

# The Prevalence of Early Childhood Caries (ECC) and Its Associated Risk Factors Among Immigrant Tibetan Pre-School Children in Bylakuppe, Mysore, India

**Madhusudan Kushalappa. Kaikure<sup>1,\*</sup>, Ann Thomas<sup>1</sup>, Sowmya B. Shetty<sup>1</sup>, Tony Jose<sup>2</sup>, Raghavendra Pidamale<sup>1</sup>, Savitha Lakshmi Kaikure<sup>3</sup>**

<sup>1</sup>Dept. of pedodontics and preventive dentistry, A J Institute of dental sciences, Mangaluru, India

<sup>2</sup>Dept. of pedodontics and preventive dentistry, Indira Gandhi dental college, Cochin, India

<sup>3</sup>Dept. of oral and maxillofacial pathology, A J Institute of dental sciences, Mangaluru, India

## Email address:

dr.mkkkaikure@gmail.com (M. K. Kaikure), dr\_mkkkaikure@yahoo.com (M. K. Kaikure), annkotts@hotmail.com (A. Thomas), sowmyab@live.com (S. B. Shetty), dr.tonyjose@live.com (T. Jose), drpidamale@yahoo.com (R. Pidamale), savimadsk@yahoo.com (S. L. Kaikure)

## To cite this article:

Madhusudan Kushalappa. Kaikure, Ann Thomas, Sowmya B. Shetty, Tony Jose, Raghavendra Pidamale, Savitha Lakshmi Kaikure. The Prevalence of Early Childhood Caries (ECC) and its Associated Risk Factors Among Immigrant Tibetan Pre-School Children in Bylakuppe, Mysore, India. *Science Journal of Public Health*. Vol. 3, No. 3, 2015, pp. 384-390. doi: 10.11648/j.sjph.20150303.23

---

**Abstract:** *Objectives:* This study estimated the prevalence of early childhood caries (ECC) and related risk factors in a population of immigrant Tibetan pre-school children in Bylakuppe of Mysore District; India. *Methodology:* A cross sectional study was conducted in 500 pre-school children between 10 to 72 months of age in and around Bylakuppe of Mysore district; India; using II stage stratified random sampling. The caries experience was recorded using defs and the deft index. Information regarding risk factors for caries was obtained through a structured questionnaire given to mothers/caretakers. *Statistical data analysis:* The data was statistically analyzed by using “chi-square” test and “ANOVA” test. *Results:* The prevalence of ECC in the study sample was significantly high. It was 92.2% with the mean defs score of 10.27 and the mean deft score of 6.15 ( $p < 0.001$ ). Higher prevalence of ECC was found, in children with bottle feeding, addition of sugar to bottle content and to regular food, in-between meal snacking habits and increase intake of sweets like chocolate, candies and toffees, lesser frequency of brushing and child brushing unassisted/unsupervised. Reports of regular visits to the dentist were almost absent in the study population. *Conclusion:* This study demonstrates the high prevalence of ECC in the study population. Development of strategies and protocols; to prevent and manage ECC, based on the risk factors identified for these population, is essential to curb this oral health problem.

**Keywords:** ECC, Caries Experience, Feeding and Dietary Practices, Oral Hygiene Practices, Regular Dental Visits, Socio-Economic Status

---

## 1. Introduction

Early Childhood Caries (ECC) has been a major health problem over many years and still continues today, affecting the physical growth and development, as well as the social adaptation of young children. It is a rampant, chronic, transmissible, infectious disease, which can rapidly destroy the primary dentition of toddlers and young children (Filstrup SL *et al.*, 2003), with a complex and multi-factorial etiology; which includes excessive bottle feeding with sugar containing liquids, “at will” breast feeding and/or falling

asleep while feeding and nursing beyond the recommended age for weaning (Man Qin *et al.*, 2008). It associated with other health problems, range from local pain, infections, abscesses, leading to difficulty in chewing, malnutrition, gastrointestinal disorders, difficulty in sleeping (Low W *et al.*, 1999); and also impairing the quality of life and low self-esteem (Tracy L *et al.*, 2007). Furthermore, children with ECC are at a greater risk for increased caries experience along the continuum of childhood (Kaste LM *et al.*, 1992; Li

Y and Wang W 2002).

