

The Effectiveness of E-Learning Anticipatory Guidance on Early Childhood Caries among the Mothers of Children Aged 9–24 Months during the Pandemic: A Nonrandomized Controlled Trial

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ABSTRACT

Background: Early childhood caries (ECC) is a multifactorial disease with known etiologic factors and can be very devastating to the oral and general well-being of a child, including psychological impacts on a growing child. Young children constitute a vulnerable population because of their dependence and inability to communicate their needs. Oral health disparities continue to pose critical challenges, as ECC is the most common chronic disease of childhood. Irony lies in the fact that milk, which is a wholesome nutrition, if fed in the wrong pattern, can be the main factor that helps this type of rampant caries spread rapidly, leading to pulp exposures and complicating proceedings. Awareness is the mainstay in prevention, and creating it becomes our sole responsibility as pediatric dentists. A multidisciplinary approach, with the involvement of mothers as the main stakeholders in this effort, becomes a very promising move. Thus, this project is phase two of an interprofessional collaboration involving mothers in prevention.

Aim: The aim of the study is to create awareness among mothers and prevent ECC during the coronavirus disease (COVID-19) pandemic.

Materials and methods: A total of 200 mothers with children aged 9–24 months were selected and added to the e-groups. The allocated mothers were given a pretest questionnaire, which was collected along with a photo of their child's oral health. Anticipatory guidance was provided to them. Follow-up was done at 2, 4, and 6 months. Awareness was evaluated by pre- and posttest questionnaires. Reversal of white spots was evaluated through indices, and progression was noted.

Statistical Analysis: The data was analyzed using Statistical Package for the Social Sciences (SPSS) 13.

Results: Pretest and posttest questionnaire analysis was done using the Chi-squared test. The test showed a marked increase in the knowledge, attitude, and practice of mothers regarding their children after the postintervention, which was given through traditional anticipatory guidance.

Conclusion: In summary, the traditional anticipatory guidance intervention appeared to improve maternal knowledge but had no effect on oral health behaviors or the progression of ECC.

Keywords: Anticipatory guidance, Early childhood caries, Lift the lip, *Streptococcus mutans*, White spot lesions.

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INTRODUCTION

Early childhood caries (ECC) refers to any primary tooth in a preschool-aged child who is 71 months of age or younger that has one or more decayed (cavitated or noncavitated lesions), missing (due to caries), or filled surfaces (AAPD, 2005).¹ Other names include nursing bottle caries, night bottle mouth, nocturnal bottle caries, maternally derived streptococcal mutans disease, and infant bottle tooth decay syndrome. Early after they erupt in the oral cavity, nearly all milk teeth are affected by the common illness ECC. About 49.6% of children in India between the ages of 8 and 48 months have this condition (Muthu et al., 2017; Simratvir 2009; Bhayade 2016; Chawla 2006; Dash 2002).² Children aged 0 to 3 in rural south India were found to have a prevalence of ECC of 40.6%, with cavitated surfaces in 49.7% and noncavitated surfaces in 50.3% of cases (Henry et al., 2017).² Initial primary incisor caries before the age of four discourages the development of subsequent dental caries lesions (Al Shala, 1997).³

The pathognomonic aspect of this disease is that it has a regular etiology and even a conventional progression pattern, making it simple to detect, treat, and ultimately avoid. If neglected,

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it may result in complications such as malnutrition and anemia due to difficulties eating, speech issues, and malocclusion from early tooth loss.⁴ The child develops an aversion to dentistry as a result of the pain and anxiety of the procedures, which prevents the pediatric dentist from using many behavior management

techniques to control the child's anxiety, as he reacts in a fight-or-flight manner to the pain of injections and cellulitis.⁵ The permanent dentition and additional teeth both become affected by ECC, in addition to these psychological issues brought on by bullying and peer pressure as a result of the child being isolated and ignored.⁶⁻⁸

The coronavirus disease (COVID) times have made personal visits to the clinic more of a threat to the mother and child, so prevention becomes imperative. ECC is a devastating disease of the teeth that can lead to life-threatening aftermath if not treated in time. It can be very crippling to neglect it, so anticipatory guidance can be very practical in motivating mothers to avoid the known etiologic factors, such as the wrong practice of feeding milk, along with other factors. ECC affects both additional teeth and the permanent dentition, together with these psychological problems brought on by bullying and peer pressure as a result of the child being excluded and ignored.

