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Development of A "Pre-Participation Dental Screening and Triaging Form" For Athletes

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Abstract

Background and Objectives of the Investigation: Athletes experience a complex array of oral health issues, two of which include: dental caries and infection/pain. These oral health conditions can impact on an athlete's ability to perform well and participate in both training and competitions. Treatment costs for athletes can be minimized and potential loss of playing time reduced when carious lesions are identified and treated early on. The objective of this study was to develop a combination Pre-participation Dental Screening and Triaging Form.

Experimental Methods Used: This research team utilized PubMed to review the literature regarding clinical studies on "Athletes" and "Dental Caries" to determine how dental caries were identified and classified among athletes.

Essential results, including data and, where appropriate, statistics: A total of N=7 research studies were identified. Dental caries has been identified and classified via three methods. These methods (N=7) include: [1] "Basic Percentage of Athletes", N= 4 [2] "DMFT" Classification System, N=2 [3] "ICDAS" Detection and Assessment System (N=1). Reporting caries as the "Percentage" of athletes does not give an accurate stage of caries present. Similarly, "DMFT" – gives a numbered value which includes but is not limited to caries present nor does it give an accurate stage of caries present. The "ICDAS", however, records not only caries prevalence, but the extant of caries progression. When a Sports Dentist performs a pre-participation dental screening, he/she should use the "ICDAS" assessment. However, the "ICDAS" assessment should be paired with Carious Triaging form with time frames: ICDAS 6 – pre-season, 5 – beginning, 4 – middle and 3 – end of season, and 2,1,0 – follow-up but no treatment. (*This new and combined form, "Wisniewski Pre-participation Dental Screening and Triaging Form", will be depicted*).

Conclusion: A new dental screening form allows for caries identification, prevalence, triaging, and treatment plan development.

Clinical Significance: Carious lesions can be identified and treated early-on utilizing a new combination "Pre-participation Dental Screening and Triaging Form", thus reducing the potential loss of playing time and minimizing the cost of dental treatment for athletes.

Keywords: Sports Dentistry, Athletes, Dental Caries, Dental Screenings, Pre-participation Dental Screening Examinations

Introduction

Athletes, who participate in various sports, experience a complex array of oral health issues. These problems plaguing the athletes include caries [1-8] periodontal disease [1-8] dental erosion [1,5-8] and infection/pain [1,3,5,6]. These oral health conditions can impact the athlete's ability to perform well and participate in both training and competitions [1,5,6,9]. Most importantly, many of these athletes have no awareness of their own oral health issues. In fact, a recent study stated that 62% of baseball players polled were unaware of their dental needs [10].

Numerous factors contribute to the large number of dental problems observed among athletes. When athletes regularly participate

in strenuous activities, the measured blood levels of these individuals contain elevated amounts of carbon dioxide. This high level of blood carbon dioxide. causes the salivary pH to decrease creating a favourable environment for bacteria in the oral cavity [11]. The saliva has a decreased buffering ability to buffer due to a lower ph. In addition, athletes often drink sports drinks which are often highly acidic and can contain high amounts of sugar concentrations12. This combination can weaken enamel causing caries and erosion, both common conditions occurring among athletes.

In combination with the lower salivary pH levels and frequent consumption of sports drinks, a number of athletes use some form of smokeless tobacco or electronic cigarettes. The use of smokeless tobacco can increase caries risk and gingival recession. One study found that 26% of smokeless tobacco users had a moderate caries risk and 34% had a high caries risk. This caries risk percentage is much higher than the control group in which had only 6% of participants were in both the moderate and severe caries risk categories [13]. Another study showed gingival recession in 87.5% of smokeless tobacco users14. Electronic cigarettes promote the growth of S. mutans and encourage the biofilms to form and adhere to the teeth [15].

When evaluating trends among the public, the number of young adults ages [15-21] who use smokeless tobacco increased from 5% to 17% from 2008 to 2017 [14]. E-cigarette usage in youth jumped from 1.5% in 2001 to 20.8% in 2008 and remains at that level today after peaking in 2020 at 34% 16,17. Both forms of tobacco use are increasing among young adults. However, of note, the increase in e-cigarettes use is greater when compared to the increase of smokeless tobacco use among these individuals. In support of this trend of use, only 2% of former college baseball players surveyed reported using E-cigarettes while 14% of current college players use E-cigarettes [18].

