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## White spot Lesions: Pediatric dentistry approach

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### Abstract

**Introduction:** White spot lesions (WSL) develop because of a prolonged buildup of plaque on the surface of the teeth, commonly due to improper oral hygiene. The non-invasive options available in pediatric dentistry for the WSL include the application of fluoride gel and desensitizing agents, in addition to the resin infiltration technique.

**Objective:** Analyze the literature of white spot lesions in pediatric dentistry, know the etiology, epidemiology, prevention, as well as the recommended treatment.

**Methodology:** To carry out this literature review, an electronic search was necessary using PubMed and Google Scholar with the words white spot lesions, etiology, epidemiology, prevention, treatment.

**Results:** WSL appear mainly as a result of inadequate oral hygiene, in addition, different associated factors were found such as the use of orthodontic appliances. Fluoride is a widely used agent for preventing incipient caries or white spot lesions, the first treatment option is remineralization with various remineralizing agents such as fluoride and Amorphous calcium peptide-phosphate casein-phosphate paste.

**Conclusion:** Among the prevention strategies for WSL, we can mention the education of parents, to carry out correct oral hygiene, as well as to educate on the correct nutrition and the use of preventive agents such as fluoride.

**Keywords:** White spot lesion, caries, primary dentition, etiology, epidemiology, prevention, treatment and dental aesthetics

### 1. Introduction

The current scenario in dentistry indicates a high prevalence of dental caries in different age groups and populations [1]. Internationally, 60-90% of school-going children have dental caries [2]. Caries remains a prevalent disease worldwide, affecting all regions, regardless of age and socioeconomic status. Early childhood caries (ECC) is a complex disease affecting children under 3 years of age. It is defined as the presence of one or more carious lesions [3]. Caries in preschool children remains a major problem in both developed and developing countries [4]. White spot lesions (WSL) is defined as a subsurface enamel porosity caused by carious demineralization and presents clinically as a milky white opacity when located on smooth surfaces [5]. WSL have been shown to develop as a result of a prolonged accumulation of "undisturbed" plaque on the surface of affected teeth, commonly due to inadequate oral hygiene [6]. Acids diffuse into the enamel and demineralization continues into the subsurface enamel, then the intact enamel surface collapses and cavitates. It has been shown that these lesions can appear within 4 weeks [7]. Dentistry has experienced a marked increase in the prevalence and severity of white spot lesions over the past decade. Non-invasive options available in use for the treatment of WSL include the application of fluoride gel and desensitizing agents [8]. There is little evidence and there is no adequate systematic review on a pediatric dentistry approach to WSL, so this research aims to analyze the literature on white spot lesions in pediatric dentistry, to know the etiology, epidemiology, prevention, as well as the recommended treatment for these lesions.

## 2. Materials and Methods

Articles on the subject published through the PubMed, SCOPUS and Google Scholar databases were analyzed, with emphasis on the last 5 years. The quality of the articles was evaluated using guidelines, i.e., identification, review, choice and inclusion. The quality of the reviews was assessed using the measurement tool for evaluating systematic reviews. The search was performed using Boolean logical operators AND, OR and NOT. The search was performed using Boolean logical operators AND, OR and NOT; with the keywords: "white spot lesion", "early childhood caries", "primary dentition", "etiology", "epidemiology", "prevention", "treatment". The keywords were used individually, as well as each of them related to each other.

## 3. Results and Discussion

### 3.1 Etiology

WSL are considered non-cavitated incipient caries caused by bacterial plaque activity<sup>[9]</sup>, of ten WSL are associated with fixed orthodontic appliances, as fixed elements represent an additional opportunity for biofilm retention and therefore increase the risk of caries<sup>[10]</sup>. ECC is the presence of one or more decayed primary teeth and begins with WSL on the upper primary incisors along the gingival margin<sup>[11]</sup>, due to its whitish, dull, chalky appearance caused by loss of minerals in the enamel<sup>[12]</sup>, the appearance of WSL can be physically explained by the stronger scattering of light within the subsurface demineralized enamel as a result of air and saliva inclusions compared to the surrounding healthy enamel<sup>[13]</sup>. Although fluoride-containing agents can be used to improve remineralization, the esthetic appearance is usually not sufficiently improved<sup>[14]</sup>. WSLs appear mainly as a consequence of inadequate oral hygiene, and different associated factors such as the use of orthodontic appliances were also found, the most frequent place to find WSLs are in the upper central incisors.

