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Social and behavioral determinants of early childhood caries: A cross-sectional study within region of Ambala, Haryana

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Abstract:

BACKGROUND: Early childhood caries is like an epidemic, especially in the developing world, hence exploring its appropriate factors in causing the disease the need of the hour. Hence, the aim of the present study was to evaluate social and behavioral determinants of early childhood caries within the region of Ambala, Haryana.

MATERIALS AND METHODS: The present survey elaborated oral examination among 398 study participants within the age group of 4–5 years. Carious tooth was recorded using Gruebel's deft DEFT index using clean mouth mirror and probe. A questionnaire comprising 21 questions in English as well as Hindi was prepared. There was an interviewer who took the interview of parents or caregivers. The questionnaire consisted of questions which were aimed at gaining information regarding infants feeding practice, social factors, and dental health behavior. The results of the study were tabulated, and inferential statistics were applied using ANOVA test along with regression (multiple logistic) procedure.

RESULTS: The occurrence of caries was affected by the behavioral factors such as breastfeeding habits, bottle feeding habits, age of beginning of solid foods in children. There was no influence of age of beginning of taking fluid from cup. Besides social factors like annual family income, education of mothers, age of mother at the time of birth of children, age of children, order of children in the family had a significant effect over the occurrence and severity and extent of caries. Factors such as gender of children and profession of mother did not have had a significant role in early childhood caries. Dental health habits such as tooth brushing frequency, brushing under supervision, frequency of toothbrushing, quantity of toothpaste used had a significant effect over the frequency, and acerbity of caries in early infancy.

CONCLUSION: It can be concluded from this study that there is a significant correlation between several social and behavioral determinants and early childhood caries.

Keywords:

Dental professionals, early childhood caries, social determinants

Introduction

Caries found in early infancy is considered as disease which is influenced by several factors like tooth involved, host factors, presence of carbohydrates in normal food which are

easily fermented, time, microorganisms which are responsible for causing caries.^[1,2] Caries found in early infancy refer to those carious lesions which are usually found in the primary tooth in those children who are <72 months in age. These include the existence of either one decayed tooth or >1 decayed tooth.^[3,4] These decayed teeth

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may be cavitated as well as non cavitated in nature. Other conditions included are missing teeth as result of caries, surfaces of primary teeth which are restored. Oral health in children going to preschools has improved markedly during recent years in many developed countries. However, still, most of the children are affected by caries of infancy.^[5,6]

During recent times, it has been postulated that there may be other factors which may affect the occurrence of caries other than common etiological factors such as cariogenic microorganisms, teeth and host factors, and time.^[7,8] Several research analysts have done studies who have tried to include other factors in etiopathogenesis of infancy caries like social factors, demographic factors and behavioral factors such as income of family, ethics within community, education level of mothers, status of family, teeth cleaning exercises, and knowledge of the parents and their beliefs.^[9,10]

It has been also observed that there is increased incidence of early infancy caries in some specific communities. This finding has further stressed the discussion on important factors which has a significant say in causing early childhood caries other than *Streptococcus mutans* in the development of early infancy caries.^[11,12] There have been several cross-sectional studies in past which has demonstrated that there is an interaction between several factors such as community ethics, status of immigration, feeding habit of infants, exposure to fluoride, socioeconomic status, and the maintenance of oral hygiene in the occurrence of early infancy caries in preschool children.^[13,14]

However, most of these studies were conducted in specific communities which were immigrant in nature and with low socioeconomic status. These communities were alienated from the general population. There was a need to apply these experiments to the general population. Moreover, factors such as breastfeeding, bottle feeding, contents of bottle feeding, positional situation, or sequence of child within the family were not discussed in previous studies. In our country also, there has been a considerable incidence of early infancy caries in the preschool-going children, and there is also necessity to evaluate the part of several social and the behavioural influences for occurrence of early infancy caries most of which not studied in studies conducted in the past.^[15,16]

But very few studies have been conducted to evaluate the role of such social and behavioral factors in such children in the general population of Ambala, Haryana. Therefore, this study was conducted to analyze the role of several social and behavioral determinants of early infancy caries in Ambala population.

Materials and Methods

Study design and setting

This study was a questionnaire-based cross-sectional study.