Among professional baseball players, however, an opposite trend has occurred. In a study among one professional baseball organization from 1991 to 2000, the use of smokeless tobacco decreased from 41% to 25.6%. This coincided with a decrease of oral leucoplakia from 22.6% of players in year 1 to only 9.4% in year 10. The researchers theorized that changes in league rules regarding tobacco use and regular education regarding the harmful effects as well as support for smokeless tobacco cessation were influential in producing these positive reductions [18].

E-cigarette use has emerged among professional baseball players. A study among 400 baseball players demonstrated the use of e-cigarettes in professional baseball. The results of this study found that prevention and intervention strategies need to be addressed among Caucasian players. Black and Latino players require recruitment and active involvement into prevention programs [19]. E-cigarette hazard awareness programs for professional baseball players similar to the smokeless tobacco hazard awareness programs need to be developed to decrease health problems, especially in the oral cavity [19].

As mentioned above, athletes face multiple risk factors which increase the occurrence of oral health issues. Many studies have highlighted these issues among athletes and advocated for increased identification, intervention, education, and prevention of oral health issues [1-8]. These studies report findings related to caries, periodontal disease, dental erosion, and infection/pain1-8. The method in which the authors document and measure the athletes' oral health issues, however, varies greatly from clinical study to clinical study. This discovery demonstrates that a new standardized pre-participation dental screening form is needed during pre-participation physical examinations.

The aims of this current study were

a.To determine the best method to identify and classify caries in athletes and

b.To develop, if necessary, a new standardized pre-participation dental screening form to prevent loss of playing time and decreased performance.

Methods

The members of this research team utilized PubMed to review the literature regarding articles on "Athletes" and "Oral Health". Once accomplished, the specific focus then became "Athletes" and "Dental Caries". The team systematically reviewed the articles to determine how caries was identified and classified. These articles were then grouped into "The Method Used to Classify Dental Caries". Within this data set of articles, three classification methods for dental caries were identified. These methods of reporting dental caries included:

a.Calculating the "Basic Percentage of Athletes" who had dental caries.

b.Utilizing the "DMFT" (decayed, missing, filled teeth) Classification System for dental caries.

c.Using the "ICDAS" (International Caries Detection and Assessment System)" for dental caries.

Results

The research team identified eight studies which reported dental caries in athletes. Four of the studies, which were identified, chose to simply identify the percentage of athletes that have caries [3-5,7]. In a study from 2019 at the Pan American games, the authors identified caries in 29% (22 of 76) athletes examined3. An additional study of Olympic athletes in London 2012 found 55% of athletes assessed to have caries7. The examination of players from professional football (soccer) teams in the UK revealed 37% of the players had active dental caries [5]. A systematic review conducted by Needleman et al. determined that sports participation can be considered a risk factor among athletes from different sports with an incidence of caries ranging between 15% and 70% 4. Although the results of these studies depict the prevalence of dental disease among the athletes via a percentage of athletes who had dental caries, the reporting of percentage does not give an accurate measurement of the progression of caries in these individuals.

Two studies chose to use a "DMFT" (decayed, missing, filled teeth) Classification System for dental caries score to assess the athletes' oral health needs. DMFT totals the number of teeth that have decay, are missing, or have been filled. One study of Dutch athletes before the Olympics, found a median DMFT-score of 3.0 8. Another study in Peru identified a mean DMFT of 4.46 among the athletes assessed20. While the DMFT scores show caries risk level over the lifetime of the athlete, DMFT scores do not accurately record the current state of active caries.

Perhaps a better method for recording caries is the ICDAS (International Caries Detection and Assessment System) which is depicted in Figure 1. This system allows the assessing dentist to record not only caries prevalence, but the extent of the caries progression. Two studies of elite athletes in the UK chose to identify caries ICDAS 3 or higher among the participants [2,6]. By doing so, the researchers identified athletes requiring immediate need of intervention.

