



# Modifiable Risk Factors Related to Oral Diseases in Youth Cuban Baseball Sportsmen

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## Abstract:

**Background:** Oral health care closes the cycle of medical assistance integrated with sports, becoming a specialized service of great value in Cuba; however, oral diseases in young athletes are very frequent. For effective prevention, it is necessary to know the modifiable risk factors related to these diseases.

**Objective:** This study aimed to determine the relationship between risk factors and oral diseases in baseball sportsmen from the sports initiation school of Villa Clara, Cuba.

**Material and Methods:** A descriptive, correlational, and cross-sectional study was carried out in the young baseball athletes (N=60) of the 15U (n=30) and 18U (n=30) divisions ( $M=15.33$ ;  $SD=1.49$ ). Data were analyzed using empirical frequency distribution and descriptive statistics. Data normality was tested using asymmetry, kurtosis, and the Kolmogorov-Smirnov test. U Mann-Whitney test was used to determine differences in the risk factors and oral diseases between divisions, and the Tau\_b Kendall correlation coefficient was used to determine relationships between both groups of variables.

**Results:** Improper tooth brushing, cariogenic diet, and inefficient oral hygiene were the main risk factors, while dental caries, gingivitis, and malocclusions were the oral diseases most notable. Athletes of higher division have greater toxic habits and a cariogenic diet; however, they brush more frequently and have more efficient oral hygiene. Except for the presence of malocclusions, the rest of the conditions are related to the determined risk factors.

**Conclusion :** The knowledge about the relationship between risk factors and oral conditions allows to base the design of educational intervention actions focused on the promotion of adequate oral health behaviors in the athletes, which shows the relevance of odontology in sports.

**Keywords:** Baseball athletes, Dentistry, Oral diseases, Risk factors, Sports divisions.

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## 1. INTRODUCTION

Since the beginning of the 21st century, a specialty called Sports Dentistry has emerged [1, 2]. This branch of odontology applied to sports is a specialty in terms of the study, review, control, prevention, and treatment of orofacial injuries and the oral manifestations of other

diseases for the maintenance of oral health in the athlete, as well as the dissemination and information of new knowledge related to oral health in the context of sports competition [1-3].

The main research reference that demonstrates the need for the application of odontology in sports is the

analysis carried out from the collection of information from the Summer Olympic Games in London 2012. The results obtained showed poor oral health of athletes. Dental caries (55%), dental erosion (45%), and gingivitis (76%) were the most common diseases [4].

In the Cuban sports system and its network of educational centers, oral health actions are articulated according to the guidelines included in the National Program of Comprehensive Dental Care for pediatric ages, so the sports medical system includes general odontology among its specialized services, considering it essential for maintaining the health of athletes [5].

The first Cuban scientific publications that highlight the importance of odontology in sports were produced in the years 1971 and 1972, which marked the beginning of the application of the knowledge of general odontology to sports activity in the national context. In practice, dental care was an essential factor for the medical control of sports training from its beginnings, strengthening services in the first provincial centers [5].

With the further development of the Cuban sports medical system, the odontology service was established in all centers of the country with the mission of ensuring the oral health of athletes at all levels of the high-performance pyramid [5, 6]. However, scientific production in this area of applied sciences has not been prolific, constituting a need in the theoretical and methodological order in Cuba due to the lack of empirical studies that show evidence of the oral health of athletes.

This research was carried out in 2018 based on the trend shown by the results of the initial medical check-up of the population of the Villa Clara sports initiation school "Héctor Ruiz Pérez" between 2015 and 2017, where the prevalence of an inadequate state of oral health in school and youth athletes was observed regardless of the universal and free provision of dental services, with baseball being one of the most affected sports. Given this problem, the following scientific objective was proposed:

To determine the relationship between risk factors and oral diseases in baseball sportsmen from the sports initiation school of Villa Clara, Cuba.

## 2. MATERIAL AND METHODS

A cross-sectional, descriptive, and correlational study was carried out during the first dental check-up carried out in the 2018-2019 school period in September 2018. The athletes were in the age range of 12-18 years, coinciding with the prioritized group of care for minors under 19 years of age in Cuba.

