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SWIMMER'S EROSION – A CASE REPORT

Pediatric & Preventive Dentistry

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ABSTRACT

Swimmer's erosion is a distinctive form of dental erosion associated with frequent exposure to improperly maintained, chlorinated swimming pool water. This case report describes a competitive swimmer who presented with significant enamel loss, tooth sensitivity, and discoloration following an intensive training period in a pool with suboptimal pH regulation. Clinical examination revealed generalized enamel erosion, particularly on the labial surfaces of the anterior teeth. Detailed history and water analysis confirmed prolonged exposure to pool water with a pH below recommended levels. The case highlights the critical role of proper pool maintenance and regular dental monitoring for swimmers, emphasizing the need for awareness among athletes, coaches, and pool operators regarding the potential oral health risks of acidic pool environments. Early diagnosis and intervention are essential to prevent irreversible dental damage and to promote long-term oral health in individuals at risk.

KEYWORDS

swimmer's erosion, dental erosion, sensitivity

INTRODUCTION

Dental erosion is a progressive and irreversible loss of dental hard tissue caused by chemical processes that do not involve bacterial action. Unlike dental caries, which result from microbial metabolism of sugars, dental erosion is primarily driven by direct exposure of teeth to acids from intrinsic sources—such as gastric reflux—or extrinsic sources, including dietary acids and environmental factors. Over time, this acid-induced demineralization can compromise the integrity of the enamel and dentin, leading to increased tooth sensitivity, altered aesthetics, and heightened risk of further dental complications.

Among the various extrinsic causes of dental erosion, a distinct and often underrecognized entity is swimmer's erosion. This occurs when the pool's pH drops below safe levels—often as a result of inadequate monitoring or excessive chlorination—making the water acidic enough to dissolve the protective enamel layer of teeth.[1] In 1982, Savad first reported that swimmers using poorly maintained swimming pools could be at risk for acid erosion of their enamel. Since then, several additional reports have supported these findings.[2]

Public and backyard swimming pools are routinely chlorinated to control bacterial and algal growth. Chlorine can be introduced into pool water in several forms, and the ideal concentration is typically maintained between 2 and 3 parts per million (ppm), with 1 ppm being the minimum recommended level. After chlorination, the water's pH is adjusted—usually to around 7.5—by adding either acids or alkalis as needed.

Common chlorine sources include sodium hypochlorite, which is alkaline and therefore does not pose a risk for dental erosion; chlorine gas, primarily used in large public pools; and "stabilized" chlorine, which consists of chlorine combined with cyanuric acid salts and is often available in tablet form. When dissolved in water, chlorine produces hypochlorous and hydrochloric acids. Hypochlorous acid acts as the primary disinfectant, while cyanuric acid helps prevent its breakdown by sunlight. If these acids are not properly neutralized—typically with sodium carbonate—the pool water pH can drop below 3.[2]

Such acidic conditions are not always noticeable to swimmers, aside from occasional eye irritation in those not wearing goggles. However, prolonged exposure of teeth to low pH water can lead to irreversible enamel erosion.

CASE REPORT

A 12 year old male patient reported to the Department of Pediatric and Preventive Dentistry, Sree Anjaneya Institute of Dental Sciences with generalised sensitivity on teeth since 3 years. He had history of going to swimming classes for past 3 years and spending minimum 4 hours daily at swimming pool. History of eye irritation was also present after attending swimming classes. There was no relevant medical history, no history of drug intake, and no relevant family history.

On examination, there was loss of enamel of the teeth particularly on anterior teeth, increased transparency at the edges, attrition at the incisal edges and gritty or rough areas in the cervical third of anterior teeth(figure 1). There was brownish discoloration present on the palatal and lingual surfaces of teeth and generalized erosion can be seen on all teeth(figure 2).

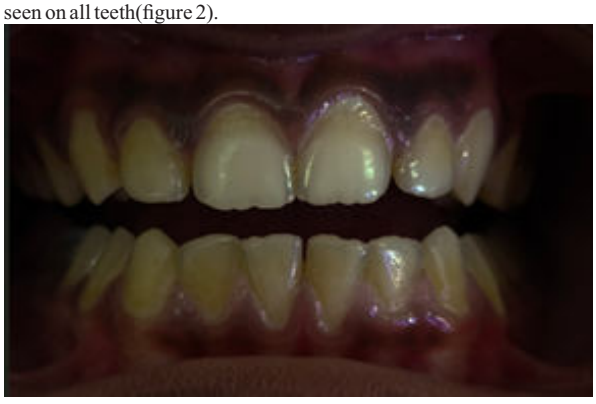
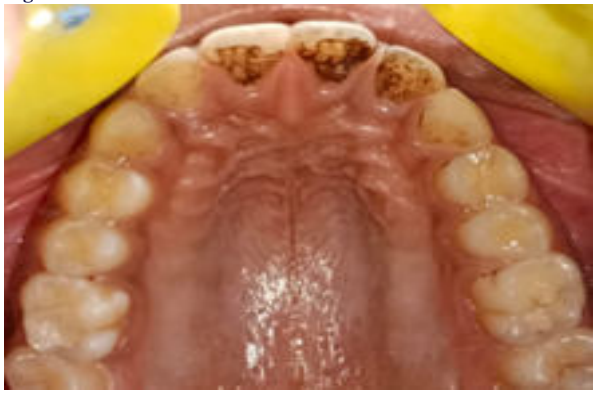


