

## Feeding pattern a dual risk? otitis media (OM) and early childhood caries (ECC)

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**Abstract:** *Purpose:* To determine the prevalence of Otitis media (OM) and Early childhood caries (ECC) and their coexistence in children with a history of faulty feeding patterns. *Method:* Children aged 5 years and below were recruited at random from dental and medical hospitals. Parents of these children were posed with questions about the feeding methods, feeding patterns such as duration, frequency, position, burping, specific childhood illness etc. Children (120) were examined for ECC by a Paedodontist and OM by an Otolaryngologist and were segregated into three groups i.e. Control group, ECC group and OM group respectively. The ECC group was sub grouped into ECC only and ECC&OM group. The OM group was also similarly sub grouped into OM group and OM&ECC group. Collected data were tabulated and subjected for statistical analysis using Pearson Chi – square test. *Results:* Prevalence of ECC, OM, and their coexistence increased with age  $P < 0.001$ , whereas gender difference was not statistically significant. Overall Prevalence of their coexistence in children was 51.25%. Significant percentages (25%) of children in the OM group were fed in supine position. Children fed on demand (47.5%) experienced ECC. overall 85% ( $p=.017$ ) of children had coexistence of ECC&OM fed on demand and during bed time. Significant numbers of children who were burped occasionally after feeding (35%) or were not burped at all (12.5%) were affected with both ECC and OM. *Conclusion:* Prevalence of their coexistence was higher in children with OM. Significant association existed between on demand feeding and ECC; supine feeding position and OM. Risk factors in common for both the disease were combined feeding position, on demand, bed time feeding and occasionally burping.

**Keywords:** Early childhood caries; Otitis media; feeding methods; feeding patterns; ear infection; breast feeding; bottle feeding; sucking; dental caries

### Introduction

The habit of sucking is a reflex occurring in the oral stage of development and is credited to be the first coordinated muscular activity of the infant [1]. The eustachian tube normally opens when swallowing, sneezing, yawning etc. The active opening of the eustachian tube is caused by the contraction of the tensor veli palatine muscle, such that there is pressure balance in the middle ear. But the teat or the nipple of a feeding bottle or pacifier will reach the junction of hard and soft palate in an infant. The sucking action in turn will lift the soft palate. The rising of the soft palate will contract the tensor veli palatine muscle. As a result the eustachian tube becomes actively

patent, providing an ideal situation for the manifestation of Otitis media [2-3]. Otitis media in general, is termed as inflammation (fluid and infection) of the middle ear without reference to etiology or pathogenesis. The increased incidence of Otitis media in infants and young children may be attributed to the structural and functional immaturity of the eustachian tube, and an immature immune system [3-4].

Risk factors attributing to the etiology of OM are pacifier use, breast or bottle feeding on demand, falling asleep while feeding, excessive bottle feeding, parental smoking,

parental education level, day care attendance etc [5-8]. Early childhood caries (ECC) is defined as the presence of one or more decayed (non-cavitated or cavitated lesion), missing due to caries, or filled tooth surfaces in any primary tooth in a child 71 months of age or younger [9]. Most authors argue that ECC is caused by use of pacifier and when the consumption pattern has certain characteristics such as ad libitum feeding, frequent breast feedings, prolonged breast & bottle feeding both day and night, resulting in the accumulation of milk around the teeth. Reduced salivary flow at night and lack of oral hygiene may further deteriorate the oral environment and result in ECC [10-14]. A common risk factor for either OM or ECC is the use of pacifier. So we wanted to investigate other risk factors in common for OM and ECC and provide anticipatory guidance. Thus, we conducted a study to determine the prevalence of OM, ECC and their coexistence in children, with a history of faulty feeding patterns.

### Material and Methods

Children of 5 years and below reporting to The Department of Pedodontia and Preventive Dentistry, A.B.Shetty Memorial Institute of Dental Sciences, The Department of ENT and Department of Pediatrics, K.S.Hegde Academy of Medical Sciences, The Department of Pediatrics, General dentistry and the Department of ENT Government Wenlock Hospital, Mangalore were examined for the presence of Otitis Media and (or) Early Childhood Caries. Children affected with or without ECC or OM before they were weaned, with a history of faulty feeding patterns, who were otherwise healthy were included in the study. Children with craniofacial abnormalities and any other medical conditions were excluded from the study.