American Academy of Pediatric Dentistry (AAPD) in 2003 defined ECC as the presence of one or more decayed (non-cavitated or Cavitated), missing (due to caries), or filled tooth surface in any primary tooth in a child 71 months of age or younger. The current definition of ECC is the presence of at least one primary tooth affected by caries in children under 6 yrs of age (Robert JS *et al.*, 2005). It encompasses all previous terminologies, namely baby bottle tooth decay, baby bottle syndrome, labial caries, nursing caries, nursing bottle caries, nursing bottle syndrome, rampant caries etc; including sub groups with minimal or isolated decay extending to those with rampant manifestations (Robert JS *et al.*, 2007). Prevalence of ECC also varies widely with several factors like race, culture and ethnicity; socioeconomic status, life style, dietary pattern and oral hygiene practices (Murray JJ 1996). Culture is characterized by different indigenous beliefs that directly impact on child-rearing practices, the nature of family roles and health beliefs (Laws MB 2001). Some cultures place little value on primary teeth, Native Americans consider ECC as a normal childhood disease affecting children (Man Wai Ng 2003).

Numerous studies have been conducted worldwide to find the prevalence of ECC. Data on preschool children are sparse and often lack adequacy in sample size and representativeness; because children at these ages are not readily accessible for examination and are difficult to examine thoroughly (Vadiakas G 2008). A comprehensive literature review of the prevalence of ECC found it highest in South East Asia (36 -85 %) and to be low in developed countries like USA and England 11-53% and 6.8-12% respectively (Vivek DK 2010). There is paucity of studies on ECC prevalence and its associated risk factors; in the immigrant Tibetan population worldwide.

Background: Invasion of Tibet by China in 1950 led to an exodus of Tibetans to India; who have immigrated and settled in small disparate communities in different parts of the country. These immigrant Tibetans continue to practice their traditional lifestyles, beliefs, customs and dietary habits; with only negligible changes made to suit the local environment (Robertson J *et al.*, 1989). A marked difference in lifestyle, culture, beliefs and practices are visible in the immigrant Tibetan population in Bylakuppe of Mysore district: India.

Hence, the aim of this study is to assess the prevalence of ECC and the associated risk factors among the immigrant Tibetan children below 6 years of age residing in Bylakuppe of Mysore district; India.

## 2. Methodology

This cross sectional study was conducted in the immigrant Tibetan pre-school children (N=500) in Bylakuppe of Mysore district; India, to assess the prevalence of ECC and its associated risk factors.

**Sampling procedure:** The study population consisted of 500 immigrant Tibetan children (266 males and 234 females) between 10 to 72 months of age. All the immigrant Tibetan

children were selected from the ten pre-schools; located at Tibetan settlements in Bylakuppe of Mysore district; India.

**Inclusion criteria:** The study sample was selected based on the following criteria:

- Children below 6 years of age only.
- Children with only primary dentition.
- Children with a class I physical status according to American Society of Anesthesiologists (ASA).

Approval for the study was obtained from the respective authorities. The parents of the study participants and the teachers/caretakers; were given clear explanations about the objective of the study and written consent was obtained; to collect information and to carry out clinical examination of the children.

**Dental examination procedure:** The dental examination was performed by one qualified dentist with the aid of a dental diagnostic set (plane mouth mirror, CPI probe and tweezer). Personal protective barriers like gloves and masks were used. Chemical sterilizing solution was used for instrument sterilization. CPI probe was used to confirm visual evidence of caries on the occlusal, buccal and lingual surfaces. Children were examined seated on an upright chair in adequate natural light and the data was recorded by a separate recorder. The caries experience was recorded using defs and the deft index.

**Data collection:** A questionnaire was developed in English; containing 23 questions to collect the relevant data of the children's demographic details (8 questions), socioeconomic status (2 questions), oral hygiene habits (6 questions); dietary habits (5 questions) and dental visits to the dentist (2 questions). Part of the questionnaire on dietary habits, was worded differently for children below 3 years and above 3 years to elicit the correct details. The children's parents were instructed to complete the questionnaires to the best of their understanding.

**Data analysis:** The data was statistically analyzed by using "chi-square" test and "ANOVA" test.

## 3. Result

The study sample consisted of 500 Immigrant Tibetan children, of which 266 were males and 234 were females with age ranged from 10 to 72 months. (Mean age= 3.896yrs/45 months). It was very highly statistically significant ( $p < 0.001$ ) (Table.1).