All young baseball athletes from the Villa Clara province participated in the study. About 60 athletes participated ( $M= 15.33$ ;  $SD=1.49$ ), including the 15U ( $n=30$ ) and 18U ( $n=30$ ) divisions. In Cuba, the 15U division is a program for boys aged 13-15, while the 18U division is for boys aged 16-18.

Through the clinical interview, information was obtained about the presence of modifiable risk factors in the athletes,

which were recorded in the dental clinical history [7].

A survey was conducted among athletes to corroborate the presence of modifiable risk factors and evaluate the level of knowledge about oral health. This instrument is the one used in the analysis of the health situation of the National Program for Comprehensive Dental Care for the Population [7], to which adjustments were made considering the variables under study.

To identify oral diseases, observation was used in the physical and clinical examination with the use of the oral mirror, periodontal probe, and artificial light in the dental unit [7].

The athletes were treated in the dentistry department of the Provincial Sports Medicine Center of Villa Clara, where the preliminary assessment was carried out, and the results of the examination were recorded in the individual medical history [8]. After this first dental check-up, information was collected from the medical records, and then the questionnaire was applied to the athletes.

For data analysis, percentage distribution, mean, and standard deviation were used to describe risk factors and oral health diseases. To determine the oral hygiene of the athletes analyzed, the O'Leary Oral Hygiene Index was applied [8], which is determined by multiplying the total number of stained surfaces by 100 and dividing the result by the total number of surfaces examined. Oral hygiene is considered efficient when the result is less than 20% and poor if the result is greater than 20%.

The data were analyzed using asymmetry, kurtosis, and the Kolmogorov-Smirnov test, determining the use of the Mann-Whitney U test to compare the variables between the sports divisions that make up the population. The non-parametric correlation coefficient Kendall's Tau\_b was applied to determine the relationship between modifiable risk factors and the most prevalent oral diseases. Differences and correlations were considered statistically significant when the p-values were  $\leq 0.05$  (significant) and p-values were  $\leq 0.01$  (very significant). IBM SPSS software version 25.0 for Windows was used.

The authors confirm that ethical considerations were considered in conducting this research, and they assert the originality of the article with unpublished content. The research adhered to ethical principles rooted in the Declaration of Helsinki. The study protocol and consent form underwent review and approval by the Provincial Center of Sports Medicine of Villa Clara ethics committee, as indicated by document number 0101/2018 (8/1/2018).

## 3. RESULTS

Table 1 shows the distribution analysis of modifiable risk factors and oral diseases in baseball athletes without specifying the sports divisions. It is also evident that the data do not have a normal distribution. There is a low presence of toxic habits and an adequate level of knowledge about oral health. Inadequate tooth brushing, a cariogenic diet, and poor oral hygiene are the main risk factors. Regarding oral diseases, a high presence of dental caries, gingivitis, and malocclusions was obtained.

**Table 1. Distribution of modifiable risk factors and oral diseases in baseball athletes.**

Variables		N	%	M	SD	Asym.	K	Z	p.
KL	Low level	15	25	2.20	.819	-.390	-1.401	.286	.000
	Middle level	18	30						
	High level	27	45						
AH	Present	6	10	1.90	.303	-2.736	5.671	.505	.000
	Not present	54	90						
TSM	Present	10	16.7	1.83	.376	-1.835	1.413	.530	.000
	Not present	50	83.3						
FB	Vertical	41	68.3	1.42	.671	1.358	.580	.416	.000
	Horizontal	13	21.7						
	Mixed	6	10						
TBF	Incorrect	54	90	1.10	.303	2.736	5.671	.530	.000
	Correct	6	10						
CD	Systematic	29	48.3	1.73	.800	.525	-1.235	.304	.000
	Between meals	18	30						
	At meals	13	21.7						
OH	Deficient	55	91.7	1.08	.279	3.093	7.826	.534	.000
	Efficient	5	8.3						
DC	Deep dentin	13	21.7	2.93	1.351	-.088	-1.168	.168	.000
	Middle dentin	9	15						
	Superficial dentin	15	25						
	Enamel	15	25						
CG	Present	48	80	1.20	.403	1.539	.379	.490	.000
	Not present	12	20						
DT	Present	10	16.7	1.83	.376	-1.835	1.413	.505	.000
	Not present	50	83.3						
ML	Present	31	51.7	1.52	.504	-.068	-2.065	.348	.000
	Not present	29	48.3						