Study participants and sampling

The study involved a dental examination of 398 children aged 4–5 year who reported to the department of pediatric and preventive dentistry, Mullana, Ambala. The sample size determination was done considering the prevalence of the dental caries within the region.

Sample size is determined using the following formula

$$N = \frac{Z \left(1 - \frac{\alpha}{2}\right)^2 p(1-p)}{d^2}$$

Where,

p = previous expected values

d = desired Margin of error

$$Z \left(1 - \frac{\alpha}{2}\right)^2 = \text{confidence interval of 95\%},$$
$$N = 398$$

Data collection tool and technique

Carious teeth were recorded using Gruebel's deft index using clean mouth mirror and probe. Parents or caregivers were interviewed by a single investigator using a structured, investigator developed questionnaire, and it was face validated by 5 experts from colleges other than the present institution. The questionnaire was given to those who were willing to be part in the study. The criterion for inclusion of study subjects in the study was cooperative child and cooperative parents. The study subjects who were medically compromised, mentally challenged and suffering from the structural and developmental defects were not included in the study. All the interviews were carried by the same interviewer.

A questionnaire comprising 21 questions in English as well as Hindi was prepared. There was an interviewer who took the interview of parents or caregivers. The questionnaire consisted of questions which were aimed at gaining information regarding infants feeding practice, social factors, and dental health behavior.

The results of the study were tabulated, and descriptive statistics was carried out using ANOVA test with multiple logistic regression.

Ethical consideration

The study was carried out only after obtaining clearance from the ethical committee of the institution.

Results

Prevalence and intensity of early infancy caries among children belonging to the age group of 12 months decreased as there was an increase in the duration of feeding through breast ($P < 0.05$). On the other hand, the prevalence and intensity of early infancy caries increased with increase in the duration of feeding with a bottle. On the other hand, there was a clear upward trend in the prevalence and severity of caries of infancy with an increase in the duration for feeding through bottle. When there was evaluation for the contents of bottle feeding then it was found that there was an increase in the occurrence of infancy caries on feeding with juice as compared with the cow milk and buffalo milk. On evaluating the role of frequency and timing of bottle feeding in infancy caries then it was found that bottle feeding at sleep was accompanied by the augmented incidence of caries in infancy. Besides, it was also observed that occurrence of caries was greater in children who used to sip from the bottle continuously throughout day time. Timing of the beginning of drinking with the help of cup was not found to have a significant effect on the occurrence of caries. However, there was a significant effect of timing of beginning of taking solid foods over the occurrence of caries. It was found that there was a decrease in the prevalence of caries and its severity when intake of solid foods started during the age of 4 months to 6 months in comparison to the beginning of solid foods should be introduced either before 4 months of age or after 6 months of age [Tables 1 and 2].

The correlation between social aspects and prevalence of caries of infancy has been also evaluated. There was an upsurge in prevalence and intensity of caries in infancy in children who were 5 years old as compared to 4 years old. When the role of gender of the children was evaluated, then it was found that the difference was not statistically significant. However, there was an increased prevalence of infancy caries in males as compared to females. Then there was the evaluation of the correlation of age of mothers at the time of birth of the child and the caries of the infancy. It was found that children whose mother was younger with 24-year age were found to be less affected by the caries as compared with the children whose mother was older with age more than 24 years. Prevalence and severity of caries was more among children who were of order more than fourth-order in their family as compared with the children born earlier. Moreover, the occurrence of caries was greater in children whose annual family income was less, and the level of education of mother was low and vice versa [Table 3].

Finally, there was analysis of the role of dental health behaviors in occurrence and the severity of caries in infancy. The occurrence of caries was more in children who started the brushing of teeth at an early stage of life as early as 12 months while the occurrence of caries increased as the age of beginning tooth brushing increased. When the tooth brushing was carried out under the guidance of adults, then it was found that the occurrence of caries was lower as compared to the condition when the tooth brushing was not under the guidance of an adult. It was also found that when the toothpaste was applied full length on the brush, then the occurrence of caries was greater as compared to the condition when the toothpaste was applied in amount in the form of pea. The occurrence of caries was greater in children when toothbrushing was done occasionally as compared to the tooth brushing done regularly with any frequency. Moreover, the occurrence of caries was greater when pacifier with sweetener was used [Table 4].