The prevalence of ECC was 92.2%; with the mean defs score of 10.2 and the mean deft score of 6.15 ( $p < 0.001$  vhs). According to the age distribution, the prevalence of ECC among the children below 36 months was 82.6%; children aged between 36-47 months was 97%; children between 48-59 months was 96.1% and children between 60-72 months was 91.4% (Table.2).

In this study, 89.2% of the Immigrant Tibetans have reported to be practicing the oral hygiene habit of tooth brushing. The majority of the children reported to be using tooth brush and toothpaste, and the prevalence of ECC in these children was 90.1% and only 1.3 % of the children

reported of using finger. No statistically significant difference was found in the ECC prevalence and the different aids used for tooth brushing. The prevalence of ECC decreased when the frequency of tooth brushing was greater. It was found statistically significant ( $p=0.012$ ). In this study, only 4.2% of the immigrant Tibetan children assisted by the parent in tooth brushing. Majority of the children reported to be brushing alone. The prevalence of ECC was found higher among those who brushed unassisted/unsupervised than those who had brushed under parental supervision/ assistance. It was highly significant ( $p = 0.006$ ). 50% of immigrant Tibetan children reported positively of rinsing mouth after every meal. ECC prevalence was found more among those who had not rinsed their mouth after every meal. No statistical difference was found between ECC prevalence and this habit (Table.3).

In this study, majority of the mothers had breast-fed their child. More than 50% of the children's caretakers did not remember the frequency of feeds during the day and night. Majority of the children weaned from breast feeding at the age of 1yr. There was no statistical significant correlation between ECC experience and breast feeding habit in the population. Bottle feeding practice was very much common among the immigrant Tibetan children (81.4%); and this was statistically highly significant ( $p<0.001$  vhs). Only 1.3 % of the immigrant Tibetan sample had reported of still breast feeding after 3yrs of age. The common content of the bottle was cow's milk and infant formula. The prevalence of ECC was found higher in the bottle fed children; and was statistically very highly significant ( $p<0.001$  vhs). The habit of adding table sugar to the bottle content was found in 80.0% of the bottle fed sample. The ECC experience was higher in those with this habit and was statistically highly significant ( $p<0.001$  vhs). 76.8% of the immigrant Tibetan children reported of consuming regular or complementary foods. 88.0% reported the habit of adding sugar to the food and this habit showed very high significant prevalence of ECC ( $<0.001$  vhs). 67.4% of the children aged 3yrs and above reported to a frequency of five regular meals per day (table.4).

The habit of in-between-meal snacking was considerably low among the immigrant Tibetan children. 18.8 % Tibetan children reported to the habit of in-between-meal snacking, while 20.4% did not respond to this question. It shows that, the correlation between ECC and in-between meal snacking habit was very highly significant. 82% of the immigrant Tibetans children reported to the presence of the habit of eating sweets. ECC prevalence was more among those who had regular sweet intake (chocolates, candies, toffees). There was statistically very high significance ( $p<0.001$ ) in the correlation between ECC and sweet intake in the population (Table.4).

Only 17% of the immigrant Tibetan children had been to the dentist. Among those who have not visited dentist; 91% of the children experienced ECC. It shows high significance (.006hs), when correlated on ECC prevalence and visit to the dentist. 90.6% of the immigrant Tibetan children had been to the dentist due to tooth related problems such as pain, swelling, trauma etc; and only 9.3 % of the children had

visited dentist for regular check up. Among those who had been to the dentist, 67.5% of the children had received treatment like amalgam restoration and extraction (table.5).

## 4. Discussion

ECC is a virulent form of dental caries that can destroy the primary dentition of toddlers and preschool children. Despite the major advances in the field of caries prevention over the decades, there are reports of early childhood caries in young children are still high (Robert. J and Berkowitz 2003). ECC universally thought to be an endemic, and is severe in socio-economic, immigrant and indigenous communities with ECC prevalence reported to range from 11-75% (Cunnigham SED *et al.*, 2008).

