EFFECT OF BREASTFEEDING ON DECAY EXTRACTED FILLING TEETH (DEFT) INDEX IN PRESCHOOL CHILDREN IN JORDAN

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ABSTRACT

Objective: To investigate the effect of the type of feeding among preschool children in Jordan on their dental health using deft index and plaque score.

Methods:A cross-sectional study was conducted in October 2021 on a kindergartens apprentice population in Karak, Jordan. A sample of 100 children aged 4-6 and above was blocked randomized, and distributed equally by gender (50% male and 50% female). The children were examined by a qualified pedodontist according to the method proposed by the World Health Organization. The parents received the questionnaire and were interviewed by the same dentist. Subsequently, the deft and plaque indices were evaluated and reported on by a trained experts.

Results: Plaque index scores were poor in 39% of the sample population, fair in 38%, and good in 22% of the samples, with only one child scoring excellent on the index. Breastfeeding, mixed feeding, and formula milk feeding groups contained 62%, 39%, and 25feeding group had the least number of cases with low scores. The cross-tabulation analysis illustrated that breastfeeding is responsible for lower deft scores (better dental health), while formula milk feeding leads to higher deft scores (worse dental health). Pearson's correlation coefficients indicated that there was no statistically significant relationship between the type of feeding and plaque index. On the other hand, the deft score and plaque index indicated a statistically significant correlation (.786; P-value: 0.000). The cross-tabulation of the deft score with the plaque index also evinced that the higher the plaque index, the low the deft score.

Conclusion: Breastfeeding showed better oral dental health than bottle feeding. Therefore, breastfeeding should be encouraged as the sole feeding method for up to six months at least. Type of feeding had some synergic effect with oral and dental hygiene (tooth brushing), a more dominant factor in determining oral dental health. Prolonged breastfeeding, including nocturnal feeding during sleep, and cariogenic foods/drinks reduce oral dental health.

Keywords: Infants, breastfeeding, deft, formula milk, Jordan

JRMS AUG 2025; 33 (2): 10.12816/0062214.

INTRODUCTION

Many researchers and scholars recommend breastfeeding in order to improve life quality and reduce mortality in preschool children (1). Many studies have linked prolonged breastfeeding, and other types of feeding to primary dental caries, which starts as a baby reaches the age of six months and progresses to tooth decay (2,3). Even though dental caries have declined globally, it is still one of the most common ailments among children, particularly in the Middle East and Asia (4).

Disease severity indexes, for instance, "deft" which refers to the proportion of decaying

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primary teeth (d), those extracted due to caries (e), and those filled (f), in relation to the total children tested, describe the prevalence of caries in a particular sample (5). Peres et al. (6) reported that children breastfed for more than a year have a higher rate of dental caries vs. those breastfed for less than a year. Research indicates that there is a relationship between the type of feeding and the prevalence of tooth decay in preschool children (7).

The presence of one or more decaying, extracted, or filled tooth surfaces in a primary tooth before the age of six is called Early Childhood Caries (ECC). The decay may result from either non-cavitated or cavitated lesions, and the missing surfaces may be caused by caries. Moreover, the occurrence of smooth-surface caries in a child under the age of three is classified as severe early childhood caries (S-ECC). Additionally, one or more cavitated, missing, or filled smooth surfaces in primary maxillary anterior teeth between the ages of three and five years, or decaying, missing or filled score of four or higher (three years of age), five or higher (four years of age), or six or higher (five years of age) is also categorized as S-ECC (8).

Dental plaque was first identified as an etiologic agent by Loe et al. in 1965 (9), who observed the development of gingivitis only a few days after oral hygiene routines were discontinued. It is believed to be a direct cause of severe dental disorders, including caries and periodontal disease, and hence, is directly related to the deft (decay extracted-filled teeth) score (10). The deft index is a widely used epidemiological indicator in dentistry. It reflects dental and oral health and is extensively used by researchers in this field (11).

According to the study of Rajab and Abdullah (12), the prevalence of ECC in children is 72.5% among four-year-olds and 77.2% among five-year-olds in Amman. The present research seeks to investigate the impact of the type of feeding on the oral health of preschool children in Jordan using deft index and score.

