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## Prevalence and associated risk factors of early childhood caries among 2 to 6 year old children in Mahe region of U.T of Puducherry, India

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### Abstract

#### Background and objectives

ECC being a preventable condition, is one of the most prevalent chronic and neglected childhood diseases worldwide. The objectives of the study was to assess the prevalence rate and the effect of independent risk factors of the early childhood caries so that we can implement preventive measures at the earlier stages of the disease.

**Methods:** 200 children of 2 to 6 years old who were diagnosed with ECC were selected for the study after obtaining the parental consent. The parents of these children were given a dental health questionnaire that evaluated the sociodemographic details, dietary habits and oral hygiene practices of the child. The results were then analysed using IBM® SPSS software.

**Results:** The prevalence of ECC was found to be 58.5% in the study and statistically significant association of parental education influencing the oral health knowledge was found. The study showed that the bottle/breast feeding for more than a year, practice of not rinsing the mouth after every meal and the practice of sleeping without brushing after snacks were significant in the causation of ECC. The pattern of breastfeeding and frequency of snacking had no association with ECC.

**Interpretation and Conclusion:** This study provides a strong association of ECC with parental oral health knowledge and ECC promoting behaviours. So oral health programmes mainly targeting the people of lower socioeconomic strata should be employed. These programmes should educate the parents on proper feeding and oral hygiene practices and also the importance of regular dental check-ups.

**Keywords:** ECC, feeding practices, oral health knowledge, parental education, risk factors

### 1. Introduction

Early childhood caries (ECC) is one of the serious public health problem which can begin early in life, progressing rapidly in those who are at high risk, and often goes untreated [1]. Although this is largely preventable, it is still one of the most prevalent chronic and neglected childhood diseases worldwide [2]. Its consequences can affect the immediate and long-term quality of life of the child's family and can have significant social and economic consequences beyond the immediate family as well [3]. If left untreated, it can lead to prolonged poor food intake, leading to poor general health, caries affecting newly erupted permanent teeth, loss of school days, poor esthetics and self-esteem [4].

The etiology of ECC is multifactorial and results from the interaction of factors like cariogenic microorganisms, exposure to fermentable carbohydrates, through inappropriate feeding practices, and a range of social variables. The major contributing factors for the high prevalence of ECC are improper feeding practices, socioeconomic background, lack of parental education, and lack of access to dental care [1]. Also, inappropriate use of baby bottle has a central role in the etiology and severity of ECC. The rationale is the prolonged bedtime use of bottles with sweet content, especially lactose [5]. Breastfeeding provides the perfect nutrition for infant, however, frequent and prolonged contact of enamel with human milk has been shown to result in acidogenic conditions and softening of enamel shifting the re-mineralization equilibrium toward de-mineralization [6].

Association between ECC and the socioeconomic status has been well documented. Studies suggested that ECC is more commonly found in children who live in poverty or in poor economic conditions, especially whose parents have low educational level.<sup>7</sup> Another risk factor for increased incidence of ECC in young children is due to the poor parental oral health knowledge regarding the importance of the primary dentition as they are often neglected as most of the care givers think that these teeth are replaced during the development stages of the child. A healthy permanent dentition, a balanced diet and esthetics depend on the healthy condition of deciduous dentition; hence their loss cannot be underestimated<sup>[8]</sup>.

Maintaining primary dentition in a healthy condition is important for the wellbeing of the child. So prevention of ECC at a very young age among pre-schoolers is important so as to maintain the primary dentition to its normal form, function and esthetics. Prevention of ECC among the smaller age groups can be achieved by identifying the risk factors in each child, educating their parents regarding ECC promoting feeding behaviours, maintaining good oral hygiene, stressing the importance of dental visits regularly<sup>[9]</sup>. Effective oral health education can produce changes in knowledge; bring about some shift in attitudes, facilitate the achievement of skills; and bring about change in behaviours or lifestyles<sup>[10]</sup>.