**Note:** \*\* p<0.01(two-tailed); \* p<0.05; N=Number; M=Mean; SD, Standard Deviation; Asym. = Asymmetry; K = Kurtosis; Z= Kolmogorov-Smirnov; KL= Knowledge level; AH= Alcoholism; TSM= Tobacco smoking; FB= Form of tooth brushing; TBF= Tooth brushing frequency; CD= Cariogenic diet; OH= Oral hygiene; DC= Dental caries according to their depth; CG= Chronic gingivitis; DT= Dental trauma; ML= Malocclusions.

**Table 2. Relationship between modifiable risk factors.**

Variables		1	2	3	4	5	6
1. OH	Tau b Kendall	-	-	-	-	-	-
	P-value	-	-	-	-	-	-
2. KL	Tau b Kendall	.292*	-	-	-	-	-
	P-value	.018	-	-	-	-	-
3. TSM	Tau b Kendall	.135	-.154	-	-	-	-
	P-value	.300	.213	-	-	-	-
4. AH	Tau b Kendall	.101	.024	.745**	-	-	-
	P-value	.440	.843	.000	-	-	-
5. TBF	Tau b Kendall	.556**	.556**	.170	.216	-	-
	P-value	.000	.000	.146	.086	-	-
6. FB	Tau b Kendall	.905**	.323**	.149	.111	.615**	-
	P-value	.000	.009	.252	.393	.000	-
7. CD	Tau b Kendall	.143	-.292*	.037	.152	.174	.210
	P-value	.246	.018	.763	.219	.147	.090

**Note:** \*\* p<0.01(two-tailed); \* p<0.05; OH= Oral hygiene; KL= Knowledge level; TSM= Tobacco smoking; AH= Alcoholism; TBF= Tooth brushing frequency; FB= Form of tooth brushing; CD= Cariogenic diet.

Table 2 shows the relationships between modifiable risk factors. Poor oral hygiene is related to low knowledge of oral health, inadequate form, and lower frequency of

tooth brushing. Likewise, low knowledge is related to the cariogenic diet, also influencing the inadequate form and lower frequency of brushing. On the other hand, the

consumption of alcoholic beverages is related to smoking, while inadequate brushing is related to less frequent tooth brushing.

Table 3 shows the results of the comparison of risk factors and oral diseases among baseball athletes according to sports divisions. In youth athletes, a greater presence of toxic habits and a cariogenic diet was identified. However, they also tend to have a more adequate brushing frequency and more efficient oral hygiene. Despite these differences, it was found that oral

health conditions do not differ between athletes 15U and 18U.

Table 4 shows the relationships between modifiable risk factors and oral diseases. A greater presence of caries in deep dentin is related to a low level of knowledge about oral health, a lower frequency of tooth brushing, a cariogenic diet, and poor oral hygiene. On the other hand, the presence of chronic gingivitis is also related to poor oral hygiene, less brushing frequency, and inadequate tooth brushing.

**Table 3. Risk factors and oral diseases according to High School baseball divisions.**

Variables Divisions		Average Range	p.
Knowledge level	15U	28.35	.306
	18U	32.65	
Tobacco smoking	15U	25.50	.001**
	18U	35.50	
Alcoholism	15U	27.50	.010**
	18U	33.50	
Form of tooth brushing	15U	30.00	.786
	18U	31.00	
Tooth brushing frequency	15U	33.50	.010**
	18U	27.50	
Cariogenic diet	15U	18.92	.000**
	18U	42.08	
Oral hygiene	15U	33.00	.021*
	18U	28.00	
Dental caries	15U	33.88	.124
	18U	27.12	
Chronic gingivitis	15U	29.50	.522
	18U	31.50	
Dental trauma	15U	28.50	.169
	18U	32.50	
Malocclusions	15U	28.00	.200
	18U	33.00	

Note: \*\* p<0.01(two-tailed); \* p<0.05.

