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Prevalence and Associated Risk Factors with Early Childhood Caries Among Anganwadi Children of Jaipur City – A Cross-Sectional Study

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ABSTRACT

Introduction - ECC is defined as the presence of one or more decayed (non-cavitated or cavitated), missing (because of caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. Present study estimated prevalence of early childhood caries (ECC) among Anganwadi children in Jaipur and to assess risk factors associated with early childhood caries among Anganwadi children in Jaipur.

Material and methods - Eight Anganwadi centres in Jaipur city were randomly selected for the study. All male and female children enrolled in these eight Anganwadi centres constituted sample for the present study. Early childhood caries was recorded using WHO Oral Health Assessment form 2013. Questionnaire consisted of questions related to oral hygiene practices, diet factors, and socio-behavioral factors was used to explore associated risk factors with ECC.

Results - Total 144 children (61 males and 83 females) were enrolled and examined in the study. Prevalence of ECC was found 61.11%. Mean dmfs among study participants was found as 6.02 ± 2.38. More than half of children were on breast feeding (54%). Majority of children (64%) consumed snacks in between snacks. Half of the respondents reported their children's teeth cleansing frequency as sometimesSnacking in between meals, addition of sugar in baby bottle and no teeth cleaning at night, bottle feeding and feeding in night were associated with risk of ECC.

Conclusion -The prevalence of dental caries was higher among the Anganwadi children, indicating the lack of implementation knowledge, underutilization of oral health services and unmet treatment needs..

Keywords: *Early Childhood Caries (ECC), Anganwadi, bottle-feeding, risk-factors, children.*

1. INTRODUCTION

Oral health is one of the utmost important components of overall health and well-being. General health status, quality of life, daily routine activities, ability of speak, mastication, smile and many others are affected by oral health of a person directly or indirectly. Although enjoying good oral health includes more than just having healthy teeth, many children have inadequate oral and general health because of active and uncontrolled dental caries. Dental caries is an irreversible microbial disease of the calcified tissues of the teeth, characterized by demineralization of the inorganic portion and destruction of the

organic substance of the tooth, which often leads to cavitations.[1,2]Dental caries, is the single most common chronic childhood disease, with manifestations persisting throughout life despite treatment.[3]

Early childhood caries (ECC) is a distressing syndrome characterized by severe caries in the primary maxillary incisors of infants, typically those 1-3 years old. According to the American Academy of Pediatric Dentistry (AAPD), ECC is defined as the presence of one or more decayed (non-cavitated or cavitated), missing (because of caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. This term now covers the previously used terms *baby-bottle tooth decay* and *nursing caries*, which describe a form of rampant caries of the primary dentition.ECC is a multifactorial disease resulting from the interaction of factors that include cariogenic microorganisms, exposure to high sugar intake through inappropriate feeding practices, lack of oral hygiene, lack of fluoride exposure, and enamel defects.[4,5] The systemic manifestations of ECC range from local pain, infections, and abscesses, leading to difficulty chewing, malnutrition, gastrointestinal disorders, and difficulty sleeping.[6]

ECC is a major oral health problem, in both developing and industrialized countries, where undernutrition is very common.[7,8] So, ECC is more prevalent in less developed countries and among the socially disadvantaged groups in developed countries, where the prevalence is as high as 70%.[9] By contrast, the prevalence of ECC in developed countries ranges between 1 and 12%.[10] Through a literature review, the prevalence of ECC varies from country to country. The prevalence of ECC in some Middle Eastern countries, such as Palestine (76%)[11] and the United Arab Emirates (83%).[12] As per the recent systematic review conducted by Ganesh A et al[13] the overall prevalence of ECC in India is 49.6%. Andhra Pradesh was found to have the highest prevalence of ECC at 63%,[14] and the lowest prevalence was reported in Sikkim (41.92%).[15]

Maintaining primary dentition in a healthy condition is important for the well-being of the child. If caries are left untreated then it leads to pain, sepsis, and eventually tooth extraction, jeopardizing children's growth and quality of life.[16]

Anganwadi centres constitute first basic centres for child development in Indian Primary health care system. Usually unskilled persons, laborers, farmers and persons living below poverty line in urban slums and villages send their children to Anganwadi centres. Most of these children have been found to belong with lower socio-economic status, and living in poor sanitary and unhygienic conditions, with poor dietary intake and feeding patterns.[17,18] All these factors can perpetuate Early Childhood Caries among these Anganwadi children.