METHODS

This cross-sectional research was performed in October 2021 in accordance with the World Medical Declaration of Helsinki, and the protocol was reviewed and authorized by the Royal Medical Services' ethics committee. The study population consisted of students from the Kindergartens in Karak, Jordan. Block randomization was performed to ensure equal distribution of a total of 100 samples, aged 4-6 years, between both genders (50% male, 50% female). Children with a history of trauma, systemic disease, congenital anomalies, or syndrome were excluded. Qualified pedodontist (S.A) examined the children orally according to the WHO recommendations [World Health Organization, 1997], while parents were given questionnaires and the same Pedodontist conducted parents' interviews in addition to written consent . Moreover, Two trained dentists evaluated and reported on the deft and plaque indices. It is important to note that only temporary restorations and carious cavities are considered d, and initial lesions (such as chalky spots and stained fissures) are not. Disclosing agents were used for all patients to evaluate the oral hygiene level and calculate plaque index.(**Fig 1**)

The Plaque Index System Scores(13)

- **0 Score:** No plaque
- **1 Score:** A film of plaque adhering to the free gingival margin and adjacent area of the tooth. Plaque can only be seen after applying a disclosing solution **or by using a probe.**
- **2 Score:** Moderate buildup of soft deposits visible with the naked eye within the gingival pocket or the tooth and gingival margin.
- **3 Score:** Plenty of soft matter in the gingival pocket and/or on the tooth and gingival margin.

The patients were divided to four groups according to the total PI score as following(14,15):

Excellent Oral Hygiene (0)
Good Oral Hygiene (0.1–0.9)
Fair Oral Hygiene (1.0–1.9)
Poor Oral Hygiene (2.0–3.0)

Statistical Analysis

Data were entered and coded using SPSS version 25.0 (Chicago, IL, USA). Date Were not normally distributed .independet values were reported as descriptive, frequency and mean ± standard deviation. The differences in the means of different groups(Type of feeding, Score and deft score) (Plaque Score , deft score) were analyzed using Kruskal-Wallis H test followed by Post Hoc test were performed showing pairwaise comparison to determin the stastical differance between groups .Bonferroni correction for statistical significance between groups. Moreover ,correlation were tested using Point-multiserial correlation (rpm) tests. P values of less than or equals 0.05 were deemed statistically significant.

RESULTS

Six years and below(4.42 ±0.52), 50 were female, and 50 were males. Formula milk was the primary type of feeding for 48% of the sample population, while 31% of the children received a combination of breastfeeding and formula milk, and 21% were breastfed only.

Plaque index scores were poor for 39%, fair for 38%, and good for 22% of the sample population, with only one child scoring excellent on the index. So Data correction were applied and Excellant group were merge with Good group so we can apply valid correlation tests .only 21% of children had only breast feeding on the othor hand the majorty of children had formula milk (48%). (Table 1).no statically significant between Gender, Type of feeding and plaque index (**Table 1**).

Point-multiserial correlation indicated that there was a statistically significant positive moderate correlation between deft Score groups and Type of feeding (rpm=0.380, p=0.000, N=100) indicating better dental health (lower deft) associated with breast feeding. similarly, a positive high correlation between deft Score groups and Plaque Index (rpm=0.785, p=0.000, N=100) indicating better dental health (lower deft) associated with low PI Score category (**Table 1**).

Regarding evaluation the differences across three groups for better dental health (lower deft score) was tested using Kruskal Wallis Test $X^2(2, n100) = 14.31$, $p \leq 0.05$. the test revealed significant differences (Asymp.Sig.=.001) in the preference to Type of Feeding (Breast Feeding , n=21; Mixed Breast feeding and Formula, n=31; Formula Milk, n=48).Post hoc test show significant between Breast Feeding - Formula Milk with P value ≤0.05 (**Table 3**).

To evaluate the differences across three groups for better dental health (lower deft score) was tested using Kruskal Wallis Test

$X^2(2, n100) = 61.16$, $p \leq 0.05$. the test revealed significant differences (Asymp.Sig.=.000) in the preference to plaque index (Excellent & Good, n=23; Fair, n=38; Poor, n=39). Post hoc test show significant between all plaque Index groups (**Table 4**).