Discussion

In the present study, the occurrence of caries was affected by the behavioral factors such as breast feeding habits, bottle feeding habits, and age of beginning of solid foods in children. Mithali *et al.* conducted a study and found that there is a significant statistical correlation of early childhood caries with the age of children, duration of feeding through breast, frequency of snacking in children, frequency of brushing in children, and level of education of father and mother. They also concluded that caries of early childhood has multifactorial etiology.^[17,18] The results of the present study were alike to the results obtained in our study.

It was found in our study that factors such as gender of children and profession of mother didn't have significant role in early childhood caries. Alshehri A conducted a study in Aseer region of Saudi Arabia on the preschool children and found that caries was suggestively more predominant among children as compared to families with employed mother.^[19,20] In our study, results were not similar because in our study; it was found that the profession of mother has no significant effect on caries in early childhood. The reason for this dissimilarity may be the racial and ethnic differences in study populations.

It was observed in this study that dental health habits like tooth brushing frequency, brushing under direction, tooth brushing frequency, amount of toothpaste applied had a significant effect on the frequency and severity of caries in early infancy. Naidu *et al.* conducted a cross-sectional survey within central Trinidad among children aged 3–5 years old randomized samples. The results of the study demonstrated that prevalence of caries is higher in children who take refined

Table 1: The correlation between early childhood caries and infant feeding habits

Variables	n	Prevalence of early childhood caries (percentage of early childhood caries within variable)	P	Severity of early childhood caries (mean deft)	P
From how long breast feeding was done					
No breast feeding	43	41.4	0.02	1.76	0.02
Duration of <3 months	45	35.2		1.36	
Duration of 3-6 months	41	28.1		1.42	
Duration of 7-12 months	48	30.1		1.32	
Duration of >13 months	42	35.2		1.53	
From how long baby bottle feeding was done					
No	67	27.3	0.04	1.03	0.03
Duration of 12 months	63	31.4		1.12	
Duration of 13-18 months	61	35.6		1.58	
Duration of 19-24 months	68	37.2		1.62	
Duration of >24 months	69	37.4		1.76	
Content of bottle feeding					
Infant formula	53	33.34	0.07	1.38	0.06
Milk of cow	57	34.23	0.08	1.41	0.07
Milk of buffalo	51	34.23	0.09	1.39	0.08
Fruit juice	52	40.45	0.04	2.02	0.02
What is the frequency of bottle feeding					
Once daily	43	33.23	0.08	1.43	0.08
Two time daily	47	34.43	0.07	1.34	0.07
At bed time only	54	54.34	0.02	2.32	0.03
At the child's will	59	32.23	0.08	1.23	0.07

Table 2: The correlation between early childhood caries and other infant feeding habits

Variables	n	Prevalence of early childhood caries (percentage of early childhood caries within variable)	P	Severity of early childhood caries (mean deft)	P
History of bottle sipping exclusively					
Yes	129	48.23	0.01	1.73	0.04
No	167	34.46		1.32	
History of breast feeding exclusively					
Yes	189	34.23	0.01	1.07	0.04
No	132	43.43		1.56	
History of both breast and bottle sipping					
Yes	177	45.43	0.07	1.13	0.08
No	123	47.23		1.12	
Age of beginning of cup drinking (months)					
12	54	34.32	0.08	1.03	0.07
13-18	51	35.53		1.08	
19	58	35.34		1.07	
>19	59	33.23		1.05	
Age of start of solid food (months)					
4	59	30.65	0.03	1.07	0.04
4-6	54	32.34		1.09	
7	52	40.43		1.10	
>7	53	47.23		1.87	

carbohydrates more than two times a day.^[21] The results of this study were similar to the results obtained in our study.

There was no influence of age of beginning of taking fluid from cup. Besides, social factors such as annual family income, education of mothers, age of mother at

the time of birth of children, age of children, and order of children in the family had a significant effect on the occurrence and severity of caries. Seow WK *et al.* and KB Hallet *et al.* conducted another study in preschool children and concluded that here are social as well as behavioral factors which have a significant role in the caries of early childhood.^[22,23] In the present study also,