Figure 1



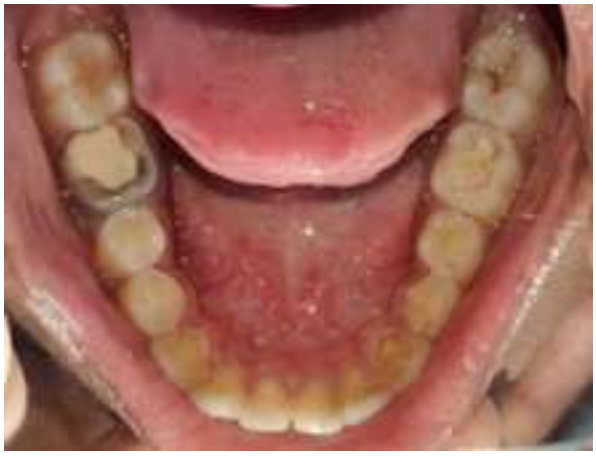


Figure 2

In the first visit, oral prophylaxis and fluoride application was done. Oral hygiene instructions were given. Patient was asked to record the diet chart for 2 weeks and review after 2 weeeks.

In the second visit, there was mild decrease in the sensitivity and the diet chart was reviewed. But this showed no exceptional consumption of acidic food, drinks or medication. On a detailed case evaluation in the second visit, he reported that his friends who went to the same swimming pool had similar symptoms like prominent sensitivity after attending swimming classes. So sample from swimming pool water was collected. The analysis of the sample showed that the level of chlorine in the water was found to be 15.95 ppm. According to the District Medical Officer (DMO) in Kerala, the chlorine level in swimming pools should be between 1 and 2 parts per million (ppm).

So the the definitive diagnosis was found to be generalized dental erosion due to improperly chlorinated swimming pool.

The patient was advised to use GC Tooth Mousse as remineralizing agent using tray method once a day during night time. He was advised to use customized mouth guards while swimming(figure 3). Swimming pool authorities and his friends were made aware of the condition.

Figure 3 Follow up after 6 months showed prominent changes in the symptoms(figure 4).

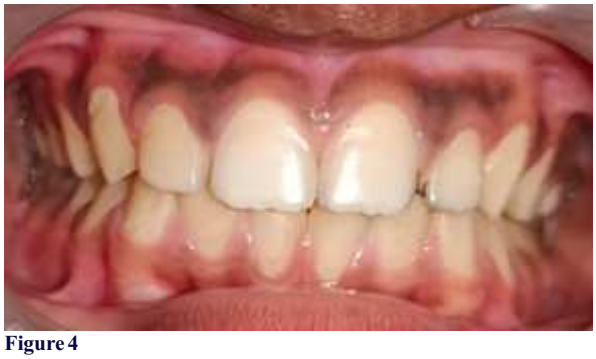


Figure 4

DISCUSSION

Swimmer's erosion, a form of dental erosion, is increasingly recognized among both competitive and recreational swimmers. Multiple studies have documented a high prevalence of enamel loss and associated dental symptoms in this group, with rates ranging from 26% in adolescent competitive swimmers to as high as 90% in some cohorts of young competitive swimmers.[1] The most commonly affected teeth are the upper anterior teeth, particularly the central incisors, with the labial surfaces being more severely impacted than the palatal surfaces.

While pool water chemistry is the main driver, other factors such as dietary habits (consumption of acidic beverages), gastroesophageal reflux, and inadequate oral hygiene can exacerbate dental erosion. However, studies controlling for these variables still find a strong association between swimming and dental erosion, underscoring the role of pool water exposure as a primary cause.[3]

Gabai et al.[4] explored the hypothesis that dental erosion in competitive swimmers may result from low pH levels in pool water caused by inadequate monitoring or insufficient buffering. An epidemiological study by Centerwall et al.[5] found that dental erosion affected 3% of non-swimmers, 12% of swimmers, and 39% of swim team members. Geurtsen[6] reported a case involving a competitive swimmer who experienced complete enamel loss on the upper incisors and generalized erosion of other teeth after just 27 days of intensive swimming in a poorly maintained, gas-chlorinated pool. Similarly, in 2008, Dawes and Boroditsky[2] described a woman who suffered near-total enamel loss due to acid erosion after swimming daily for two weeks in an improperly chlorinated pool in Cuba. In contrast, Lokin and Huysmans[7] found that only 0.14% of Dutch swimming pools had pH values below 5.5.

Treatment modalities for swimmer's erosion are tailored to the severity of tooth surface loss and aim to eliminate hypersensitivity, restore lost tooth structure, and reestablish oral esthetics and function.[8] Approaches range from preventive strategies, such as regular fluoride applications, use of remineralizing agents and education on pool maintenance, to restorative procedures including direct composite resin restorations, porcelain laminate veneers, and full-coverage crowns for more advanced cases.

CONCLUSION

Despite the strong evidence linking swimming to dental erosion, limitations exist, including variability in pool maintenance practices, differences in study populations, and reliance on self-reported data for confounding factors like diet and reflux. Future research should focus on longitudinal studies with larger sample sizes and standardized diagnostic criteria to better understand the long-term effects of swimmer's erosion and the efficacy of preventive interventions.

In summary, swimmer's erosion is a significant and preventable dental health issue among swimmers, driven primarily by exposure to improperly maintained pool water. Awareness, regular monitoring, and preventive strategies are essential to mitigate its impact on oral health.

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