The study aims to assess the effectiveness of online anticipatory guidance. During this pandemic, most parents fear bringing their child to the clinic; hence, the need for this study is to improve awareness through anticipatory guidance among parents of children aged 9–24 months (Fig. 1).

MATERIALS AND METHODS

Ethical Review

The Institutional Ethics Committee of KVG Dental College and Hospital approved this study (Ref. no.: IECKVGDCH/SS15/2020–21). All participants were provided with a consent form.

Study Design

This study manuscript follows and is reported by the TREND criteria for nonrandomized clinical trials. This is a pretest and posttest nonrandomized clinical trial. One example of an approach is the addition of contacts to online communities. Snowball sampling is therefore used after the study. The number of participants may range from 50 to 200, as it is a duration-based study, but only those who are willing and meet the inclusion and exclusion criteria are chosen for the study.

Inclusion Criteria

Children with erupted upper incisor teeth, mothers whose child is between the ages of 9 and 24 months, and consenting participants are all included in this study.

Exclusion Criteria

Children who have severe systemic diseases, such as bleeding disorders, cardiac disorders, or renal disorders, are taking long-term

antiepileptic medications, have oral soft tissue lesions, a history of allergies to the ingredients in fluoride gel, are ill overall, or need prolonged rehabilitation were excluded.

All study materials, including a consent form, a self-completed questionnaire, and information regarding oral health awareness, were provided to the participants.

The parent/caregiver and child were assessed using "Lift the Lip," an oral health assessment tool for use on babies and young children. Parents received pamphlets with instructions on how to perform the "Lift the Lip" technique in advance. The front anterior teeth, in particular, need to be visually inspected in order to identify extremely early signs of dental decay, such as white spot lesions. It is easy to complete and doesn't require a dental professional.

"Lift the Lip" aims to educate parents and guardians about oral health and promote their involvement in clinical dentistry treatments. Parents are also encouraged to regularly check their children's teeth at home. The use of "Lift the Lip" highlights the importance of dental services and child health specialists having solid training and working together.

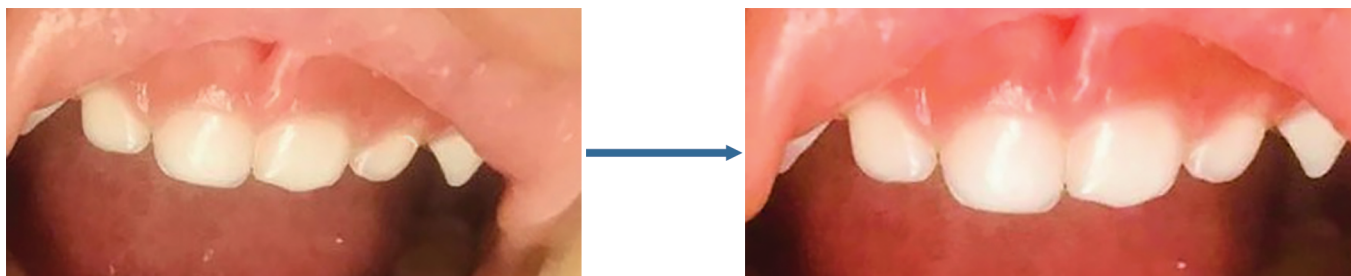
Using a smartphone camera with at least 2 megapixels of resolution and adequate lighting, children were evaluated for this study. Mothers received training on how to take a standard photo. Additionally, the online image acquired through the caries risk assessment tool was used to categorize the lesion (Fig. 2).

The self-completed questionnaire collected sociodemographic information (age, sex, education level, family income, Aboriginality) and knowledge of children's oral hygiene from mothers. The impact of the awareness was assessed using the self-structured, validated questionnaire. Participants were given this questionnaire both at baseline and 6 months later (https://docs.google.com/forms/d/e/1FAIpQLSe_1kkGWqKOA2auFSUWdS9Pw_B69hEP1mBRr94Xfh4-Hu5ZiQ/viewform?usp=sf_link). A total of thirty-two closed-ended items measuring five Likert scales constitute the questionnaire.

Using statistical power analysis with G*Power 3 software and considering goodness of fit test analysis, the sample size for the current study was estimated to be 197 by maintaining α error as 0.05 at a 95% confidence interval, β error as 0.2, power of the test ($1-\beta$ error) as 80%, effect size (Cohen's w) as 0.20 (Manchanda et al., 2014), and degrees of freedom as 1.