**ECC Prevalence:** In this study, the prevalence of ECC in the immigrant Tibetan sample was significantly higher. It was 92.2% with a mean defs score of 10.27 and deft score of 6.15 and only 7.8% was caries free (Table No.2). This is similar to the other reports of the immigrant population having higher prevalence of ECC (Ekman A *et al.*, 1981; Tang JMW *et al.*, 1997). No data is available regarding ECC prevalence in the Tibetan populations or in the immigrant Tibetans in India. In children aged between 5-6yrs, 8.6% were caries free with a mean deft score of 7.04; it was higher to the value reported in the similar population in Dhar, India, 20% of the children were caries free and the mean deft score was six (Robertson J *et al.*, 1989). The ECC prevalence in the Tibetan population, when compared to the developed and developing countries was higher. In children aged 3yrs, the ECC prevalence in immigrant Tibetans was 97%, and is considerably higher to the value reported in Philippines (Cariono KM *et al.*, 2003) which was 80%; and was more than twice the value reported in Turkey which was 40% (Namal N *et al.*, 2005). In the children aged 4yrs, ECC prevalence in immigrant Tibetans was 96.1%; which considerably more than the values reported in Scotland (Sweeney PC and Gel bier S 1999) and Philippines (Cariono KM *et al.*, 2003) which was 86% and 90% respectively; whereas it is almost twice the value reported in Turkey which was 50% (Namal N *et al.*, 2005). In children aged 5yrs ECC prevalence in immigrant Tibetans was 91.4%; and is lower than the value reported in Philippines which was 94% (Cariono KM *et al.*, 2003); higher than the value reported in Turkey which was 69% (Namal N *et al.*, 2005), and is more than thrice the value reported in Denmark which was 29.1% (Poulsen S and Scheutz F 1999). Also in the children aged 3-5yrs. ECC prevalence in immigrant Tibetans was more than those reported in Maryland USA, which was 52% (Clemencia M *et al.*, 2000), and in children aged 6 to 59 months in Korea which was 56.5% (Jin BH *et al.*, 2003).

**Oral Hygiene Practices and ECC Prevalence:** Many researchers have reported that the prevalence of regular tooth brushing has a positive impact on dental caries (Dominguez RV *et al.*, 1993; Verrips GH *et al.*, 1993). No such effect was observed in this study; though 89.2% of the study sample practiced regular tooth brushing habit (Table.3). Similar

finding was reported in Turkey (Namal N *et al.*, 2005). Majority of the children (82%) in the population used toothbrush and paste; this could be attributed to the increase in media advertisements and ease of availability. No significant difference in ECC prevalence was observed with the different aids used for tooth brushing; which is contradictory to the earlier report (Chan SCL *et al.*, 2002). Most children (68.6%) have reported to be brushing their teeth unassisted and, or unsupervised; though tooth brushing in this age group is to be carried out under parental supervision or assistance. And like the earlier reports. Prevalence of ECC in this population was very high; since most mothers let children brush their teeth themselves; because of the difficulties and time constraints (Chan SCL *et al.*, 2002; Jose B and King NM 2003; Kuriakose S and Joseph E 1999). There was significant decrease in ECC prevalence with increase in tooth brushing frequency in the population; similar to the previous reports (Jose B and King NM 2003; Rodrigues CS and Sheham A. 2000). Majority of the children (69.2%) brushed their teeth only in the morning in both the population.

#### *Feeding and Dietary Habits and ECC Prevalence:*

**Feeding practices:** Breast feeding is a common accepted feeding practice in the immigrant Tibetan population. Majority of the mothers (90.2%) (Table.4) of the study population had breast fed their children; but was unable to recall the frequency. Majority of the children (43%) reported to have weaned from breast feeding and to have started bottle feeding by the age of 1yr. No significance in ECC prevalence was found in relation to the breast feeding habit. Systematic review of scientific literature suggests contradictory findings between breastfeeding and development of ECC (Valaitis R, *et al.*, 2000). Majority of the immigrant Tibetan study sample (81.4%) reported to have bottle fed their children, and highly significant association was found between bottle feeding practice and ECC prevalence in the study population. Bottle feeding practice beyond the age of 1 year at night-time, was common among these population. Reports suggest a strong association between this variable and development of ECC (Verrips GH *et al.*, 1993). The contents of the bottles were usually milk and infant formula; whereas 67.6% of the study sample reported positively to the habit of adding table sugar to the bottle content, and strong significance was found between this variable and ECC prevalence. Similar reports are present suggesting this variable as risk factor for ECC development (Chan SCL *et al.*, 2002; Jin BH *et al.*, 2003; Robert JS *et al.*, 2005).