There is a scarcity of published literature related to prevalence and associated risk factors among Anganwadi Children in Jaipur Rajasthan so the present study was conducted with the aim to estimate prevalence of early childhood caries (ECC) among Anganwadi children in Jaipur and to assess risk factors associated with early childhood caries among Anganwadi children in Jaipur.

2. MATERIAL AND METHODS

Present study was conducted among Anganwadi centres of Jaipur city. Eight Anganwadi centres in Jaipur city were randomly selected for the study. All male and female children enrolled in these eight Anganwadi centres constituted sample for the present study. Official permission was taken to conduct the study. Written informed consent was obtained from the parents/caretakers of all the children before enrolling them in the study.

Participants

A list of Anganwadi Centres will be taken from authorities. Study participants included 3 to 5 years old children attending Anganwadi Centres of Jaipur.Children between age of 3 to 5 years attending Anganwadi centres were included in study. Children with major illness were excluded from study.

Methods: Data collection, management, and analysis

Data was collected by principal investigator, after obtaining permission from competent authorities. Anganwadi workers from these centres were informed about study purpose. Children were examined at their Anganwadi centers.

Early childhood caries was recorded using WHO Oral Health Assessment form 2013.[19] Caries was detected using ball end CPI probe and mouth mirror. Child were made to sit in supine position on a stool. Examinations were carried out in sun light whenever possible.

A questionnaire was prepared based on previous studies, translated in local language (hindi) and validated to check reliability to assess risk factors associated with ECC. Questionnaire consisted of questions related to oral hygiene practices, diet factors, and socio-behavioral factors. Questionnaire was given to children along with their parents and sufficient time was given to return filled questionnaire.

After collection of data, the data were coded and entered in Microsoft Excel 2019. The descriptive analysis of data included proportions, mean, standard deviation, and median. The data distribution was not normal ($P<0.05$) after applying Shpiro Wilk test to assess the normality of the data. Hence, non-parametric tests were applied for the inferential statistics.

Multivariate logistic regression was done to determine the risk factors for dental caries as a dependent variable (yes/no). Backward stepwise method was used having entry with $P=0.05$ and removal with $P=0.10$ to select independent variables. Adjusted odd ratio (OR) with a 95% confidence interval (CI) of risk of dental caries were calculated. Statistical Package for Social Science (SPSS version 23, IBM cooperation). A P value less than 0.05 was considered as statistically significant.

3. RESULTS

Total 144 children (61 males and 83 females) were enrolled and examined in the study through screening with a mean age of 3.73 ± 0.73 (Table 1). Prevalence of ECC was found 61.11%.

The prevalence was 40.4% in males and 36% in females. The mean dmft was 3.57 ± 1.53 and mean dmfs among study participants was found as 6.02 ± 2.38 (Table 2).No significant difference was found in prevalence of ECC among children of 3, 4 and 5 year old children and between boys and girls.

Table 3 shows response of parents to risk factors of early childhood caries. All parents/caretakers of children considered their children oral health as good. More than half of children were on breast feeding (54%). Majority of children (64%) consumed snacks in between snacks. Half of the respondents reported their children's teeth cleansing frequency as sometimes (irregular). All children cleaned their teeth on their own without mother's supervision. Almost all children started teeth cleaning after attainment of two years of age. Surprisingly only 2 children visited dentist in past for check-up/visit.

Table 4 shows multivariate logistic regression model for determining risk factors fordental caries. The multivariable-adjusted model depicted that bottle-feeding was a significant predictor (AOR: 7.30; 95% CI: 1.53–34.80; p = 0.01), in addition with length of feeding and bottle feeding at night were found significant risk factors for ECC. Snacking in between meals, addition of sugar in baby bottle and no teeth cleaning at night were also associated with risk of developing early childhood caries among Anganwadi children.

Table 1 Age and gender wise distribution of children

Variables	Frequency (n=144)	%
Age (in years)		
3	63	43.75
4	57	39.58
5	24	16.67
Mean age	3.73 ± 0.73	
Gender		
Male	61	42.36
Female	83	57.64