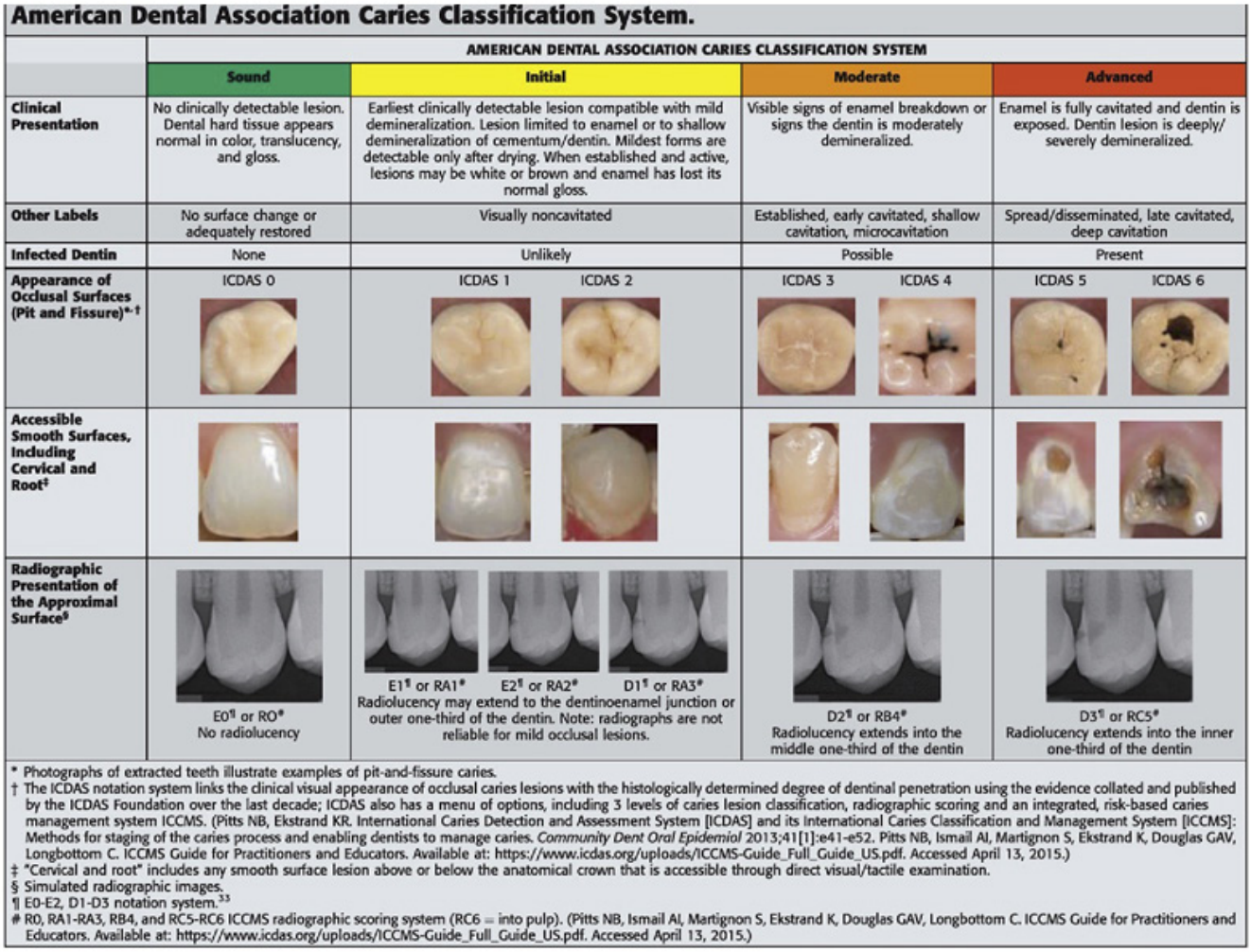

Figure 1: ICDAS – International Caries Detection and Assessment System [21].

Discussion

Previous studies [9,10], demonstrated a vital need for a "Combination Pre-Participation Dental Screening and Caries Triaging Form" for athletes. Many athletes do not recognize the state of their oral health prior to pre-preparticipation examinations [10]. This lack of awareness of oral health needs may lead to several detrimental side effects for the athletes and their teams. Some athletes may need to miss conditioning, practices, or even games because of infection and treatments1. As athletes postpone dental treatment, the complexity and cost of the treatment generally increases as well [9].