In India, there are infinite number of studies done on the prevalence of dental caries. However, only a few of them focussed on dental caries across different age groups. A recent study stated 16% to 92.2% of prevalence rate of ECC in India among preschoolers.<sup>11</sup> Another study conducted among preschool children in Trivandrum district of Kerala found that the prevalence rate was 54%<sup>[12]</sup>. Similar studies conducted in Andhra Pradesh showed prevalence rate as high as 63%.<sup>8</sup> Since the prevalence of ECC varies from population to population. No studies have been conducted to evaluate the prevalence of ECC in the area of Mahe to our knowledge. Mahe is a small town which is a part of Union Territory of Puducherry with an area of 9km<sup>2</sup>. In order to prevent the psychosocial, physical and functional consequences of ECC in the children of Mahe, the present study was conducted to

assess the prevalence rate and the risk factors associated with ECC in caries risk children so that we can implement preventive measures and instill a positive dental knowledge in their parents at earlier stages of the disease.

### Aims and objectives

1. To determine the prevalence of ECC among 2 to 6 -year-old children in Mahe.
2. To assess the effect of the risk factors associated with ECC among 2 to 6- year- old children in Mahe.

### Materials and methods

Out of 400 children examined, 234 subjects were having ECC. From this 234, parents of 200 children of 2 to 6 years old who gave the consent were selected based on the inclusion criteria. After obtaining the ethical clearance from the Institutional ethical committee this cross-sectional study was conducted in our Department of Pedodontics & Preventive Dentistry.

The parents were explained about the objectives of the study and an informed consent was taken from them prior to the study. They were given a prepared dental health questionnaire for assessing sociodemographic details of the child; dental awareness regarding importance of milk teeth, dietary habits and oral hygiene practices. The questionnaire was prepared in English as well as in their local language. The results were then tabulated and analysed using IBM® SPSS software. Descriptive statistics has been applied for determining the prevalence of ECC while Chi square test has been used for analysing the effect of risk factors for ECC.

### Observation and Results

A total of 400 subjects were randomly selected for the study out of which 234 subjects were having early childhood caries making a prevalence of 58.5%. Out of these 234 subjects, parents of 200 children were considered and evaluated for knowledge and risk factors. The children age range was from 2 to 6 years with the mean age of 4.49 ± 1.14 years with 100 male children and 100 female children.

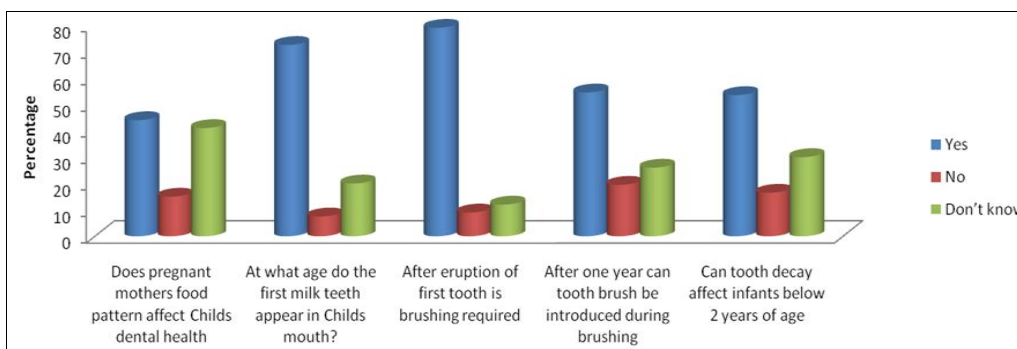
**Table 1:** Response of study participants on knowledge based questions regarding ECC