Table 3: The correlation between early childhood caries and social factors

Variables	<i>n</i>	Prevalence of early childhood caries (percentage of early childhood caries within variable)	<i>P</i>	Severity of early childhood caries (mean deft)	<i>P</i>
Age (years)					
4	112	31.23	0.03	1.07	0.04
5	123	42.52		2.12	
Sex					
Male	117	32.34	0.07	1.06	0.08
Female	123	33.21		1.09	
Age of mother at child birth (years)					
<20	58	44.23	0.02	2.02	0.01
20-25	61	23.28		1.32	
26-30	59	24.45		1.43	
>30	63	21.23		1.31	
Order of child in the family					
1 st child	59	31.23	0.04	1.12	0.02
2 nd child	60	32.52		1.23	
3 rd child	52	33.41		1.12	
4 th in the sequence	61	41.23		2.13	
Annual family income					
<10,000	56	51.21	0.01	2.03	0.03
10,000-25,000	59	40.34		1.34	
25,000-50,000	61	35.23		1.54	
>50	60	39.67		1.23	
Level of education of mother					
Below 10 th	65	49.43	0.01	2.12	0.04
10 th pass	64	39.76		1.32	
Graduate	62	35.23		1.43	
Post graduate	54	33.21		1.12	
Occupation of mother					
Working	118	43.21	0.08	1.04	0.09
Housewife	115	45.32		1.07	

it was found that several social and behavioural factors have an impact on manifestation and severity of caries in the infancy.

Generally, most dental professionals while carrying out treatment of the early childhood caries consider cariogenic bacteria as the only etiological factor and plan their treatment accordingly, but caries in early childhood is a multifactorial condition involving the role of several factors other than the role of cariogenic bacteria.^[24] Since very little research has been done to correlate the social and behavioral aspects on early childhood caries (*sen et al*) and the action of fluoride and the action of specific food variety consumed and the occurrence of early childhood caries, especially in North Indian population (*chhabra et al*).^[25,26] Therefore, this study was conducted to evaluate the role of some specific social and behavioral factors in early childhood caries in Ambala population of North India.

In our study, multiple logistic regression process was utilized for the measurement of the influence of several risk factors. As a result, there was an proper evaluation

of both individual and confounding effect of risk factors. This was not observed in previous studies. Moreover, the sample size was large and children from all sections of society were included in this study irrespective of most of previous studies where only certain sections of society were included. The findings obtained from this study can be used in framing of programs for promotion of oral health and preclusion of early childhood caries among this population. The clinical implication of this study is that general dentists, while observing the preschool children can correlate the etiology of early childhood caries with social and behavioral determinants discussed in this study and plan the diagnosis and treatment planning accordingly.

Limitation and recommendation

The limitation of this study was that effect of main social and behavioral factors was reduced due to the inclusion of other factors. Besides, it was also observed that there was no use of investigations for caries detection for confirmation of the results. Therefore, more research should be carried out in which proper investigations

Table 4: The correlation between early childhood caries and dental health behaviours

Variables	n	Prevalence of early childhood caries (percentage of early childhood caries within variable)	P	Severity of early childhood caries (mean dft)	P
Age at the beginning of tooth brushing (months)					
12	48	31.23	0.01	1.23	0.02
13-18	49	38.57		1.56	
19	51	47.31		2.12	
>19	54	56.91		3.01	
Guidance of tooth brushing under adults					
Yes	124	34.21	0.02	1.43	0.03
No	112	45.67		2.12	
Quantity of tooth paste					
Smear	64	31.02	0.08	1.32	0.09
Pea sized	67	34.03		1.41	
Full brush length	61	33.05		1.32	
Tooth powder only	60	34.01		1.28	
Use of pacifier					
Yes without sweetener	87	33.26	0.04	1.21	0.01
Yes with sweetener	91	43.04		1.91	
No	86	34.21		1.31	
What is the frequency of tooth brushing					
Occasionally	65	42.24	0.01	2.12	0.03
Once daily	68	32.52		1.12	
Twice daily	62	31.48		1.21	
After every meal	63	32.03		1.26	

should be included, and proper effect of specific social and behavioral determinants can be determined.

Recommendation

The current study provides a great opportunity to investigate the interaction of social and behavioral determinants in the outcome of early childhood caries. The findings can be used to plan appropriate treatment and provide oral health education with these factors in mind to prevent early childhood caries.

Conclusion

From the present study, it can be concluded from this study that there is a significant correlation between several social and behavioral determinants and early childhood caries. Children older than fourth in the sequence in the family and families with less income and education had more chances of early childhood caries.

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Conflicts of interest

There are no conflicts of interest.

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