The final target sample size was increased to 200 to allow for unanticipated deviations from statistical assumptions, specifically for the evaluation of a single group of dyads (mother/one parent and child). A pre- and postquestionnaire was given within the same group.

Thirty parents participated in the pilot study, which was conducted to assess the study's validity and reliability. The



Figs 1A and B: (A) Initial lesion; (B) Reversal of lesion

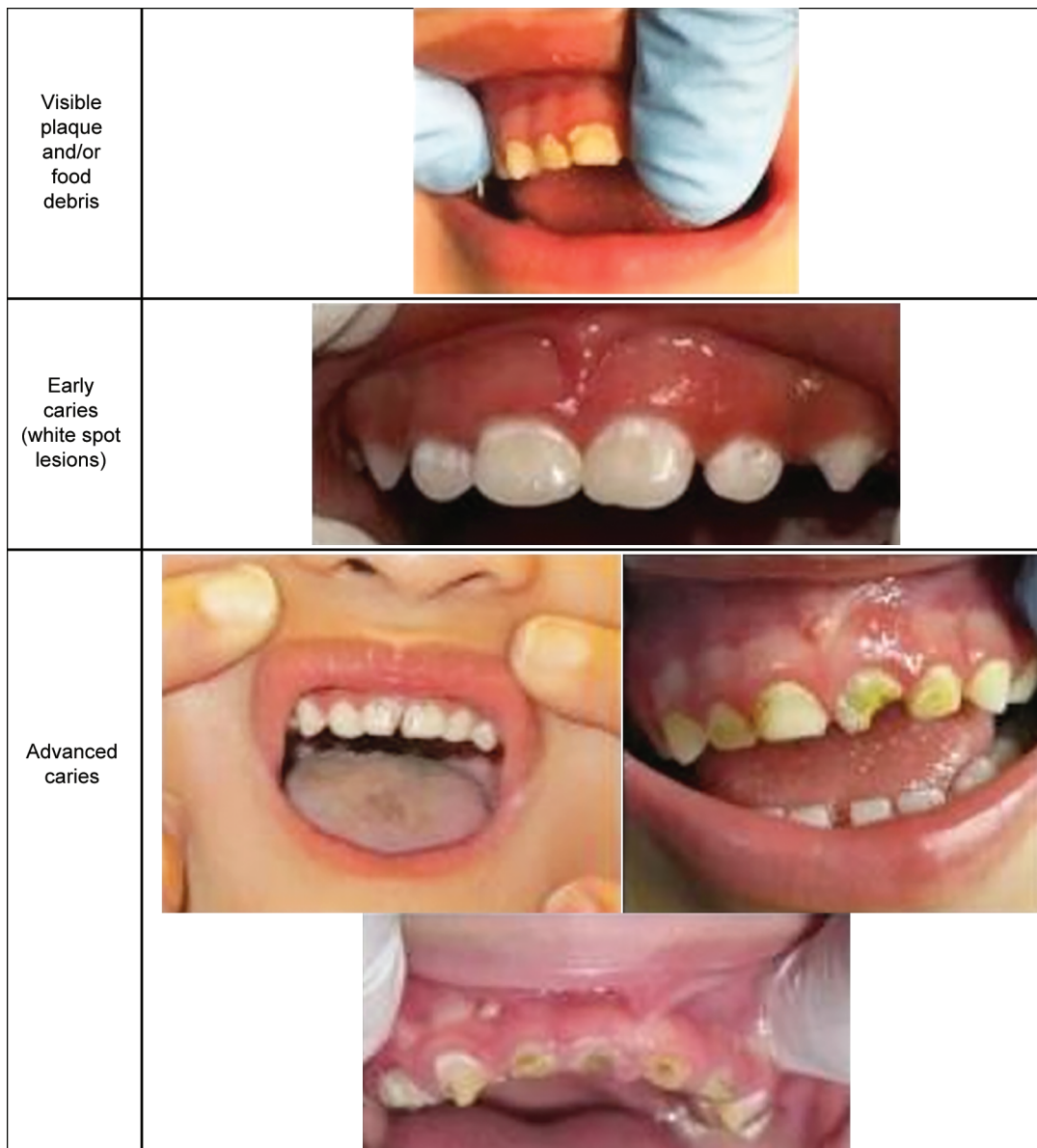


Fig. 2: Canadian Caries Risk Assessment Tool for children under 6 years

30 participants received the questionnaire and were asked to rate their level of comprehension or reading ability. While validating, the Flesch-Kincaid readability score was 50.8, the Flesch-Kincaid grade level was 9.8, and Aiken's V index for each item ranged from 0.75 to 1 (high to very high). Additionally, face validity was analyzed separately. The Cronbach's alpha test, used to assess the study's reliability, yielded an acceptable result of 0.83.