	Yes	No	Don't know
Does pregnant mothers food pattern affect Childs dental health	88 (44.0)	30 (15.0)	82 (41.0)
At what age do the first milk teeth appear in Child's mouth?	145 (72.5)	15 (7.5)	40 (20.0)
After eruption of first tooth is brushing required	158 (79.0)	18 (9.0)	24 (12.0)
After one year can tooth brush be introduced during brushing	109 (54.5)	39 (19.5)	52 (26.0)
Can tooth decay affect infants below 2 years of age	107 (53.5)	33(16.5)	60 (30.0)
Does intake of sweets causes tooth decay?	169 (84.5)	15 (7.5)	16 (8.0)
Does night feeding causes tooth decay?	87 (43.5)	51 (25.5)	62 (31.0)
Does sharing of things used by mother causes tooth decay in child?	29 (14.5)	86 (43.0)	85 (42.5)
Do you know that the Child's first dental visit should be planned by the age of one?	30 (15.0)	19 (9.5)	151 (75.5)

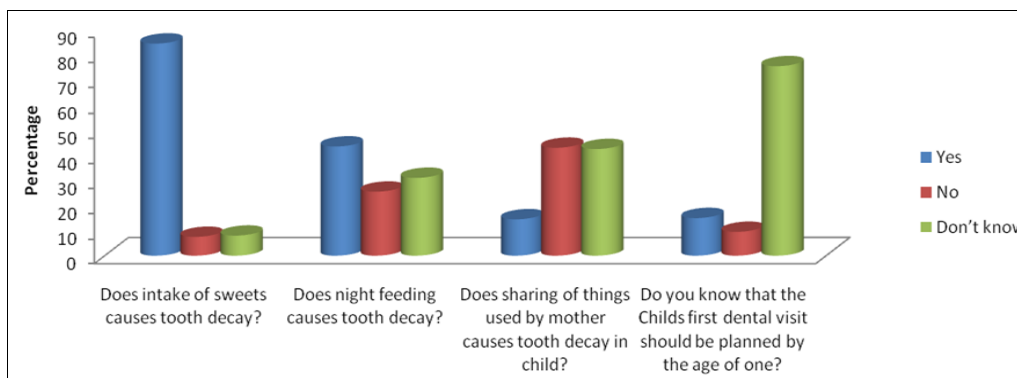
**Table 2:** Response of study participants on knowledge based questions regarding ECC according to demographic characteristics

	Mothers' education	Fathers' education	Mothers' occupation	Fathers' occupation
Does pregnant mothers' food pattern affect Childs dental health	$\chi^2 = 2.50$	$\chi^2 = 2.55$	$\chi^2 = 7.87$	$\chi^2 = 7.72$
	p = 0.643	p = 0.635	p = 0.020	p = 0.656
	NS	NS	S	NS
At what age do the first milk teeth appear in Childs mouth?	$\chi^2 = 11.24$	$\chi^2 = 6.31$	$\chi^2 = 3.46$	$\chi^2 = 10.34$
	p = 0.024	p = 0.177	p = 0.177	p = 0.410
	S	NS	NS	NS
After eruption of first tooth is brushing required	$\chi^2 = 10.97$	$\chi^2 = 2.16$	$\chi^2 = 0.378$	$\chi^2 = 19.51$
	p = 0.027	p = 0.706	p = 0.828	p = 0.034
	S	NS	NS	S
After one year can tooth brush be	$\chi^2 = 3.87$	$\chi^2 = 3.27$	$\chi^2 = 5.198$	$\chi^2 = 6.16$