With regard to the deft scores, breastfeeding illustrated the lowest score, followed by mixed feeding and formula milk feeding (Table 2). The breastfeeding group included 13 cases with low deft scores (62% of the total number for the group, or 21 children), while there were 12 children with low scores in the mixed feeding group (39% of the group population, or 31 children). Likewise, the formula milk group involved 12 children having low scores (25% of the total number, or 48 children).

A comparison of the least scores among the groups was also made (Table 1). The formula milk group with the highest scores (poor dental health), had 29 cases, accounting for 60.4% of the total number of cases in the group (48 children). The mixed feeding group included nine cases, 29% share in the group (31 children).

The least number of cases with low scores (better dental health) were recorded in the breastfeeding group that encompassed only four cases, or 19% of the total number of cases (21 children). Overall, the cross-tabulation analysis illustrated that breastfeeding is responsible for lower deft scores (better dental health), while formula milk feeding leads to higher deft scores (worse dental health).

Moreover, The Poor Plaque Index group were the highest deft scores (poor dental health), had 31 cases, accounting for 79.5% of the total number of cases in the group (39 children). The Fair plaque Index group included eleven cases, 28.9% share inthe group (38 children). The least number of cases with low scores (better dental health) were recorded in the "Excellent & Good plaque Index" group that encompassed no cases, or 0% of the total number of cases (23 children). Overall, analysis illustrated that good oral hygiene (excellent or good oral hygiene) which is responsible for lower deft scores (better dental health), while fair - poor oral hygiene (high plaque index) leads to higher deft scores (worse dental health).

Table 1: Custom table shows Plaque index of different variables (Gender ,Type of feeding)

		Plaque Index				
		Excellent	**Good**	**Fair**	**Poor**	**Total**
Gender	**Male**	1	10	19	20	50
	Female	0	12	19	19	50
	Total	1	22	38	39	100
Type Of Feeding	**Breast Feeding**	1	4	9	7	21
	Mixed	0	7	15	9	31
	Formula Milk	0	11	14	23	48
	Total	1	22	38	39	100

		Gender	Type Of Feeding	Plaque Index	DEFT Score
Gender	**Corr. Coeff.**	1	-0.059	-0.026	-0.011
	Sig.	.	0.56	0.801	0.914
Type Of Feeding	**Corr. Coeff.**	-0.059	1	0.11	.380**
	Sig.	0.56	.	0.277	0
Plaque Index	**Corr. Coeff.**	-0.026	0.11	1	.785**
DEFT Score	**Sig.**	0.801	0.277	.	0
	Corr. Coeff.	-0.011	.380**	.785**	1
	Sig.	0.914	0	0	.

****. Correlation is significant at the 0.01 level (2-tailed).**

Table 2: DEFT Score Vs Gender,Type Of Feeding and Plaque Index.

		DEFT Score		
		Mean	**SD**	**N**
Gender	Male	3.12	1.64	50
	Female	3.1	1.56	50
	Total	3.11	1.59	100
Type Of Feeding	Breast Feeding	2.14	1.42	21
	Mixed	2.87	1.31	31
	Formula Milk	3.69	1.6	48
	Total	3.11	1.59	100
Plaque Index	Excellent & Good	1.26	0.81	23
	Fair	2.84	1.03	38
	Poor	4.46	1.07	39
	Total	3.11	1.59	100

Table 3 :Kruskal-Wallis test between Type of Feeding and deft Score

	Type Of Feeding	N	Mean Rank
DEFT Scor	Breast Feeding	21	33.67
	Mixed Breast feeding and Formula	31	45.97
	Formula Milk	48	60.79
	Total	100	

Test Statisticsa,b

	DEFT Score
Kruskal-Wallis H	14.313
df	2
Asymp. Sig.	0.001

a. Kruskal Wallis Test
b. Grouping Variable: Type Of Feeding

Table 4 :Kruskal-Wallis test between Plaque Index and deft Score

	Plaque Index	N	Mean Rank
DEFT Score	Excellent & Good	23	17.26
	Fair	38	45.43
	Poor	39	75.04
	Total	100	

Test Statisticsa,b

	deft Score
Kruskal-Wallis H	61.158
df	2
Asymp. Sig.	0

a. Kruskal Wallis Test
b. Grouping Variable: Plaque Index

Fig 1 :Disclousing Agent for Assesment of Plaque index.

