

Erosive Tooth Wear among Preschool Children

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Erosive tooth wear is understood as a common problem to many adults, but it also affects many children. The findings suggested that the prevalence of erosive tooth wear among preschool children was over one-third (39.64%), with low-quality evidence suggesting boys and children with digestive disorders being more significantly affected.

Keywords: tooth erosion ; child ; preschool ; prevalence ; risk factors

1. Introduction

Dental erosion refers to the chemical loss of mineralized tooth substance caused by the exposure to acids not derived from oral bacteria ^[1]. Dental erosion can cause dentine hypersensitivity; poor aesthetics; or in severe cases, near or frank pulp exposures requiring root canal treatment or extraction ^[2]. As enamel of the primary teeth is softer than that of permanent teeth ^[3], erosive tooth wear in primary teeth may occur faster and possibly result in pulp exposure in some cases ^[4]. As erosive tooth wear has serious long-term implications, it is important to establish the prevalence of erosive tooth wear, and its associated and aetiological factors.

Erosive tooth wear is understood as a significant problem to many adults. Almost 80% of Swedish and up to 97.9% of Chilean adults have signs of erosive tooth wear ^{[4][5]}. The prevalence of erosive tooth wear in children is, however, inconsistent. The prevalence ranges from 5.7% to 78% ^{[6][7]}, depending on the study location, age, methodology, as well as definition and criteria of “erosive tooth wear”. There have been multiple reviews on the risk factors of erosive tooth wear in adults ^{[8][9]} and adolescents ^[10]. Risk factors associated with erosive tooth wear in these age groups include gastroesophageal reflux disease (GERD) ^{[8][9]}, eating disorders associated with vomiting ^[9], vegetarian diets ^[11], and frequent consumption of soft drinks and acidic drinks, particularly at bedtime ^[10].

However, there has not been a recent review on the associated factors of erosive tooth wear in children. Individual studies have conflicting conclusions regarding the risk factors of erosive tooth wear in children. One study found that dietary factors, oral hygiene behaviour, and systemic diseases were not associated with erosion in children ^[12], while another study ^[13] found that the frequent consumption of certain foods, including fruit juice and citrus fruits, was significantly associated with erosive tooth wear. Similar to adults, children and adolescents with certain medical conditions are also more likely to have erosive tooth wear. For instance, children with gastroesophageal reflux disease (GERD) had an increased risk of erosive tooth wear compared with children without GERD ^[14]. The level of parental education may also be a factor associated with erosive tooth wear that is unique to children ^{[7][15]}.

2. Prevalence and Associated Factors of Erosive Tooth Wear among Preschool Children

A meta-analysis on primary teeth ^[16] showed a lower range of prevalence of erosive tooth wear from 5% to 35%. However, Corica and Caprioglio (2014) only included three studies, resulting in a much smaller sample of children included in the meta-analysis. Besides that, the erosion indices utilized in the included studies only examined maxillary anterior incisors without including the posterior teeth, which might account for the lower prevalence of erosive tooth wear in the study ^[16]. Furthermore, the study did not perform any meta-regression and subgroup analyses to evaluate potential confounders associated with erosion. Salas et al. (2015) also identified a lower estimated prevalence of erosive tooth wear. However, the study ^{[16][17]} was conducted on permanent dentition of children and adolescents aged 8 to 19 years old. Primary teeth are reported to be less resistant to erosive tooth wear than permanent teeth ^{[3][18]}, which might have explained the higher overall estimated prevalence of erosive tooth wear in this entry compared with the review by Salas et al. (2015).

Interestingly, this entry found that the likelihood of boys having erosive tooth wear is significantly higher than girls (OR = 1.26; 95% CI = 1.12, 1.40; $p < 0.001$). Similar findings were also reported among adolescents. In adolescents, it is

hypothesized that, since males tend to have higher physical activity ^[19], they are more prone to salivary changes ^[20]. Decreased salivary flow during exercise, as well as lower stimulated salivary flow rate, cause a decrease in clearance rate, leading to an increase in risk of erosive tooth wear ^[21]. Similarly, among preschool children, boys are found to engage in physical activity more often than girls ^[22]. Similar salivary changes may occur in preschool boys, resulting in a higher likelihood of erosive tooth wear compared with girls. Future research can focus on any resultant changes of salivary composition after physical activity in children.

