dentists – London, UK
*Dental Associate, January 2010 – November 2010*

Lake Street Dental – Roselle, IL
*Dental Assistant, September 2009 – December 2009*

Southgate Smiles – London, UK
*Dental Associate, July 2008 – July 2009*

Purly’s Dental Care – Hertfordshire, UK
*Dental Associate, July 2008 – July 2009*

King’s College Dental Institute – London, UK
*Clinical Professor Restorative Dentistry, July 2008 – July 2009*

LICENSURE & CERTIFICATIONS
Pediatric Advanced Life Support (PALS), University of Illinois at Chicago 2013
Advanced Cardiac Life Support (ACLS), University of Illinois at Chicago 2013

PROFESSIONAL MEMBERSHIPS

Omicron Kappa Upsilon (National Dental Honor Society) Member 2013-Present

American Dental Association (ADA), *Active Member*, 2011-Present

American Association of Pediatric Dentistry (AAPD), *Resident Committee*, 2013-Present

Illinois Society of Pediatric Dentistry (ISPD), *Active Member*, 2013-Present

Chicago Dental Society (CDS), *Active Member*, 2011-Present

Indian Student Dental Association (ISDA), *President*, 2011-2013

American Dental Education Association (ADEA), *UIC IDDP Representative*, 2012-2013

International Dental Degree Program (IDDP), *Class Representative*, 2011-2013

American Student Dental Association (ASDA), *Active Member*, 2011–2013

Student National Dental Association (SNDA), *Active Member*, 2011-2013

British Society of Pediatric Dentistry (BSPD), *Active Member*, 2007-Present

Academy of General Dentistry (AGD), *Active Member*, 2011-Present

*British Dental Association, Active Member, 2007-Present*