introduced during brushing	p = 0.424	p = 0.513	p = 0.074	p = 0.801
	NS	NS	NS	NS
Can tooth decay affect infants below 2 years of age	$\chi^2 = 3.63$	$\chi^2 = 6.75$	$\chi^2 = 11.50$	$\chi^2 = 7.24$
	p = 0.458	p = 0.149	p = 0.003	p = 0.702
	NS	NS	S	NS
Does intake of sweets cause tooth decay?	$\chi^2 = 3.91$	$\chi^2 = 1.42$	$\chi^2 = 0.140$	$\chi^2 = 29.73$
	p = 0.41	p = 0.839	p = 0.932	p = 0.001
	NS	NS	NS	NS
Does night feeding causes tooth decay?	$\chi^2 = 0.060$	$\chi^2 = 13.46$	$\chi^2 = 0.684$	$\chi^2 = 7.25$
	p = 0.060	p = 0.009	p = 0.710	p = 0.702
	NS	S	NS	NS
Does sharing of things used by mother causes tooth decay in child?	$\chi^2 = 7.37$	$\chi^2 = 3.175$	$\chi^2 = 5.67$	$\chi^2 = 13.67$
	p = 0.117	p = 0.529	p = 0.059	p = 0.188
	NS	NS	NS	NS
Do you know that the Childs first dental visit should be planned by the age of one?	$\chi^2 = 3.61$	$\chi^2 = 5.204$	$\chi^2 = 0.070$	$\chi^2 = 7.60$
	p = 0.461	p = 0.267	p = 0.965	p = 0.668
	NS	NS	NS	NS



Graph 1: Response of study participants on knowledge based questions regarding ECC

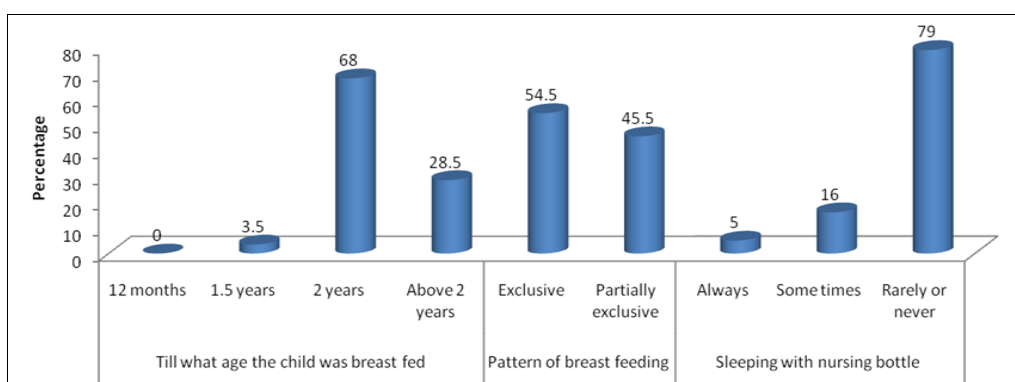


Graph 2: Response of study participants on knowledge based questions regarding ECC

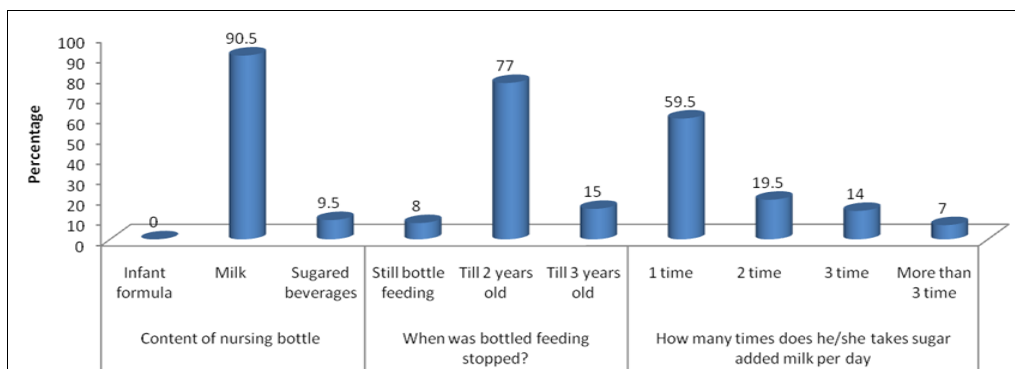
Table 3: Response of study participants on risk factors of ECC