**Dietary practices:** Majority of the study sample reported to be taking complementary or regular food in the population. 88% of the immigrant Tibetans reported positively to the habit of adding table sugar or some other sweetener to the food. Significantly higher ECC prevalence was found in association to this variable. The habit of in-between meal snacking was considerably lower (18.8%) (Table.4). This could be due to the longer school hours and community school meal programs for the immigrant Tibetan children. Highly significant association was found between ECC

prevalence and the habit of in-between meal snacking in both the population; similar to the previous reports (Chan SCL *et al.*, 2002; Jin BH *et al.*, 2003; Jose B and King NM 2003). 82% of the immigrant Tibetan study sample reported positively to the habit of eating candies, toffees, chocolates etc; significantly high ECC prevalence was found in relation to this variable (Table.4). Reports suggest higher caries increment with increased sugar intake, and lesser oral clearance /greater retain ability of sugars (Chan SCL *et al.*, 2002; Jin BH *et al.*, 2003; Jose B and King NM 2003; Rodrigues CS and Sheham A. 2000).

**Routine Dental Visits and ECC Prevalence:** In this study, only 17.2% of the study sample had visited the dentist. None had reported to have been to the dentist for a routine dental check up, but rather for specific treatment needs, such as pain, swelling, trauma, etc. Likewise higher ECC Prevalence was found in those children, who had reported, to have visited the dentist (Table.5). Similar reports are also observed in Korea (Jin BH *et al.*, 2003) and china (Man Qin *et al.*, 2008). Regarding the dental treatment, eleven immigrant Tibetan children reported to have undergone, including silver amalgam and temporary restorations, extractions and oral prophylaxis. Evidence suggests that, initiation of routine dental checkups before one year of age, could aid in education and reinforcement of healthy feeding practices and oral hygiene habits in the parents; and also in prevention, early detection and management of incipient carious lesions and before its deleterious effects (Chan SCL *et al.*, 2002; Jin BH *et al.*, 2003).

## 5. Conclusion

This study indicates that ECC is a serious health problem affecting the immigrant Tibetan children in Bylakuppe of Mysore district; India. The prevalence of ECC was very high in this population; greater than the national and worldwide reports.

Assessment of retrospective interview data of the children's oral hygiene practices, feeding/dietary habits and practices, and dental visits revealed the followings:

- Majority of the children in the study population brushed their teeth unassisted/unsupervised by the parent with toothbrush and toothpaste.
- Higher prevalence of ECC was found, with the use of other tooth brushing aids, than the toothbrush and toothpaste; lesser frequency of brushing and the child brushing unassisted/unsupervised by the parent.
- Higher prevalence of ECC was found, with feeding/dietary habits like bottle feeding; addition of sugar to bottle content and to regular food; and increase intake of sweets like chocolate, candies and toffees.
- Reports of regular visits to the dentist were almost absent in the study population. Few who reported to have visited the dentist, had done so, for alleviating dental problems like pain, swelling, trauma etc.

This study demonstrates the high prevalence of the disease in the immigrant Tibetan population; and there is an urgent

need for treatment and promotion of oral health awareness factors.  
and management strategies; based on the identified risk

**Table 1.** Distribution of the population based on sex and mean age.

Sample	Sex Distribution				Age		
	Males		Females		Mean	S.d	T'value
	N	%	N	%			
Tibetan	266	53.2	234	46.8	3.8969	1.11823	8.80300 P<0.001 vhs

**Table 2.** Prevalence of ECC by age in the population and the mean defs& deft value.

Population	Caries status	<36months		36-47months		48-59months		60-72months		Total sample(500N)		Total sample(500N)	
		n	%	n	%	n	%	N	%	N	%	mean defs	mean deft
Tibetan	ECC	81	82.6	105	97.0	125	96.1	150	91.4	461	92.2	10.2	6.15

ECC:  $X^2 = 62.12$ ;  $p = \text{value} < 0.001$  (vhs); defs:  $F = 9.88$ ;  $p = < 0.001$  (vhs); deft:  $F = 13.2$ ;  $p = < 0.001$  (vhs)