### 3.2 Epidemiology

Internationally, 60-90% of school-going children have dental caries<sup>[15]</sup>. ECC is a complex disease affecting children under 3 years of age, this disease is defined as the presence of one or more carious lesions<sup>[16]</sup>, and usually begins with white spot lesions. These lesions are particularly evident in the upper central incisors<sup>[17]</sup>. Caries in preschool children remains a major problem in both developed and developing countries<sup>[18]</sup>, it also varies widely with various factors such as race, culture and ethnicity; socioeconomic status, lifestyle, dietary pattern and oral hygiene practices and also according to various factors from one country to another and from one area to another. A review of the literature suggests that in most developed countries the prevalence rate of ECC is between 1 and 12%<sup>[19]</sup>. The highest prevalence of ECC and WSL is found in the age group of 3 to 4 years and that boys are significantly more affected than girls, with ages ranging from 8 months to 7 years<sup>[20]</sup>. ECC initially presents as WSL in the upper incisors along the gingival margin, progressing to complete destruction of the crown<sup>[21]</sup>. WSL are also common in individuals with malocclusion such as dental crowding and fixed orthodontic appliances as they have a greater number of retention sites and consequently make cleaning more difficult and more predisposed to caries. WSL have been shown to be a frequent side effect of fixed orthodontic treatment<sup>[22]</sup>. In orthodontic patients the prevalence of WSL varies from 2% to 96%<sup>[23]</sup>. ECC remains a major problem in both developed and developing countries, 60-90% of school-going children have

caries, the highest prevalence of ECC and WSL is in the 3-to-4-year age group, and boys are significantly more affected than girls.

### 3.3 Prevention

Early childhood caries preventive strategies should begin with prenatal education of prospective parents, progress through the perinatal period, and continue with the mother and infant<sup>[24]</sup>. Prevention of WSL progression can be achieved with dietary support and counseling, as well as educating parents about caries-promoting dietary behaviors, maintaining good oral hygiene, and the use of preventive agents such as topical fluorides<sup>[25]</sup>. Fluoride is a widely used agent for the prevention of incipient caries or white spot lesions. The use of fluoride-containing toothpastes has been shown to be an effective way for children to prevent the development of caries<sup>[26]</sup>. A recently published multilevel conceptual model, which incorporates the influences of ECC exerted at the individual, family and community levels, suggests that both social and behavioral change are important in the prevention of this oral disease<sup>[27]</sup>. The use of probiotic chewable tablets or supplements also showed some evidence in caries control in children, their effectiveness is still under investigation<sup>[28]</sup>. Some studies showed that it is best to use toothpastes containing mainly remineralizing agents for oral care in children such as calcium phosphates, i.e. casein phosphopeptide calcium phosphate amorphous or hydroxyapatite<sup>[29]</sup>. Prevention is the key to avoid WSL in children. Prevention strategies include educating parents and prospective parents to carry out proper oral hygiene, as well as educating about proper nutrition and the use of preventive agents such as fluoride.

### 3.4 Treatment

The first treatment option is remineralization with various remineralizing agents such as fluoride and (CPP-ACP) Pastes<sup>[30]</sup>. Numerous fluoride varnishes are available, however, to date only sodium fluoride varnish has been extensively investigated to be effective in children. According to the recent concept, calcium and phosphate ions are considered to be the primary constituents of tooth mineral, and adequate amounts of these ions must be present in the remineralizing medium for remineralization to occur<sup>[31]</sup>. Application of CPP-ACP has a regenerative effect on WSL<sup>[32]</sup>, biannual applications have been shown to be effective in decreasing WSL in early childhood<sup>[33]</sup>. Minimally invasive treatment is available to address non-cavitated caries lesions using the resin infiltration technique in primary teeth. The primary enamel is less mineralized, more porous and aprismatic compared to permanent enamel. The proximal surface layer is less mineralized and thinner in primary molars compared to permanent molars and, therefore, the rate of proximal caries progression in primary molars is significantly higher than in permanent molars<sup>[34]</sup>. Resin infiltration appears to be a promising and less invasive treatment modality. In this method, subsurface porosities are occluded with a clear hydrophobic resin applied on the surface of the conditioned lesion. As a positive side effect, the white spot is also masked because the refractive index (RI) of the lesion becomes similar to healthy enamel<sup>[35]</sup>. The resin infiltrates the body of the lesion by capillary forces and forms resin-infiltrated parts of the lesion. The depth of resin infiltration is up to 100 microns<sup>[36]</sup>. Resin infiltration and microabrasion are comparatively effective in reducing the size of WSL, but resin infiltration enjoys an esthetic advantage over microabrasion

[37]. There are several methods to address WSL, the first treatment option is remineralization with various remineralizing agents such as fluoride and amorphous casein-phospho-calcium peptide-phosphate casein-phosphate pastes. In addition to infiltrative resin, which has become a promising and less invasive treatment modality, it also benefits the patient by improving esthetics.

#### 4. Conclusions

WSL appear mainly as a consequence of inadequate oral hygiene, and different associated factors such as the use of orthodontic appliances were also found. The highest prevalence of WSL is found in the 3 to 4 years age group, keeping the primary dentition in a healthy condition is important for the wellbeing of the child. Among the prevention strategies we can mention the education of parents and future parents, to carry out a correct oral hygiene, as well as educate about the correct diet and the use of preventive agents such as fluoride, since it is considered to be the first treatment option to reverse WSL in children with ECC.

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