Risk factor	Response	Number	Percentage
Till what age the child was breast fed	12 months	0	0
	1.5 years	07	3.5
	2 years	136	68
	Above 2 years	57	28.5
Pattern of breast feeding	Exclusive	109	54.5
	Partially exclusive	91	45.5
Sleeping with nursing bottle	Always	10	5.0
	Some times	32	16.0
	Rarely or never	158	79.0
Content of nursing bottle	Infant formula	0	0
	Milk	181	90.5
	Sugared beverages	19	9.5
When was bottled feeding stopped?	Still bottle feeding	16	8.0
	Till 2 years old	154	77.0
	Till 3 years old	30	15.0
How many times does he/she takes sugar added milk per day	1 time	119	59.5
	2 time	39	19.5
	3 time	28	14.0

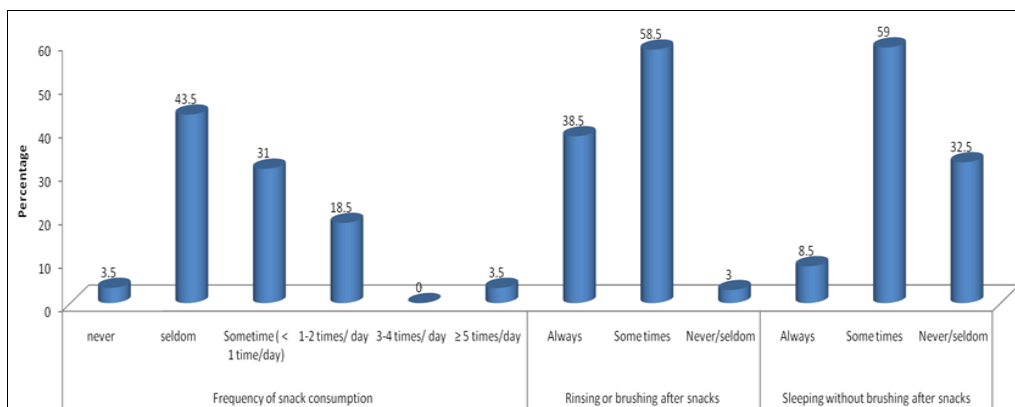
	More than 3 time	14	7.0
Frequency of snack consumption	never	7	3.5
	seldom	87	43.5
	Sometime (< 1 time/day)	62	31.0
	1-2 times/ day	37	18.5
	3-4 times/ day	0	0
	≥ 5 times/day	7	3.5
Rinsing or brushing after snacks	Always	77	38.5
	Some times	117	58.5
	Never/seldom	6	3.0
Sleeping without brushing after snacks	Always	17	8.5
	Some times	118	59.0
	Never/seldom	65	32.5
Frequency of tooth brushing	Twice daily	149	74.5
	Once daily	49	24.5
	Less than once daily	2	1.0
	Never	0	0
Guardians helping with the brushing	Every day	134	67.0
	Sometimes	65	32.5
	No or never brushing	1	0.5



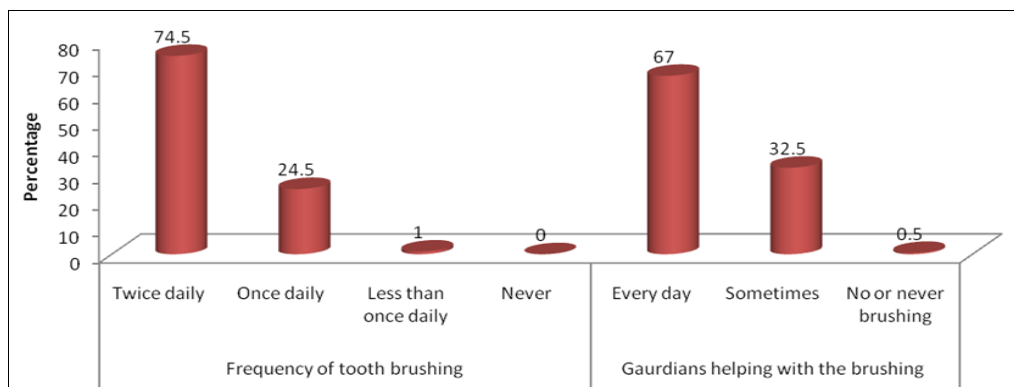
**Graph 3:** Response of study participants on risk factors of ECC