DISCUSSION

Dental caries can manifest as untreated decay, fillings, or extraction of the affected tooth, as indicated by an increasing deft score. Numerous factors, including tooth brushing, the type and quality of diet, water fluoridation, dental prevention procedures, the dentin of teeth, and the type and quality of enamel, can increase dental caries (16). Worldwide, the prevalence of caries among five-year-old children remains high, ranging from 11.0-53.0% in the United States, 46.6% in Brazil, and 27.6% in England (17–19).

Breast feeding

Breastfeeding is beneficial to both infants and mothers. For children, there is evidence of a decrease in infants' illness frequency and a possible increase in IQ—though this is debatable. For mothers, breastfeeding benefits by preventing certain diseases, preserving hormonal balance following delivery, and decreasing the risk of breast and ovarian malignancies, type 2 diabetes, and postnatal depression (20,21).

Organizations like the WHO, the American Academy of Pediatrics, and the Japanese Pediatric Society advocate exclusive breastfeeding for at least six months because of the numerous benefits it provides (7,22–24). Breastfeeding is then supplemented by food consumption till the child is two years old (24). The American Academy of Pediatrics suggests that human milk is the best nourishment for newborns and offers numerous health-related benefits to children, mothers, and society (25,26). Breast milk, on the other hand, includes sugars that may be cariogenic, thus extended and unrestricted breastfeeding has been identified as a possible risk factor for early childhood caries (27–32) as reflected in the regulations of pediatric dentistry organizations, including the American Academy of Pediatric Dentistry and the Japanese Society of Pediatric Dentistry Policies (7,33).

There are many theories regarding the impact of breastfeeding on dental caries

1. Breast milk contains minerals such as phosphate and calcium, which aid in preventing dental enamel. These minerals alter as breastfeeding progresses, potentially affecting the child's cariogenic status (34).
2. Breastfeeding transfers maternal protective elements like immunoglobulins, casein, and lactoferrin, which play a role in reducing the growth of oral bacteria that cause caries. These elements are also debleated with advanced lactating (35,36).
3. Breastfeeding frequency, duration, and night breastfeeding may have an adverse effect on the cariogenic state; increasing breastfeeding duration by

more than six months means more milk sugar due to the high sugar content in breast milk, which increases the possibility of caries (27,29,37–39). Streptococcus mutans, a significant contributor to tooth decay, may not be able to utilize lactose, the sugar present in breast milk, as readily as sucrose, found in food or artificial milk. Moreover, certain breastmilk antibodies may help inhibit bacterial growth (40,41). Therefore, sugar, in supplementary foods, should be introduced after six months of age.

4. Primary teeth usually begin to erupt around the age of six months. After six months, exposing these teeth to breast milk, particularly if breastfeeding is frequent, may increase the prevalence of caries (42).

Several studies have been conducted to determine the optimal duration of breastfeeding, with some controversy surrounding adverse and beneficial effects or even the lack of a relationship with ECC. Many previous studies suggest a direct relationship between breastfeeding length and ECC.(43,44) However, in numerous other investigations, the onset of ECC was attributed to age, excessive sugar intake between meals, and poor oral hygiene rather than extended reports, our study found no link between breastfeeding and ECC (29,43,44). In contrast to previous research, we only examined the type of feeding during the first six months after infant birth to eliminate the bias associated with introducing supplementary food or drinks in infants' diet.

Formula Milk

primary or adjunctive feeding for infants and abandoning natural feeding may have adverse consequences for community health. Additionally, a number of commercials are being produced that promote formula milk and downplay the value of natural breastfeeding, aggravating the situation.

Formula milk may be a viable option in some instances, such as lactose sensitivity, mother illness, or mother's unavailability. Nonetheless, it should still be regarded as an exception rather than a norm. According to a 2005 Japanese survey, 90% of families had weaned their infants from breastfeeding by six months of age (45). Because of the high sugar content of formula milk and the possibility of milk bottles being misused, employing formula milk may increase the number of caries cases.