Many research projects have examined the oral health needs of athletes including caries, periodontal health, erosion, and infection/pain [1-8]. The authors analysed studies that focused on caries among athletes. These studies utilized various methods to document caries among athletes: [1] documenting percentage of athletes with caries, [2] recording DMFT scores, and [3] the International Caries Detection and Assessment System (ICDAS). Each of these caries identification methods have strengths and weaknesses but the first two methods indicated above fail in providing the athlete and dentist with proper timing for treatment. For this reason, the Principal Investigator of this research group has developed a "Combination Pre-participation Dental Screening and Caries Triaging Form" employing ICDAS to aid the examining dentists' ability to not only identify the severity caries, but to also determine the best time for when treatment should be rendered for treatment.

The caries triage form provides ample room to document the location of caries for each tooth. The severity of the caries, which is identified utilizing the ICDAS criteria, determines when dental treatment should be completed. Options for when treatment should be recommended include during the preseason, at the beginning of the season, at midseason, or during the postseason. The identification of caries and providing treatment according to these parameters will help to minimize the loss of performance and playing time as well as decrease the severity and cost of treatment

"Wisniewski Pre-Participation Dental Screening and Triaging Form"

NAME: _____ **DATE:** _____

Please check the box of the clinical finding and list tooth number and surface(s) in the space provided corresponding to the ICDAS category.

Clinical Finding	Pre-season ICDAS 6	Beginning of Season ICDAS 5	Middle of Season ICDAS 4	End of Season ICDAS 3
☐ Cavities				
☐ Lost Filling				
☐ Broken Filling				
☐ Broken Tooth				

***ICDAS 2,1,0 – Required follow-up but no treatment.**

NOTE: Caries lesions were identified and classified via the ICDAS – International Caries Detection and Assessment System (Figure 1).