Table 2 Caries (dmfs) status according to age and gender

Variables	d Mean ± SD (median)	m Mean ± SD (median)	f Mean ± SD (median)	dmfs Mean ± SD (median)
Age (in years)				
3 (n=33)	5.67 ± 2.04 (6.0)	0.39 ± 1.17 (0)	0	6.09 ± 2.48 (6.0)
4 (n=30)	5.57 ± 2.36 (6.0)	0.43 ± 1.04 (0)	0	6.0 ± 2.56 (7.0)
5 (n=17)	5.47 ± 2.03 (6.0)	0.24 ± 0.66 (0)	0.24 ± 0.97 (0)	5.94 ± 1.92 (7.0)
	Mean dmfs		6.02 ± 2.38	
P value[a]	0.95	0.85	0.16	0.96
Gender				
Male (n=33)	5.45 ± 2.06 (6.0)	0.33 ± 0.96 (0)	0	5.82 ± 2.24 (7.0)
Female (n=47)	5.68 ± 2.21 (6.0)	0.40 ± 1.03 (0)	0.09 ± 0.58 (0)	6.17 ± 2.48 (7.0)
P Value[b]	0.61	0.73	0.40	0.58

[a]Kruskal Wallis test, [b]Mann Whitney U test, P>0.05 not significant

Table 3 - Participants Responses to the questionnaire

Items/question	Response	Frequency (n=144)	%
How do you consider your child oral health (Parents)?	Good	144	100
	Poor	0	0
	Do not know	0	0
How did you feed your child?	Breast feeding	78	54.17
	Bottle feeding	24	16.67
	Both	42	29.17
Whether on demand breast-feeding was done?	No	24	16.67
	Yes	120	83.33
What was length of breast-feeding?	<1 year	60	41.67
	1-2 year	30	20.83
	>2 years	54	37.50
Did you feed child at night?	No	43	29.86
	Yes	101	70.14
Do you give snacks (toffee, chocolate, soft drink, sweets) to child between-meals?	No	51	35.42
	Yes	93	64.58
If yes, frequency of snacks-	Sometimes	48	33.33
	Once daily	23	15.97
	Twice or more daily	27	18.75
Do you add free sugar to baby bottle?	No	67	46.53
	Yes	77	53.47
Whether pacifier was used for child?	No	144	100
	Yes	0	0
What is frequency of teeth cleaning of child?	Never	2	1.39
	Sometimes	78	54.17
	Once daily	51	35.42
	Twice or more daily	13	9.03
How your child teeth be cleaned?	Child cleaning	143	99.31
	Mother cleaning	1	0.69
	Under supervision	0	0
Whether your child cleans teeth at night?	No	121	84.03
	Yes	23	15.97
Do you use dentifrice for child?	No	2	1.39
	Yes	142	98.61
If yes, which dentifrice is used?	Toothpowder	-	-
	Tooth paste	142	98.61
	Other	-	-
When child started teeth cleaning?	6-12 months	0	0
	13-18 months	2	1.39
	19-24 months	0	0
	>24 months	142	98.61
How your child cleans his/her teeth?	Baby brush	142	98.61
	Finger	2	1.39
Have your child visited any dental health care professional in past?	No	142	98.61
	Yes	2	1.39
If yes, when was first visit (child age)?	6-12 months	-	-
	13-18 months	-	-
	19-24 months	-	-
	>24 months	2	1.39

Table 4- Multivariate logistic regression model for determining risk factors for dental caries (N=144)

Independent Variables	Crude OR	P Value	95% CI	Adjusted OR	P Value	95% CI
Age		0.93		N/A	-	-

3		Ref				
4	0.88	0.80	0.33 – 2.32		-	-
5	0.79	0.73	0.20 – 3.09		-	-
Gender				N/A		
Male		Ref				
Female	1.58	0.32	0.65 – 3.87		-	-
Feeding of child		0.02*			0.01*	
Breast feeding		Ref			Ref	
Bottle feeding	6.17	0.03	1.23 – 30.94	7.30	0.01	1.53-34.80
Both	0.34	0.15	0.08 – 1.45	0.45	0.24	0.12–1.70
Length of breast feeding		<0.001**			<0.001**	
<1 year		Ref			Ref	
1-2 years	6.77	<0.001**	1.84 – 24.86	5.12	0.01*	1.54-17.02
> 2 years	7.80	<0.001**	2.63 – 23.13	6.82	<0.001**	2.43-19.18
feeding at night						
No		Ref			Ref	
Yes	7.57	<0.001**	2.49 – 23.03	6.93	<0.001**	2.39-20.11
Taking snacks between meals						
No		Ref			Ref	
Yes	4.09	0.01*	1.47 – 11.39	3.42	0.01*	1.32-8.87
Addition of sugar in baby bottle						
No		Ref			Ref	
Yes	3.25	0.06	0.96 – 11.03	3.44	0.05*	1.02-11.58
Cleaning of child teeth at night				N/A	-	-
No		Ref				
Yes	0.35	0.12	0.09 – 1.33		-	-
Constant	0.03	<0.001**		0.04	<0.001**	