The likelihood of children with GERD, frequent vomiting, and/or digestive disorders having erosive tooth wear is significantly higher than that of children without such digestive disorders (OR = 1.38; 95% CI = 1.12, 1.70; $p = 0.002$). This shows the need for the dentist to carefully take a detailed medical history for each patient due to the close relationship between the patient's medical and dental health. Likewise, children with erosive tooth wear should be screened for any GERD or digestive issues. If these children are screened positive, then an appropriate referral should be made to a gastroenterologist for further evaluation and management.

Researchers' findings suggest no statistically significant relationship between age and prevalence of erosive tooth wear. This appears to contradict the results in a systematic review published by Kreulen (2010), which identified a linear relationship between age and erosive tooth wear ^[23]. However, Kreulen (2010) only looked into dentinal erosion rather than both enamel and dentinal erosion as a whole, which might explain the difference in the results. This entry also found that children with a higher frequency of consumption of soft drinks and fruit juices had higher prevalence of erosive tooth wear. While it is concerning that many children have poor dietary habits that lead to erosive tooth wear, raising awareness and educating parents will encourage children to reduce these erosive beverages. For instance, one-to-one dietary interventions given by medical and dental professionals ^[24] were found to be effective in motivating patients to make dietary changes. Parents should be educated during dental appointments on which foods can cause dental caries and/or erosive tooth wear.

Erosive medications that cannot be avoided may be a more worrying cause of erosive tooth wear. Oral medications for children are often in liquid form for ease of swallowing. They are also high in sugar to increase palatability, acceptability, and compliance of paediatric patients. Unfortunately, many of these medications have high erosive potential ^[25]. These medications have been implicated in softening enamel and increasing risk of erosive tooth wear ^{[26][27]}. Unfortunately, this entry did not find sufficient studies on the association between intake of medications and erosive tooth wear that met the inclusion criteria. Future research can focus on whether the frequent intake of certain paediatric oral liquid medications may increase the risk of erosive tooth wear.

Some of the included studies recruited study participants from hospitals and clinics. As such, these participants may have pre-existing medical and dental conditions that may be confounders for associated factors of erosive tooth wear. Furthermore, to include a larger number of subjects in this entry, studies using different erosion indices were all included in this entry. While this entry showed that there was no statistically significant difference in erosive tooth wear when different indices were used, some other studies have concluded otherwise. For example, a 2010 systematic review ^[23] suggested that erosion indices that focused on incisors only could lead to an underestimation of prevalence of severe wear. Another systematic review and meta-regression analysis ^[17] found that TWI presents the highest prevalence rates of erosive tooth wear. Moreover, the use of different indices precluded an analysis on the severity of erosive tooth wear, as different indices had different standards of severity. As the use of different erosion indices could result in variability in the estimates of prevalence of erosive tooth wear, there is a real need for an agreement among researchers on which index to use. Such standardized research methods will ensure that results are less heterogeneous and thus allow for easier analysis and comparison between studies.

Medical and dental professionals should strive to help raise awareness of erosive tooth wear as well as to educate the public on good oral and dietary habits. Healthcare professionals who see patients who have GERD or digestive issues should be aware of the higher risk of having erosive tooth wear in these children and provide appropriate counselling and advice. Other than cases of erosive tooth wear caused by GERD, digestive issues, and medications, increasing evidence has suggested that underlying developmental dental defects might also increase the risk of erosive tooth wear among children ^[28]. As these causes of erosive tooth wear may not be so easily controlled, future research should also look into different preventive measures, such as varnishes that can be applied to patients to prevent erosive tooth wear. The role of fluoride in preventing erosive tooth wear and in encouraging remineralization is well-researched and understood. However, there is no concrete evidence yet on whether fluoride varnishes can prevent erosive tooth wear. Therefore, future studies should look into the possibility of fluoride varnishes and other varnishes such as arginine-enhanced fluoride, and CPP-ACP in preventing or reducing erosive tooth wear caused by acids that may be intrinsic, or even into other acidic liquids such as paediatric oral liquid medications, acidic fruit juices, and soft drinks.

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