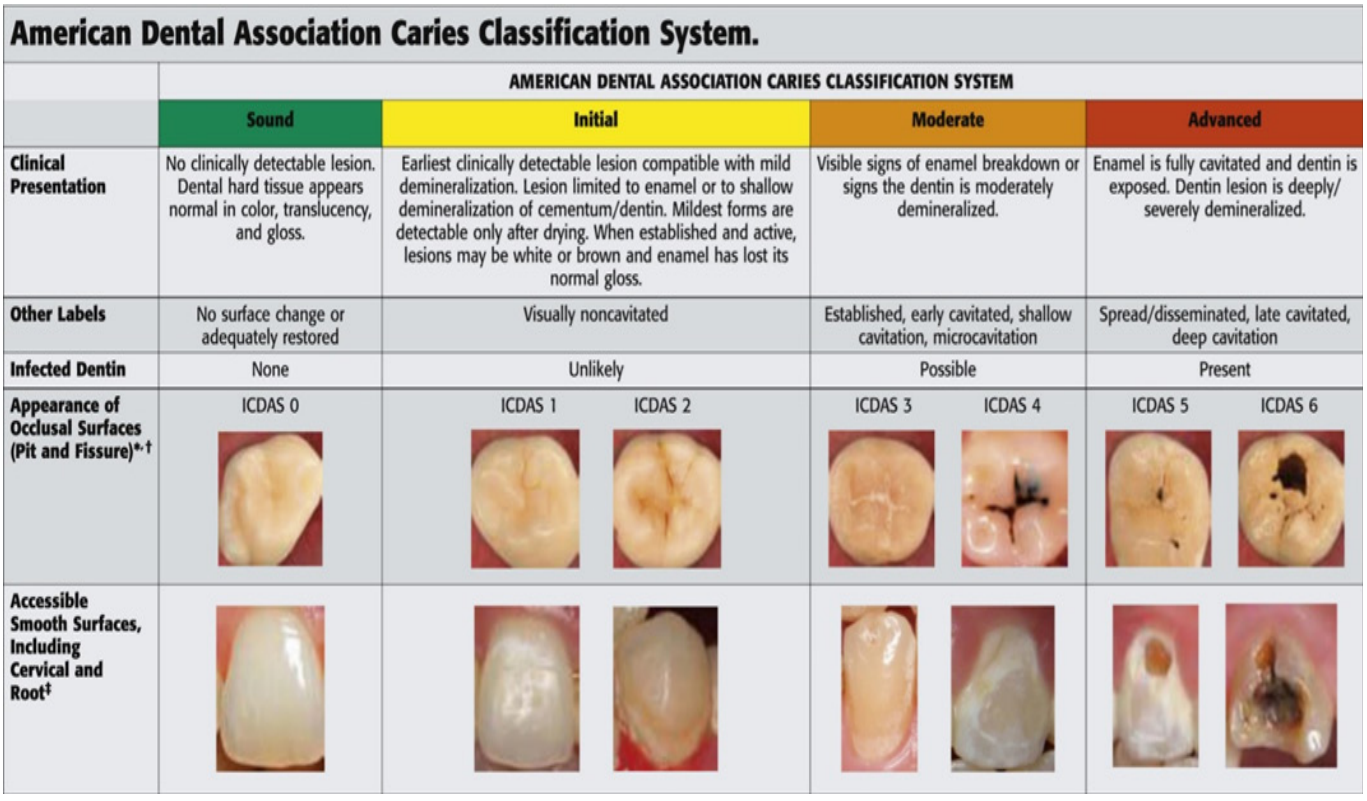

Figure 1: ICDAS – International Caries Detection and Assessment System [21].

It has been reported that most athletes are unaware of their restorative needs [9]. In a research study, 59 professional baseball players were asked to report their perception of restorative needs. This would include no cavities, no lost fillings, and no broken teeth. Of the 59 athletes, 62% (38 players) reported that there were no perceived restorative occurrences. The players then received an oral examination by a licensed dental practitioner. It was found that 90% (53 players) had current restorative needs whether that is carious lesions, lost restorations, fractured restorations, and broken teeth. This study helps guide the conversation that there is a lack of understanding from the athlete's perspective and from the organization that monitors players' health.

It is vital for a general dentist to record an accurate health history of his / her patients. When recording health history in a private practice setting, it can appear different from one office to another, particularly due to the variety of systemic diseases and health conditions which a general dentist may encounter. Depending on the location of a general dentist practice, it's important to consider the demographic population's health patterns, which can be different through various regions. It is paramount that a dentist to cater to the demographics regarding the area in which a his /her dental practice is located. It is even more important to inquire about specific oral health habits of an athlete and provide space in a caries triaging form where these important factors can be documented.

Establishing a sports specific health history or adapting dental examinations for athletes would be an important step towards treating a large population of people who are at risk trauma than most [22]. Factors to consider when examining athletes could be salivary pH, buffering capacity, secretory immunoglobin A, smokeless tobacco uses and E-cigarette usage [10]. All factors have been shown to increase the incidence of caries in athletes. Along with carious lesions athletes are at a higher risk of dental trauma than most populations [23-24]. Trauma is a risk to always consider when examining athletes. With a higher instance of physical activity an athlete can potentially frequent a general dentist's office for any dental emergency need.

There are many ways to evaluate an athlete's health status prior to competition play. This can be done through a preparticipation exam. [25] The Caries Triage Form provides an option for sports teams to have a dental practitioner come into the team facility and facilitate dental triage levels based on their current caries risk status. This viable option allows sports teams to accommodate players to receive an oral screening. Thus, the whole team can be screened by the attending dental practitioner.

Practical, Clinical, and Research Implications of Using this Form

The Principal Investigator (First Author) of this research project has used the essential elements of this particular "Pre-Participation Dental Screening and Triaging Form" while coordinating dental screening examinations as part of the Atlanta Braves' Spring Training Physicals. The triaging concepts were developed out of a practical necessity prior to the ICDAS – International Caries Detection and Identification System was published in February 2015 [21]. Utilizing this form, clinical dental screening examinations were accomplished quickly, efficiently, and in detail. During select periods of time from 1993 – 2023, the clinical research team, which consisted of two dentists, one functioning as the examiner and one functioning as the recording assistant, completion as many as twenty-five dental screenings in the span of one hour. The dental team provided the Head Minor League Athletic Trainer Coordinator with a list of players requiring "immediate care" (treatment necessary in spring training or at the beginning of the season) as well as a discussion of the recommended treatment. The original "Pre-participation Dental Screening and Triaging Form" for each player screened, whether "immediate care" was recommended or not, was inserted and became part of the player's medical record. Additionally, throughout the years, several research projects were accomplished. The results of these clinical research project were notable and published in refereed journals [9,10,26].

Conclusions

A new dental screening form allows for caries identification, prevalence, triaging, and treatment plan development. Carious lesions can be identified and treated early-on utilizing a new combination "Pre-participation Dental Screening and Triaging Form", thus reducing the potential loss of playing time and minimizing the cost of dental treatment for athletes.

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