Traditional awareness techniques, such as presentations, video models, and posters, were used to raise awareness among mother-child dyads. Oral screening and evaluation were then conducted at the time of follow-up to see if the white

spot lesions had reversed. The final posttest questionnaire was distributed at the end of 6 months, and a final oral screening and evaluation were carried out. Following this, the information was gathered, evaluated, and combined to yield the final results.

The study design provides much clarification of the study [Fig. 3](#).

RESULTS

To assess the knowledge and attitude of the mothers toward ECC, scoring was given as poor and good ([Table 1](#)). The pretest and posttest showed a substantial change at baseline.

Table 1: Knowledge among parents regarding early childhood caries and its prevention pre- and postintervention

Sl. No.	Questions	Answers	Pretest (n = 200) n (%)	Posttest (n = 200) n (%)	Chi-square value	p-value
1	Do you know about early childhood caries in young children?	Yes	106 (53)	191 (95.5)	2.964	0.32
		No	68 (34)	6 (3)		
		Don't know	26 (13)	3 (1.5)		
2	Do you know that early childhood caries affects milk teeth in young children?	Yes	76 (38)	182 (91)	13.632	0.0034*
		No	104 (52)	18 (9)		
		Don't know	20 (10)	0		
3	Do you know that early childhood caries is also called as baby bottle syndrome?	Yes	21 (10.5)	113 (56.5)	4.171	0.079
		No	117 (58.7)	87 (43.5)		
		Don't know	62 (31.4)	0		
4	Do you know the importance of first dental visit in young children?	Yes	43 (21.9)	167 (83.7)	5.892	0.231
		No	118 (59.3)	30 (15.1)		
		Don't know	39 (19.5)	3 (1.45)		
5	Do you know preventive dental programs for early childhood caries?	Yes	32 (16)	161 (82)	3.984	0.001
		No	117 (58.5)	34 (4.5)		
		Don't know	51 (25.5)	5 (13.5)		
6	Do you know that cleaning of gums and newly erupted teeth is necessary in young children?	Yes	31 (15.5)	152 (82)	17.591	0.003*
		No	112 (56.3)	48 (18)		
		Don't know	57 (49.2)	0		
7	Are you aware that early childhood caries affects psychological welfare of child?	Yes	42 (23.5)	163 (81.5)	3.341	0.653
		No	137 (68.5)	24 (12)		
		Don't know	21 (10.5)	13 (6.5)		
8	What you think is the main reason for early childhood caries in child is prolonged feeding at night containing sugar?	Yes	33 (16.5)	171 (85.5)	5.124	0.163
		No	121 (60.5)	24 (12)		
		Don't know	46 (23)	5 (2.45)		
9	Do you know that putting your child with bottle to sleep causes early childhood caries because of stagnation of milk?	Yes	49 (24.4)	173 (86.5)	2.765	0.631
		No	126 (63)	16 (8)		
		Don't know	25 (12.5)	11 (5.5)		
10	Are you aware that teeth in children put to sleep with sweetened pacifiers predispose to early childhood caries due to high sugar content?	Yes	41 (17.6)	184 (92)	7.356	0.071
		No	131 (55)	11 (5.5)		
		Don't know	28 (27.5)	5 (2.5)		
11	Are you aware that early childhood caries affects the overall development of the child?	Yes	47 (23.5)	138 (69)	7.148	0.154
		No	111 (55.5)	41 (20.5)		
		Don't know	42 (21)	21 (10.5)		
12	Are you aware that early childhood caries spread from mother to child?	Yes	37 (18.5)	174 (87)	3.944	0.078
		No	107 (52.5)	14 (7)		
		Don't know	56 (28)	12 (6)		
13	Are you aware that prolonged nighttime bottle feeding predisposes to early childhood caries?	Yes	57 (28.5)	187 (93.5)	4.120	0.314
		No	24 (12)	13 (6.5)		
		Don't know	119 (59.5)	0		
14	Are you aware that preterm low birth weight babies and vitamin deficiencies predisposes to early childhood caries?	Yes	21 (10.5)	183 (91.5)	14.974	0.004*
		No	128 (64)	17 (8.5)		
		Don't know	51 (25.5)	0		
15	Are you aware that sweetened medications predispose to early childhood caries?	Yes	34 (17)	179 (89.5)	10.514	0.036*
		No	109 (54.5)	11 (5.5)		
		Don't know	57 (28.5)	10 (5)		
16	Are you aware that white spot lesion are early signs of decay which if not prevented will results in severe ECC?	Yes	43 (21.5)	178 (89)		
		No	115 (57.5)	20 (10)		
		Don't know	42 (21)	2 (1)		