**Graph 4:** Response of study participants on risk factors of ECC



**Graph 5:** Response of study participants on risk factors of ECC



**Graph 6:** Response of study participants on risk factors of ECC

## Discussion

ECC is a virulent form of dental caries that can destroy the primary dentition and can also affect the harmony of the permanent dentition in children. Several studies have evaluated the risk factors of ECC to be sociodemographic factors, dietary factors, oral hygiene factors and breast/ bottle feeding. However, the degree to which these risk factors are associated with ECC remains unclear.

## ECC Prevalence

The prevalence rate of ECC in 3 to 6 year old children of south India was found to be 27.3% in a study conducted by S Gopal *et al.* (2016) [13], where in our study the prevalence rate among 2 to 6 year old children were found to be at a slightly higher rate of 58.5%. A study conducted by A M Gaidhane *et al.* (2013) [14] in Wardha district showed a prevalence rate of 33.48% and that by R Naidu *et al.* (2013) [15] showed a prevalence rate of 29.1%.

The prevalence of ECC in our study is lower than the values reported in the preschool population of Andhra Pradesh, and higher when compared to the ECC prevalence in the preschool population of Sikkim in a study conducted by Akila Ganesh *et al.* (2018) [8]. A lower prevalence rate of ECC were shown among the preschool population in Salem [16] and Bhubaneswar [17] which was 16% and 37.29% respectively. We had found that our prevalence rate of ECC is almost equivalent to the values reported among the preschool population of Trivandrum [12] and Hubli-Dharwad [18] which were 54% and 54.1% respectively.

Relatively higher prevalence of ECC observed in this study, could be due to poor oral hygiene practices, decreased oral hygiene awareness, inappropriate feeding practices and increased frequency of in-between meals. Another possible reason could be higher number of lower middle socioeconomic residents in this area.

## Education and socioeconomic status influencing oral health knowledge

In our study only the mothers from the well-educated category knew that brushing is required after the eruption of the first tooth and were aware of the age of eruption of the first milk tooth. And only the working mothers knew the fact that the pregnant mother's nutrition affects the child's dentition and that the dental caries can also affect the children below 2 years of age. The above findings are in accordance with a study by A Banihani (2020) which showed that mother's level of education and occupation were strongly associated with the oral health knowledge [19]. Sunil Babu Kotha *et al.* (2018) also found a statistically significant relation between parental educational status and oral health

knowledge [20].

The oral health knowledge about the night feeding in infants as one of the risk factors for ECC was highly correlating with father's educational status in this present study. Most of the educated parents were very well aware that there is increased risk of developing ECC in infants who are breast fed or bottle fed during night time. This was in accordance with the study conducted by Bakri N N *et al.* (2020) where he found a statistically significant association between dmft score and parental knowledge about the effect of bottle feeding while sleeping on the development of ECC [21].

## Feeding practices and ECC Prevalence

Among the 200 children with ECC, who had participated in our study 136 (68%) of them were weaned at the age of 2 years, 28.5% after 2 years and only 3.5% at the age of 1.5 years. This finding goes in accordance with the study conducted in Indore, Madhya Pradesh by K Barjatya (2020) which stated that breastfeeding more than one year significantly increased the risk for ECC [22]. On the contrary, this conclusion does not agree with a study by Sunanda S (2021) which stated that the duration of feeding, particularly at night, is the most important determinant for ECC development, rather than feeding itself [23].