Parents or legal guardian received an explanation of the study and all of them agreed to participate in our study. Parents were asked to fill out questionnaires regarding the feeding habits and patterns when the children were infants. Some of the children were 4-5 yrs old at the time of the study, so obviously there are other dietary factors may also come into play and contribute to ECC since the time they were weaned. Hence we informed the parents about this issue. The form contained questions about infant feeding, duration, frequency and position of breast-

feeding, bottle-feeding and combination (both breast and bottle feeding). Information about burping the child after feeding, pacifier use was also collected. Parents were asked to provide information about their Child's health, occurrence of any specific childhood illness and OM in particular. After obtaining consent from parents, dental examinations for these children was performed by a Pedodontist in the dental hospital for ECC and was sent to the medical college for ear examination and similarly ear examination by an Otolaryngologist for OM and were sent to the dental college for dental examination.

Out of 196 children only 120 fitted the criteria. These children were divided into three groups. Control group: Children who neither had ECC nor had OM before they were weaned. ECC Group: Children with history of ECC. OM Group: Children with OM (history of or current infection). Past medical records were reviewed retrospectively to determine if a child had been diagnosed with an OM and or ECC. Children who formed the ECC group were again subdivided into *ECC only group* and *ECC&OM group*, similarly children in the OM group were also subdivided into *OM only* and *OM&ECC group*. This organization of subgroups was done so as to find out which group had a higher prevalence of coexistence of the disease that is ECC & OM together. Collected data were then tabulated under categories such as age, sex, method of feeding, pattern of feeding (duration of feeding, frequency of feeding, position of feeding, burping the child after feeding), pacifier use. All these categories on individual basis were subjected to statistical analysis using Pearson–Chi square test.

### Results

Overall prevalence of their coexistence in children was 51.25%. The OM group children had higher prevalence (67.5%) of their coexistence. One hundred and twenty children, among them 80 were boys and 40 girls with an age range of 0-5yrs. Occurrence of either ECC or OM and coexistence of ECC&OM was found to increase with age ( $P < 0.001$ ). Prevalence was higher in boys than girls (67.5%,  $p=0.567$ ; not significant statistically) (Table-1). Majority of children

were exclusively breast fed (60%) followed by combination feeding (35%) for a time span of 1-3 yrs. Children fed predominantly on demand experienced ECC only (47.5%), 20% of children

in the OM group were fed during bed time. Overall 85% (p=.017 significant) of children had coexistence of ECC&OM fed on demand and during bed time (Table-2).

**Table-1: Age distribution of cases and control**

Age in Years	Control Group (A)	Experimental group				Total
		ECC group (B)		OM group (C)		
		ECC only	ECC&OM	OM only	OM&ECC	
0 – 1	0	0	0	3(7.5%)	1(2.5%)	4(5%)
1.1 - 2	1(2.5%)	2(5%)	0	3(7.5%)	3(7.5%)	8(10%)
2.1 - 3	1(2.5%)	7(17.5%)	3(7.5%)	2(5%)	5(12.5%)	17(21.25%)
3.1 - 4	15(37.5%)	3(7.5%)	0	2(5%)	8 (20%)	13(16.25%)
4.1 - 5	23(57.5%)	14(35%)	11(27.5%)	3(7.5%)	10 (25%)	48(60%)
Total	40(100%)	26(65%)	14(35%)	13(32.5%)	27(67.5%)	80(100%)
		40 (100%)		40 (100%)		

$X^2=47.003$ ;  $p=.001$  vhs

**Table-2: Frequency of feeding**

Frequency of feeding	Control Group (A)	Experimental group				Total
		ECC group (B)		OM group (C)		
		ECC only	ECC&OM	OM only	OM&ECC	
Every hour	9(22.5%)	2(5%)	0	0	2(5%)	4(5%)
Every 2 - 3hours	5(12.5%)	0	2(5%)	1(2.5%)	3(7.5%)	6(7.5%)
During bed time	16(40%)	5(12.5%)	5(12.5%)	8(20%)	11(27.5%)	29(36.25%)
On demand	10(25%)	19(47.5%)	7(17.5%)	4(10 %)	11(27.5%)	41(51.25%)
Total	40(100%)	26(65%)	14(35%)	13(32.5%)	27(67.5%)	80(100%)
		40 (100%)		40 (100%)		