**Table 3.** Oral hygiene practices and ECC prevalence.

Oral hygiene practices	Variables	TIBETAN			
		N	n	%	P
Tooth brushing	Yes	446	428	95.9	<0.748 (ns)
	No	54	35	64.8	
Aids used for tooth brushing	Only Brush	70	65	92.8	$p = 0.841$ (ns)
	Only finger	6	6	100.0	
	Brush and Tooth Paste	366	330	90.1	
	Finger and tooth paste	1	1	100.0	
Frequency of Brushing	Any other	3	3	100.0	$p = 0.012$ (sig)
	Morning only	309	295	95.4	
	Night only	11	10	90.9	
	Morning and Night	122	101	82.7	
	After every meal	4	3	75.0	
Tooth brushing assisted/supervised	Parent alone	65	56	86.1	$p = .006$ (hs)
	Child assisted by the parent	19	16	84.2	
	Child under parental supervision	56	50	89.2	
	Child alone	306	293	95.7	
Rinsing mouth after food	Yes	251	224	89.2	$p = 0.739$ (ns)
	No	249	239	95.9	

**Table 4.** Dietary habits and ECC prevalence.

Dietary habits	Variables	Tibetan			P
		N	n	%	
Breast Feeding	Yes	451	363	80.4	0.349 ns
	No	49	24	48.9	
Bottle Feeding	Yes	407	376	92.3	<0.001 vhs
	No	93	41	44.0	
Sugar added to the bottle	Yes	326	277	84.9	<0.001 vhs
	No	81	81	100.0	
Sugar added to the other food (table sugar/jagery/honey)	Yes	338	335	99.1	<0.001 vhs
	No	46	38	82.6	
	Yes	94	80	85.5	
In-between-meal snacking	No	304	123	40.4	<0.001 vhs
	Not Answered	102	96	94.1	
sweets intake(chocolates, candies, toffes)	Yes	410	346	84.3	<0.001 vhs
	No	73	14	19.1	
	Not Answered	17	17	100.0	

Table 5. Dental visits and ECC prevalence.

Population		Tibetan			
		N	n	%	P
Dental visits	Yes	85 (17%)	85	100.0	0.006
	No	415(83%)	378	91.0	Hs

## Acknowledgements

The authors wish to extend their gratitude to all the parents, school teachers and marvelous children for being cooperative and assisting in this study. We would especially like to acknowledge Mr. Tamdin Tsering Janyal, Director, Tibetan SOS children's Village, the Representatives of Lugsom Samdupling Tibetan Settlement, Tibetan Dickey Larsoe settlement and Rabgayling Settlement Bailakuppe, Mysore District; India for giving the permission to conduct this study.