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Sl. No.	Questions	Answers	Pretest (n = 200) n (%)	Posttest (n = 200) n (%)	Chi-square value	p-value
17	Do you think really think it is inevitable to get early treatment for children suffering from early childhood caries?	Yes	31 (15.8)	164 (82)	17.462	0.001*
		No	116 (58)	31 (15.5)		
		Don't know	53 (26.5)	5 (2.5)		
18	I think examination of child's oral cavity is necessary?	Strongly disagree	0	0	3.485	0.610
		Disagree	7 (3.6)	0		
		Undecided	11 (4.1)	0		
		Agree	154 (78.8)	111 (50.5)		
		Strongly agree	28 (13.5)	89 (49.5)		
19	I think that early detection of early childhood caries will increase the chance of long-term survival of the tooth?	Strongly disagree	3 (0.5)	0	5.941	0.632
		Disagree	11 (5.9)	3 (9)		
		Undecided	71 (23.4)	0		
		Agree	71 (56.3)	75 (23.4)		
		Strongly agree	44 (14)	122 (67.6)		
20	Do you think that awareness programs will motivate you to improve child's oral health?	Strongly disagree	1 (0.5)	0	12.148	0.239
		Disagree	110 (6.8)	0		
		Undecided	51 (20.7)	12 (9)		
		Agree	24 (59.9)	98 (41)		
		Strongly agree	14 (12.2)	90 (50)		
21	Did attending awareness program help you to improve feeding practices of children with early childhood caries?	Strongly disagree	13	0	7.719	0.259
		Disagree	121 (6.8)	0		
		Undecided	5 (19.4)	20 (9)		
		Agree	54 (62.6)	61 (27.9)		
		Strongly agree	7 (11.3)	119 (63.1)		
22	Will correcting the feeding practices improve the child's oral health?	Strongly disagree	12 (6)	0	16.531	0.048*
		Disagree	68 (34)	0		
		Undecided	54 (27)	16 (8.1)		
		Agree	28 (14)	154 (77.2)		
		Strongly agree	38 (19)	30 (15.7)		
23	The interprofessional multidisciplinary approach will improve the oral health status of children with early childhood caries?	Strongly disagree	16 (8)	0	7.115	0.648
		Disagree	121 (60.6)	0		
		Undecided	10 (5.1)	11 (5)		
		Agree	29 (14.4)	161 (80.6)		
		Strongly agree	24 (12.3)	28 (14.4)		
24	Will intermittent snack intake in lead to early childhood caries in children?	Strongly disagree	21 (10.5)	0	7.842	0.084
		Disagree	119 (59.7)	0		
		Undecided	31 (15.4)	3 (1.4)		
		Agree	14 (7.1)	121 (60.5)		
		Strongly agree	15 (7.5)	79 (39.6)		
25	Will management of children affected with early childhood caries improve overall wellbeing of the child?	Strongly disagree	3	0	5.173	0.429
		Disagree	114 (57)	0		
		Undecided	31 (15.5)	2		
		Agree	26 (13.1)	173 (86.5)		
		Strongly agree	16 (8.1)	25 (12.5)		
26	Will the awareness on expecting mothers about early childhood caries improves their child wellbeing?	Strongly disagree	25 (12.5)	0	13.487	0.036*
		Disagree	131 (65.5)	0		
		Undecided	21 (10.5)	16 (8.4)		
		Agree	16 (8.1)	149 (74.6)		
		Strongly agree	7 (3.6)	35 (17.6)		
27	Do you think that regular visit to pediatric dentist is necessary in prevention of early childhood caries?	Strongly disagree	13 (6.7)	0	10.213	0.364
		Disagree	161 (80.1)	0		
		Undecided	21 (10.6)	19 (9.6)		
		Agree	3 (1.5)	171 (85.6)		
		Strongly agree	2 (1.1)	10 (5.1)		