$X^2=24.492$ ;  $p=.017$  sig

Among the varied feeding positions, higher percentages (40%) of the controls were fed in the head elevated position. Significant percentages (25%) of children in the OM group were fed in supine position. Overall 82.5% (p=.001) children experienced coexistence of OM and ECC who were fed in the combined feeding position (i.e. supine and head elevated) and was statistically found to be very highly significant (Table-3). Majority of controls (87.5%) were burped regularly after every feed. Similarly majority of

cases {(62.5%) of ECC group and (47.5%) of OM group children were also burped regularly after every feed. A significant number of children who were burped occasionally after feeding (35%) or were not burped at all (12.5%) were affected with both ECC and OM and was (p=.037) statistically significant (Table-4). In our study only one child had used a pacifier and that child also had ECC.

<b>Table-3: Position of feeding</b>						
<b>Position of feeding</b>	<b>Control Group (A)</b>	<b>Experimental group</b>				<b>Total</b>
		<b>ECC group (B)</b>		<b>OM group (C)</b>		
		<b>ECC only</b>	<b>ECC&amp;OM</b>	<b>OM only</b>	<b>OM&amp;ECC</b>	
Supine	10(25%)	2(5%)	0	5(12.5%)	5(12.5%)	12(15%)
Head Elevated	16(40%)	3(7.5%)	2(5%)	1(2.5%)	1(2.5%)	7(8.75%)
Head elevated & supine	14(35.0%)	21(52.5%)	12(30%)	7(17.5%)	21(52.5%)	61(76.25%)
Total	40(100%)	26(65%)	14(35%)	13(32.5%)	27(67.5%)	80(100%)
		40 (100%)		40 (100%)		
X <sup>2</sup> =2						

<b>Table-4: Burping the child after feeding</b>						
<b>Burping</b>	<b>Control Group (A)</b>	<b>Experimental group</b>				<b>Total</b>
		<b>ECC group (B)</b>		<b>OM group (C)</b>		
		<b>ECC only</b>	<b>ECC&amp;OM</b>	<b>OM only</b>	<b>OM&amp;ECC</b>	
Occasionally	3(7.5%)	7(17.5%)	3(7.5%)	4(10%)	11(27.5%)	25(31.25%)
Regularly	35(87.5%)	16(40%)	9(22.5%)	6(15%)	13(32.5%)	44(55%)
Not at all	2(5%)	3(7.5%)	2(5%)	3(7.5%)	3(7.5%)	11(13.75%)
Total	40(100%)	26(65%)	14(35%)	13(32.5%)	27(67.5%)	80(100%)
		40 (100%)		40 (100%)		
X <sup>2</sup> =16.433; p=.037 sig						

**Discussion**

Otitis media continues to be one of the most commonly diagnosed childhood illnesses [15-16] Researchers have demonstrated the prevalence of OM ranging anywhere from 62%-84% in the child patient [3, 16-20]. In the current study no effort at differentiating various forms of Otitis media was made. All were included under the global term Otitis Media. ECC affect teeth but the consequences of this disease may lead to more wide spread health issues. Infants with ECC grow

at a slower pace than caries free infants and quite a few of them may be severely underweight because of associated pain and disinclination to eat. Added complications can be listed as neuromuscular imbalance with decreased masticatory efficacy, speech disturbances; development of parafunctional habits, and loss of vertical dimension and the most important of all, the unaesthetic look which affects the psychology of the child [14, 21-23].

The immature general and oral defense system as well as various anatomical and physiological maturity factors of the child gets better as age advances [24-25]. But still in our study ECC, OM and the coexistence of OM & ECC was found to be prevalent in all age groups. In contrast Teel et al [18] have found the 2 year olds and below to be the most affected but Nelson [26] did find a second, but a lower peak between ages 4 and 5. Probably a uniform age wise distribution of cases and controls would give more relevant information in this direction.