## References

- [1] American academy of pediatric dentistry (AAPD): policy on early childhood caries: unique challenges and treatment options (2003): *Pediatrc Dent special issue* 24(7),24-25.
- [2] Cariono, KM., Shinada, K. and Kawaguchi, Y. (2003): Early childhood caries in northern Philippines. *Community Dent Oral Epidemiology*31, 81-89.
- [3] Chan, SCL., Tsai, JSJ. and King, NM. (2002): Feeding and oral hygiene of preschool children in Hong Kong and their caregivers' dental knowledge and attitudes. *Int J. of Paediatric Dentistry*12, 322-331.
- [4] Clemencia, M., Vargas, CM., Manajemy, N., Pooja, K. and Tinanoff, N. (2000): Oral health status of preschool children attending head start in Maryland. *Pediatric Dentistry*24(3),257-263.
- [5] Cunningham, SED., Farokhi, M., Baez, M. and Cano, S. (2008): Prevalence of early childhood caries in young Mexican American children. *IADR 86<sup>th</sup> General session and exhibition 3<sup>rd</sup> July 2008, Caries research – epidemiology*.
- [6] Dominguez, RV., Astasio, AP. and Ortega, MP. (1993): Analysis of several risk factors involved in dental caries through multiple logistic regressions. *Int Dent J*43, 149-156.
- [7] Ekman, A., Holm, AK., Schelin, B. and Gustafson, L. (1981): Dental health and parental attitudes in Finnish immigrant preschool children in the north of Sweden. *Community Dent Oral Epidemiol*9(5),224-229.
- [8] Filstrup, SL., Briskie, D., Da-Fonseca, M., Lawrence, L., Wandera, A. and Inglehart, MR. (2003): Early childhood caries and quality of life: child and parent perspectives. *Pediatr Dent* 25, 431-440.
- [9] Jin, BH., Ma, DS., Moon, HS., Paik, DMI., Hahn, SH. And Horowitz, AM. (2003): ECC prevalence and risk factors in Seoul, Korea. *American Assoc Pub Health Dentistry*23, 183-188.
- [10] Jose, B. and King, NM. (2003): Early childhood caries lesions in preschool children in Kerala, India. *Pediatr Dent* 25(6),594-600.
- [11] Kaste, LM., Marianos, D., Chang, R. and Phipps, KR. (1992): The assessment of nursing caries and its relationship to high caries in the permanent dentition. *J Public Health Dent* 52, 64-68.
- [12] Kuriakose, S. and Joseph, E. (1999): Caries prevalence and its relation to socioeconomic status and oral hygiene practices in 600 pre-school children of Kerala-India. *J Int Soc Prev Ped Dentistry*17(3), 97-100.
- [13] Laws, MB. (2001): Race and ethnicity in biomedical and health services research. *Archives of Pediatrics and Adolescent Medicine*155, 972-974.
- [14] Li, Y. and Wang, W. (2002): Predicting caries in permanent teeth from caries in primary teeth: an eight-year cohort study. *J Dent Res*81, 561-566.
- [15] Low, W., Tan, S. and Schwartz, S. (1999): The effect of severe caries on the quality of life in young children. *Pediatr Dent*21, 325-326.
- [16] Man Qin., Jing Li., Sun Zhang. And Wenli Ma. (2008): Risk factors for severe ECC in children younger than 4 yrs old in Beijing; China. *Pediatric Dentistry*30(2), 122-128.
- [17] Man Wai Ng. (2003): Multicultural influences on child-rearing practices: implications for today's pediatric dentist. *Pediatric Dentistry* 25(1),19-22.
- [18] Murray, JJ. (1996): Prevention of Oral Disease. 3rd Edition.,pp 3&231.
- [19] Namal, N., Vehit, HE. and Can, G. (2005): Risk factors for dental caries in Turkish pre-school children. *J Indian Soc Pedod Prev Dent*23(3),115-118.
- [20] Poulsen, S. and Scheutz, F. (1999): Dental caries in Danish children and adolescents 1988-1997. *Community Dent Health*16, 166-170.
- [21] Robert, J. and Berkowitz. (2003): Causes, treatment and prevention of ECC: A Microbiological Perspective. *J.Can Dent Assoc*69(5),304.
- [22] Robert, JS., Douglas, JB., Michael, EK. and Moffatt. (2007): Caregiver knowledge and attitudes of preschool oral health and early childhood caries (ECC). *International Journal of Circumpolar Health*66(2),153-167.
- [23] Robert, JS., Pamela, JS. and Jeanne, CW. (2005): Prevalence of caries among preschool-aged children in a northern Manitoba Community. *JCDA*71(1),567.
- [24] Robertson, J., McL, A., Reade, PC., Steidler, NE. and Spencer, AJ. (1989): A dental survey of Tibetan children in Dharamsala. *Community Dent Oral Epidemiol*17, 44-46. Rodrigues, CS. and Sheham, A. (2000): The relationship between dietary guidelines, sugar intake and caries in primary teeth in low income Brazilian 3 year olds: a longitudinal study. *Int J. of Paediatric Dentistry*10, 47-55.

- [25] Sweeney, PC. and Gel bier, S. (1999): The dental health of pre-school children in a deprived urban community in Glasgow. *Community Dent Health*16, 22-25.
- [26] Tang, JMW., Altman, DS., Robertson, DC., O'Sullivan, DM., Douglass, JM. And Tinanoff, N. (1997): Dental caries prevalence and treatment levels in Arizona pre-school children. *Public Health Reports*112, 319-329.
- [27] Tracy, L., Finlayson., Kristine, S., Ismail., Amid, I. and Woosung, S. (2007): Psychosocial factors and early childhood caries among low-income African-American children in Detroit. *Community Dent Oral Epidemiol*35, 439-448.
- [28] Vadiakas, G. (2008): Case definition, etiology and risk assessment of early childhood caries (ECC): A revisited review. *European Archives of Pediatric Dentistry*9(3),114-125.
- [29] Valaitis, R., Hesch, R., Passarelli, C., Sheehan, D. and Sinton, J. (2000): A systemic review of relationship between breastfeeding and ECC. *CanadianJ of Pub Health* 91(6),411-417.
- [30] Verrips, GH.,Kalsbeek, H. and Eijikman, MA. (1993): Ethnicity and maternal education as risk indicators for dental caries and role of dental behavior. *Community Dent Oral Epidemiol*21, 209-214.
- [31] Vivek, DK. (2010): Early Childhood Caries–An Insight. *J Int Oral health*2(1), 1-9.