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Sl. No.	Questions	Answers	Pretest (n = 200) n (%)	Posttest (n = 200) n (%)	Chi-square value	p-value
28	Have you ever noticed any changes in your child's teeth?	Yes	13 (6.5)	197 (98.6)	— [†]	— [†]
		No	187 (93.6)	3 (1.4)		
29	How often do you emphasize on dental examination of children by lifting the lips?	Once in a week	110 (55.2)	200 (100)	— [†]	— [†]
		Once in a month	83 (41.5)	0		
		Once in 6 months	1 (0.6)	0		
		Once in a year	6 (3.1)	0		
		If any problem arises	0	0		
30	What age did you start oral examination of children with early childhood caries?	6 months	21 (10.6)	182 (91)	2.947	0.814
		1 year	5 (1.1)	18 (9)		
		2–3 years	10 (5.4)	0		
		>3 years	154 (77)	0		
		Don't know	10 (5.3)	0		
31	How often do you emphasize on improving feeding practices in children with early childhood caries?	Once	110 (55.3)	161 (80.6)	7.849	0.345
		Twice	21 (10.6)	39 (19.5)		
		Biweekly	23 (11.6)	0		
		Monthly	7 (3.5)	0		
		Don't know	39 (19.4)	0		
32	In your opinion, which oral health regime is most effective in prevention of early childhood caries?	Nutritional and preventive oral health	138 (69.4)	68 (34)	2.103	0.895
		Brushing and flossing	47 (23.6)	33 (16.5)		
		Fluoride supplementations	12 (6.1)	34 (17)		
		Wiping the oral cavity of child with moist cotton and use of xylitol wipes	3 (1.5)	65 (32.6)		

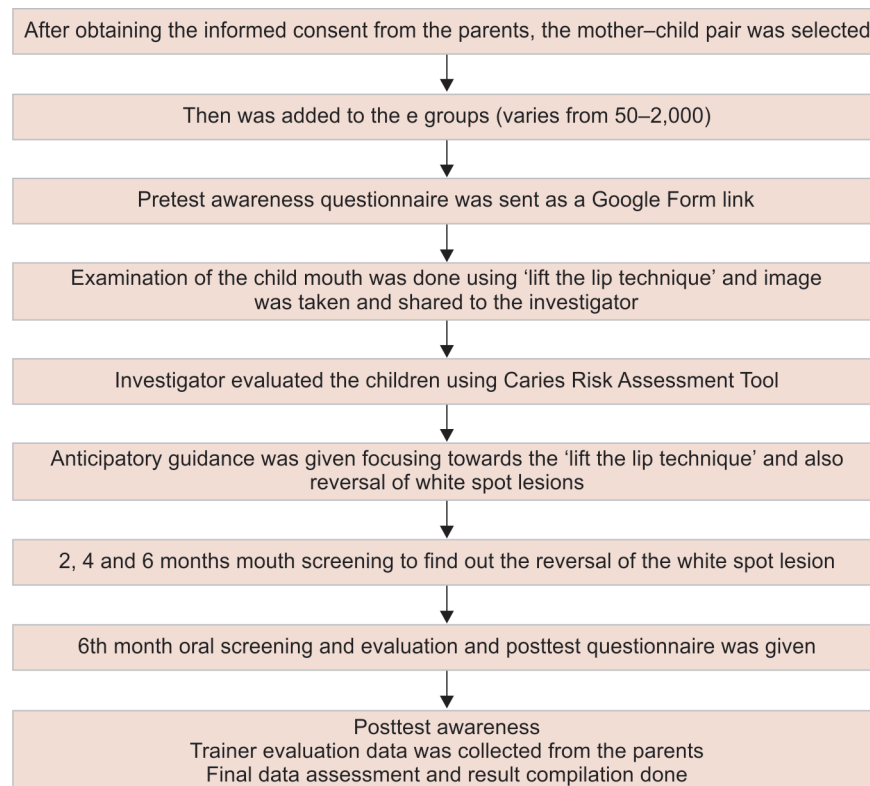


Fig. 3: Investigation design

By the end of 6 months, the mothers' knowledge of ECC had risen from approximately 28.5% to nearly 81% after the intervention (Fig. 4).