Boys were found to have a higher prevalence of ECC, OM and their coexistence than girls. Gender prevalence of ECC and OM has no pertinent grounds till date but it has been stated that males formed a minor determinant for this prototype [18, 27]. Higher prevalence of ECC and OM were associated with bottle feeding than with breast feeding. However prolonged breast feeding occasionally gives rise to a similar clinical picture. It is an established fact that bottle feeding and pacifier use causes ECC and OM but the effect of breast feeding in this regard has been mixed [24, 26-28, 29]. Out of the total sample majority were exclusively breast fed followed by combination feeding i.e. both breast and bottle feeding. Similarly majority of cases and controls were fed for a period of 3yrs in our study. Prevalence of ECC, OM and coexistence of ECC&OM was high in our study. Thus, raising a query about the protective effects of breast feeding and its duration on OM, ECC and their coexistence. It could be ascertained that the other dependent variables such as age, sex, frequency, position, burping and oral hygiene measures etc, could have probably influenced this pattern of disease presentation in the experimental group. The absence of disease in a comparable number of breast fed controls i.e. (62.5%) could be attributed to a better immune system or probably the influence of other favorable variables {As both the diseases are of multifactorial etiology}.

In the current study differentiation between different feeding methods i.e. when analyzing the feeding patterns (duration, frequency, position, burping etc) were not made. As numerous studies [15, 18, 27] have facts established, on the feeding methods and its relationship with ECC and OM, we were more zealous to know the effects of the patterns of feeding on ECC, OM and their

coexistence rather than the method of feeding. It is our view that it is not the method of feeding per se causing the disease but more so the pattern. The AAPD [9] recommends that ad libitum breast feeding should be avoided after the first primary tooth erupts. Frequent bottle feeding at night, breast-feeding on demand, extended and repetitive use of a non-spill training cup are associated with, but not consistently implicated in ECC. Griffith S [24] found that the mean number of ear infections was higher in dental caries versus the non dental caries group children. We observed that a significant number of children who were fed at bed time were affected with OM and those fed on demand predominantly experienced ECC. Majority of children fed predominantly either on demand and/or during bed time were affected with the coexistence of ECC&OM. Thus giving us a lead that, feeding children during bed time could be a major contributing factor for OM, feeding on demand for ECC and both i.e. feeding on demand and during bed time could be causal for the occurrence of both the diseases together.

In the current study, significant percentages of the controls were fed in the head elevated position. Owen et al [29] noted that, when infants were fed radiopaque material in a supine position, it was seen entering the eustachian tube and on occasions could even be seen within the middle ear cavity. If contrast material can do that, it is presumed that milk can as well. In accordance [28, 30-32] with various studies, we also observed that significant number of children who were fed either continuously or frequently in the supine (i.e. both mother and child in the supine position) feeding position were more prone to develop OM. Children who were fed in the combined feeding position (i.e. supine and head elevated) experienced coexistence of OM and ECC.

Upper pharyngeal and nasal involvements by Gastroesophageal reflux and Gastroesophageal reflux related OM or otalgia, have been suggested by some authors [30-31]. Nearly all infants have episodes of gastroesophageal reflux because the lower esophageal sphincter and its nerve supply are

not fully developed in infants. Being held flat during a feeding (instead of more upright) or lying down after feeding promotes reflux [32]. In our study majority of cases and controls were burped regularly after every feed. A significant number of children who were burped occasionally after feeding or were not burped at all were affected with the coexistence ECC and OM.

Being aware of certain predisposing factors may enable us to provide anticipatory guidance to parents about faulty feeding patterns as preventable and modifiable risk factors for OM and ECC. Targeting preventive measures not only prevents the physical and psychological ailments

of the child, but also the added financial strain of parents [33].

### Conclusion

- Prevalence of ECC, OM and their coexistence increased with age.
- Significant association existed between on demand feeding and ECC; supine feeding position and OM.
- Significant association existed between on demand and/or during bed time feeding, combined feeding position (i.e. supine and head elevated), occasionally burping and coexistence of ECC&OM.
- Prevalence of their coexistence was higher in children with OM.

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