Dependent variable caries, OR= odds ratio, 95% CI= 95% Confidence interval, *P<0.05 significant, **P<0.001 highly significant, N/A= Not applicable

4. DISCUSSION

The present study found that 61.11% of children examined in the selected Anganwadi Centres in Jaipur had early childhood caries. Almost similar percentage of ECC was also seen in previous studies conducted by Rangnekar&Chalakkal, 2023[20] who found the prevalence of ECC to be 47%. The prevalence of ECC was seen very high (76%) in Belgavi as reported in a study by Hugar S et al, 2016 [21]and by Mudhol in Karantaka (62%)[22] and is in accordance with results found by Singhal et al (64%)[23]These findings suggest the rampant prevalence of ECC in India and emphasize the need for targeted intervention to address this issue. In contrast, a lower prevalence was found in studies conducted by Panwar et al (38%)[1] and Tyagi in Davangere (19%) [24] and Chevvuri et al (25%)[25]

This broad range in prevalence of ECC could be attributed to different diagnostic criteria being used, cultural varied patterns in child-rearing, infant feeding practices, and oral health beliefs. In few studies where bottle feeding practices found less, and parents were aware of children's oral health, prevalence of early childhood caries was low.

The mean dmfs scores across different age groups in the present study did not show a statistically significant difference as the p-value is more than 0.05 which is consistent from the findings of the study conducted in Bhilai where ECC did not show any statistically significant association with age.[25] In contrast the studies in Ambala and Goa reported an increasing trend in ECC with age suggesting prolonged exposure to cryogenic risk factors.[20,26] With respect to gender our study found no significant difference in ECC prevalence between males and females. Similar observation is also supported by the status conducted in Goa and Delhi.

In contrast, boys had a slightly higher prevalence of ECC in comparison to girls. [25] This can be attributed to girls positive attitude towards their oral health.

The present study also recorded the parental perception of the child's oral health, which revealed that 100% of the parents and the present study considered their child's oral health to be good despite a high ECC prevalence. This is suggestive of the lack of awareness regarding ECC and its risk factors among the caregivers.

Regarding dietary habits, 64.58% of children consume sugary snacks between meals with 33.3% consuming them sometimes, 15.19% once daily and 18.75% twice or more daily. This is a well-established risk factor for ECC as frequent consumption

of fermentable carbohydrates promotes bacterial growth and acid production leading to enamel demineralization [26]. Additionally, 53.47% of parents reported adding free sugar to their child's bottle which further exacerbates the caries risk.
When bottle feeding was taken into consideration, it was observed that the association of duration of bottle feeding and ECC was statistically significant. The relation of the history of bottle feeding at night and falling asleep with the nipple of milk bottle in the mouth with the prevalence of ECC was statistically highly significant in this study.
Oral hygiene practices among the children in this study were suboptimal. Although, 98.61% used a toothbrush and toothpaste, only 9.03% clean their teeth twice or more daily and 84.03% did not clean their teeth at night. Regular night time tooth brushing has been found to significantly reduce ECC risk. [25] Furthermore only 0.69% of children have their teeth cleaned by their mother's while 99.31% clean their teeth independently without supervision. Studies indicate that children who receive parental assistance during brushing have lower ECC prevalence. [27]
Another concerning finding in the study was that 98.61% of children started brushing their teeth after 24 months with no children initiating oral hygiene before 12 months. The American Academy of Pediatric Dentistry recommends starting oral hygiene as soon as the first tooth erupts. (AAPD, 2012) Delayed initiation of tooth brushing increases the risk of early plaque accumulation and caries development.
The study has some limitations. The study being cross-sectional, measures the cause and effect only at a given point in time. Thus, the inability to establish a causal relationship and the persistence of temporal ambiguity contribute to certain grey areas. In addition, there are potential sources of bias, such as interviewer bias and social desirability response bias.
As our study is based on a self-administered questionnaire, we have received information from the memory of parents which may have its inherent inaccuracies leading to some bias.

5. CONCLUSION

The prevalence of dental caries was higher among the Anganwadi children, indicating the lack of implementation knowledge, underutilization of oral health services and urgent treatment needs. Almost all the dmfs component found in the study was due to caries decay and missing component, which demonstrates unawareness of oral health among the study population and lack of utilization of dental services among them.
A through community level preventive oral health campaign with treatment plan is required to lessen oral health burden among Anganwadi children and to provide them a good, healthy smile.

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