Since the attitude nearly provides identical sampling variability and has no effect on the behavior of the children, it is marginally significant (Fig. 5). Although 90% of mothers agreed that they would frequently notice any changes in their child's mouth during the practices, 100% of mothers recommended the lift-the-lip procedure once a week, along with the first dental appointment as soon as the tooth erupts. Additionally, 86% recommended it for nutritional and preventive health, and 16.5%

recommended brushing and flossing as the best way to prevent ECC (Table 2 and Fig. 6).

DISCUSSION

It is preferable to begin ECC prevention in the prenatal and perinatal periods very early. The risk of passing these germs to newborns whose mothers have greater levels of *Streptococcus mutans* due to untreated dental caries is higher.⁹ Numerous studies have shown that when *S. mutans* bacteria are acquired early in life, they primarily result in ECC. Other factors, such as race, socioeconomic status of the caregivers, water fluoridation, number of years of education, and dental insurance coverage, may contribute to the development or prevention of caries.^{10,11} It is believed that children with a history of dental caries, as well as those whose parents and siblings have severe dental caries, are more likely to experience dental caries themselves in the future.^{12,13} Additionally, children's involvement in the financial burden influences adults' dental well-being.¹⁴ Adults' oral health is impacted by a number of variables, including limited access to dental care and insufficient availability of preventive treatments, including fluoridated water, fluoride toothpaste, and fluoride varnish.¹⁵

According to studies, there are two ways for *S. mutans* to be transmitted: vertically and horizontally. Parent-to-child vertical transmission occurs when a mother or father is the caregiver.¹⁶ Therefore, having poor dental hygiene and consuming more sugar each day increases the likelihood that the mother may pass the infection on to her child.¹⁷ On the other hand, neonatal variables may raise the risk of contracting *S. mutans* in cases of horizontal transmission. *S. mutans* is transmitted more quickly by cesarean delivery than by vaginal delivery.¹⁸ Between *S. mutans* colonization