In our study, ECC was prevalent in children who were both exclusively and partially exclusive breastfed during infancy. This is in accordance with a study conducted in United States that showed breastfeeding whether exclusive or not, is not associated with increased risk for ECC [24]. But a study conducted in Thailand by P Chanpum (2020) stated that the prevalence of ECC was high in exclusively breastfed children [25]. Hence, this shows that the influence of infant breastfeeding on ECC remains as a complex and controversial issue. However, exclusive breastfeeding should be encouraged only upto the sixth month. Wiping the gum pads with a soft cloth after breastfeeding, especially in the night should be employed. If this is not done, the liquid carbohydrate will remain in the mouth and pool around the teeth as there is decreased salivary flow resulting in decreased clearance rate in the night.

79% of our study sample with ECC reported negatively to the habit of sleeping with nursing bottle. And in our study, there is also an inverse relationship between adding sugar content to the nursing bottle and ECC as only 9.5% of the study sample agreed to the same, while a study in Kanpur by SP Shrutha (2013) [26] that stated ECC prevalence was higher in children who fell asleep with the nursing bottle and in children consuming sugar added milk. 92% of our study sample were bottle-fed for 2 years or more, this is in accordance with a study in Himachal Pradesh (2017) [27] that

stated higher prevalence of ECC in children who were bottle-fed more than 13 months.

### Dietary and oral hygiene practices in the prevalence of ECC

In our study, only 3.5% of the children with ECC consumed snacks more than twice a day, 31% consumed once a day and 18.5% consumed one to two times a day. However, a study by S Kuriakose (2015) stated that more the frequency of consumption of snacks, more are the children affected by ECC [12].

Through our study, we had found out that the guardians supervised brushing daily in 67% of the children with ECC and supervised sometimes in 32.5% of the children. This is higher to that reported in Himachal Pradesh [27] (37.4%) and Bangalore [28] (80.7%). So according to our present study there is no significant association between children brushing under parental supervision and prevalence of ECC.

A study conducted in Bangalore, by P Subramaniam (2014) [28] showed a higher prevalence of caries in children who brushed once a day, whereas in our study only 24.5% brushed once a day while 74.5% who brushed twice daily were affected with ECC. It is reported by S Kuriakose (2015) [12] that only 17% of the preschool children brushed twice daily in Trivandrum which is very less when compared to the values which we got in our study. In spite, the majority of our study sample brushes twice daily, it did not show a significant reduction in the prevalence of ECC which might be because majority of the population would have used non fluoridated toothpaste and improper brushing techniques. A study by P Prakash (2012) conveys that the use of fluoridated toothpastes decreased the prevalence of ECC [29]. Another study by M Zhang (2020) among the preschool populations of Shandong, China proved that the frequency of brushing was not associated with increased rates of ECC [30]. Also a study by SP Shrutha (2013) showed that the incidence of ECC was less in subjects who followed roll on technique of brushing than who followed both horizontal and vertical methods of brushing [26].

According to S Kuriakose (2015) [12], 66% of the preschool population rinsed their mouth after every meal whereas in the present study only 38.5% does it after every meal and 58.5% rinses sometimes. However, the above study also showed a lesser prevalence of ECC in children who had the habit of rinsing after every meal.

### Conclusion

The present study has shown a prevalence rate of ECC of 58.5% in 2 to 6 year old children during the study period. This study provides a strong association of ECC with parental oral health knowledge and ECC promoting behaviours. Present findings suggests that low parental education, improper feeding and oral hygiene practices are potent risk factors for the development of ECC. However, further studies to examine the relation between parental psychosocial factors and ECC development have to be carried out with larger sample size to understand their influence on ECC.

### Recommendation

With the present study we would like to recommend that more number of oral health care programs should be executed in all the regions aiming mainly the low socioeconomic status group, that creates awareness about proper feeding and oral hygiene practices for the parents and caregivers of preschool children and also stressing the importance of regular dental check-ups to be carried out depending on the caries risk status

of the children. By these awareness programs, the oral health knowledge of the parents of pre-schoolers about the risk factors of ECC can be improvised and thereby reducing the prevalence of ECC among pre-schoolers.

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