Lactobacilli were found in the saliva of formula-fed children in in vitro studies, which may inhibit the development of some streptococci. Some reports also suggest that inhibitory capability and susceptibility to S. mutans colonization in infancy may be explained by phenotypic differences in milk and saliva glycosylation (46).

Strength of the Study

Our research participants were comparable in age and geographic background, which presumably minimized possible confounding caused by unmeasured parameters linked with age and geographic background. The influence of investigated

Dental Caries Assessment

We assessed dental caries in children aged 3–4 years. Two qualified dentists performed a full-mouth examination for dental caries without utilizing radiographs. defs index, based on WHO standards, was used in the study. Under natural light, the children were examined in a supine posture using a blunt UNC-15 probe (Hu-Friedy, Ill., USA) and a mouth mirror. In case the kid needed treatment, the caregivers were requested to consult a dentist at a local community

hospital. It is also worth mentioning that the three examiners were calibrated prior to the examination until their intra- and inter-examiner agreements reached > 90%.

Oral Hygiene Level Plaque index

The current study found that the deft score directly correlates with the level of oral hygiene mirrored by the plaque index score. This is consistent with previous reports, which found that oral hygiene is one of the primary causes of dental caries and ECC (20,21).

Type of Feeding

Our study illustrated that the breastfeeding group exhibited a lower deft score than the mixed feeding and infant formula groups, which is in line with the previous research. (2,3,7) However, some studies also suggest that breastfeeding may increase dental caries (47–54). Therefore, the research regarding the relationship between breastfeeding and caries is inconclusive (31,55,56). Furthermore, some reports claim that bottle-feeding coupled with baby formula milk is a risk factor for dental caries (57–59), while others have reported different results (60).

STRENGTHS

Our research participants were comparable in age and geographic background, which presumably minimized possible confounding caused by unmeasured parameters linked with age and geographic background. The influence of investigated milk types (breast or formula milk) on caries was investigated till six months of age, thus reducing the chance of other diets or liquids bias. Moreover, we were able to control a number of possible confounding variables by collecting data on dental caries via standardized oral examinations by dentists. Thus, the exams' standardized nature minimized examination outcome bias, while the use of disclosing agents improved the reliability of the results for assessing the plaque index. Hence, this research carries significant strengths regarding the subject matter and may serve as a potential reference in the concerned area of research.

LIMITATIONS

The study was conducted on the sample population taken from a single Jordanian city, thus limiting the applicability to the entire Jordanian population. Furthermore, the data on the kind of feeding was evaluated 4-6 years after the infants were born, which may have resulted in recall bias. Undisclosed use of high-sucrose foods in conjunction with breastfeeding before six months could also impact the results. With regard to future research, a longitudinal investigation uncovering the behavior of intraoral bacteria involved in dental caries in at least two groups of infants with different feeding styles, with no other food introduction, will be extremely valuable in this field.

RECOMMENDATIONS

The existing scientific evidence indicates that breastfeeding is not detrimental to oral health, but it does appear to protect primary teeth. Therefore, health professionals should encourage breastfeeding; substituting with formula milk is not recommended. At the age of six months, it is proposed that sugar-free foods and beverages be introduced, as well as the use of fluoridated water. Moreover, brushing the infant's teeth twice a day with fluoride toothpaste should be started immediately after the first tooth's appearance. Furthermore, overnight breastmilk or infant formula feeding should be avoided.

CONCLUSION

Breastfeeding was found to be better for oral dental health than bottle-feeding in our study, and therefore, it should be promoted as the exclusive feeding option for the first six months. The type of feeding had a synergistic effect with oral and dental hygiene (tooth brushing), which is a more critical factor in determining oral dental health. Prolonged breastfeeding, particularly nocturnal feeding and cariogenic foods/drinks, all have a negative impact on oral dental health. Feeding decisions for infants should be made cautiously. Parents must be educated about proper child oral hygiene practices. For the first six months after childbirth, breastfeeding should be recommended to all mothers due to the numerous benefits to both infant and mother. Subsequently, non-cariogenic foods can be introduced into the child's diet.

AKNOELEDGEMENTS

No funding sources to acknowledge. The authors appreciate the assistance of colleagues, dental assistants and kindergartens managers, and teachers for their magnificent collaboration.

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