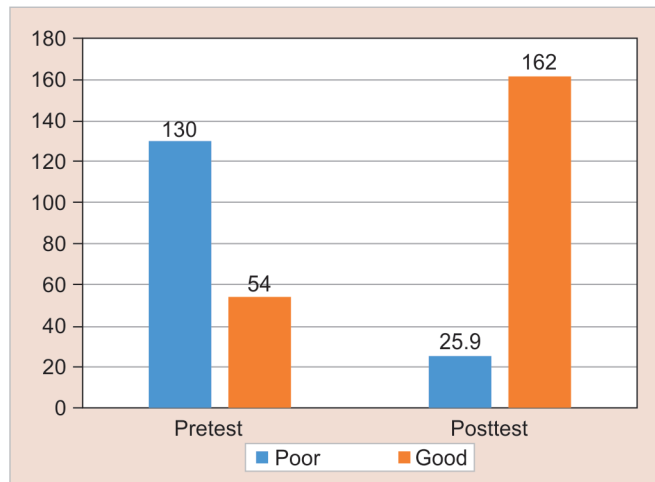


Fig. 4: Overall knowledge of study participants pre- and postintervention

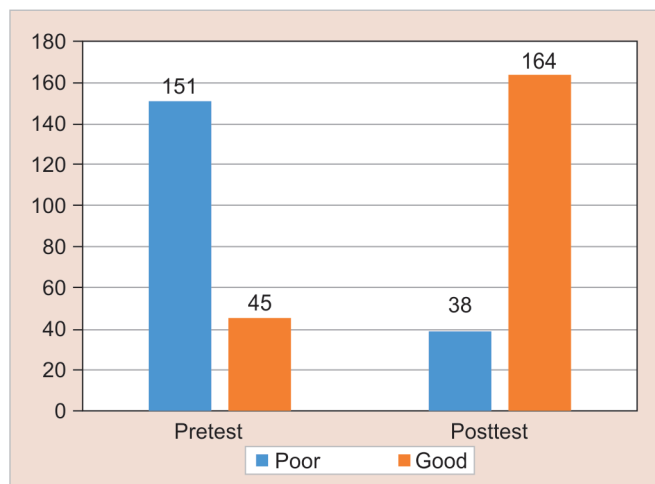


Fig. 5: Overall attitude of study participants pre- and postintervention

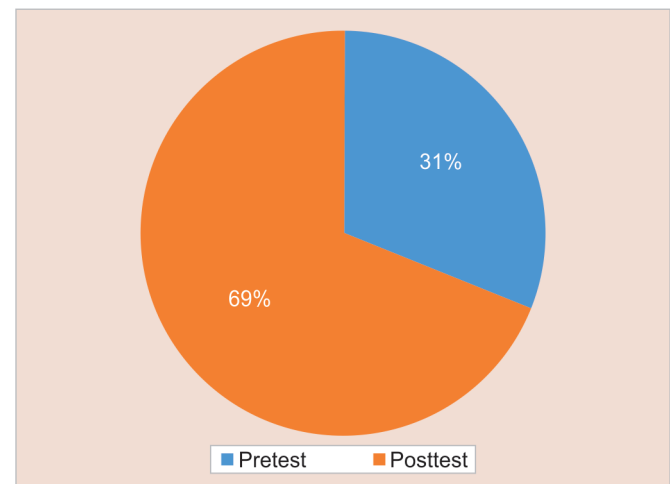


Fig. 6: Overall percentage of awareness postintervention

Table 2: Overall knowledge and attitude among parents regarding early childhood caries and its prevention pre- and postintervention

		Pretest (n = 200)	Posttest (n = 200)
Score category		n (%)	n (%)
Knowledge	0–8 (poor)	143 (71.5)	38 (19)
	9–17 (good)	57 (28.5)	162 (81)
Attitude	0–30 (poor)	151 (75.5)	47 (23.5)
	31–50 (good)	49 (24.5)	153 (76.5)

and the beginning and progression of caries lesions, it takes around 13–16 months.

Young children are more likely to experience enamel demineralization if they are fed at night using nursing bottles or sippy cups. Drinking sugary drinks at night should be avoided or at least reduced because of the increased risk of dental caries caused by the flow of saliva and oral clearance during the night.

The main objective of oral health education is to foster essential leadership for oral health reviews and to encourage sensible decisions for such practices. The ultimate goal of oral health education is to prevent disease. The substrate component of sugar is the key factor causing caries to occur. As a result, the majority of dentists have shifted their focus to educating parents and caregivers about altering children's diets and feeding patterns.^{19,20} In order to reduce the condition, healthcare professionals such as doctors and nurses play a vital role in teaching both parents and children. Most kids don't go to the dentist until they are 3 years old.¹⁹ By providing information in the form of pamphlets, experiences, or learning exercises intended to promote oral care, oral health education can be carried out.²⁰

The optimum strategy for newborn oral health care is the early formation of a dental home, which includes ECC prevention and management.^{21,22} The acceptance of the age-one dental visit can be facilitated by including oral health education in the curricula of medical, dental, nursing, and allied health professional programs.^{23,24}

Predictive advice to lower the risk of dental caries should include diet analysis, counseling to limit consumption of sugar-containing beverages, and advice on cleaning children's teeth twice daily with the proper amount of fluoride toothpaste.²⁵

To ensure knowledge of age-specific oral health issues, the AAPD encourages collaboration with early intervention programs, schools, early childhood education and care programs, members of the medical and dental communities, and other public and private community agencies.²⁶

According to Lin et al.'s study, improvements in oral health knowledge and good tooth-cleaning habits were seen after a dental public health program, which is consistent with our study's findings. In this study, a comparison of the data from the beginning and the end revealed a significant difference in the growth in knowledge and attitude levels in the group receiving direct intervention, suggesting that the educational program had a good impact when it was delivered in this manner.²⁷

Cardenas and Damon observed that the tested population's awareness of oral health increased within four weeks of receiving anticipatory counseling through a PowerPoint presentation, which is similar to the results of the current study. The direct and indirect intervention groups significantly differed from one another and the control group, demonstrating the direct intervention's beneficial impact on modifying the knowledge of the expectant mothers.²⁸ Bahri et al. found that the knowledge scores obtained by the control and intervention groups at the end of their study differed significantly, which is consistent with the findings of the current study.²⁹

However, our study is one of the few that looked at instructional strategies for providing guidance to mothers of children between the ages of 9 and 24 months during the epidemic. Given the limitations, it is recommended that research be conducted to assess the long-term progression of changes in variables. The outcomes of different oral health care teaching strategies can be investigated in such a study.

CONCLUSION

In conclusion, enhancing the experience of the caregiver with caries and her perception of the child's oral health condition may improve the experience of the child with caries and the family's quality of life with regard to oral health. These facts are significant and ought to guide public oral health initiatives for children.

Limitations

The complicated interaction of numerous components in the current picture of ECC makes it impossible for this investigation to pinpoint the precise cause of ECC. To reveal the hidden components of this aspect, more investigation is required.

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