**Table 4. Relationships between modifiable risk factors and oral diseases.**

Variables		DC	CG	DT	ML
Knowledge level	Tau b Kendall	-.308**	.183	.039	-.112
	P-value	.009	.136	.749	.365
Tobacco smoking	Tau b Kendall	.121	.224	-.080	.015
	P-value	.332	.086	.539	.909
Alcoholism	Tau b Kendall	.055	.167	.000	.233
	P-value	.661	.200	1.000	0.73
Form of tooth brushing	Tau b Kendall	.114	-.426**	.208	-.052
	P-value	.313	.001	.099	.678
Tooth brushing frequency	Tau b Kendall	-.314**	-.528**	.149	-.011
	P-value	.007	.000	.252	.932
Cariogenic diet	Tau b Kendall	.332**	.082	.080	.114
	P-value	.003	.508	.519	.313
Oral hygiene	Tau b Kendall	-.416**	-.603**	.135	-.070
	P-value	.000	.000	.300	.589

Note: \*\* p<0.01(two-tailed); \* p<0.05; DC= Dental caries according to their depth; CG= Chronic gingivitis; DT= Dental trauma; ML= Malocclusions.

#### 4. DISCUSSION

Regarding the level of knowledge about oral health, several studies agree that athletes have insufficient information and, therefore, low levels of knowledge about oral health care [9-11]. However, in another study [12], it was found that the athletes analyzed presented a high level of information about oral health, coinciding with the present investigation. This divergence in the results regarding the level of information about the oral health of athletes may be conditioned by multiple factors, including the diversity of the samples analyzed in terms of sociodemographic characteristics of the subjects, availability and access to dental services, and the effectiveness of educational and health promotion actions aimed at different populations.

Despite the adequate level of knowledge that the analyzed athletes have about oral health care, educational needs were identified in relation to the frequency and form of tooth brushing, as well as the control of the cariogenic diet due to inadequate ingestion of sugary foods. Athletes who have low knowledge about oral health care have poor hygiene and continually eat sugary foods; they do not brush their teeth properly or with the frequency necessary to prevent oral diseases.

Although, in the general sense, athletes have a high level of knowledge, modifiable risk factors were identified in the form and frequency of tooth brushing, the high presence of a cariogenic diet, and poor oral hygiene. This indicates that theoretical knowledge does not regulate health behaviors on its own. However, it is an important factor to consider since it was determined that athletes whose level of knowledge is low are at a greater degree of vulnerability. Several studies carried out in adolescent populations agree that inadequate tooth brushing, a cariogenic diet, and poor oral hygiene constitute the main modifiable risk factors that depend on the subjects. Furthermore, a low presence of toxic habits has been identified in adolescent athletes [10-15].

Poor oral hygiene constitutes the main risk factor in the population analyzed, although with greater emphasis on athletes in the 15U division, while the cariogenic diet was found to have a greater presence in 18U athletes. More specifically, a greater presence of alcoholism and smoking was obtained in youth athletes; however, educational needs are considered for this group due to the influence exerted by peers on the adolescent's subjectivity, which poses the risk that this inappropriate behavior extends to others.

With respect to oral diseases, the notable presence of dental caries and gingivitis coincides with both studies in non-athletic adolescent populations [9-11] and in athletes [4, 12, 15, 16]. In contrast, the high presence of malocclusions only coincides with a previous study [16]. The low presence of dental trauma is contrary to the results obtained in populations of athletes of different modalities [11, 17-19] and in baseball specifically [20], although recently, a lower frequency of injuries has been identified in this sport compared to other sports games in

the Villa Clara province [21].

The most relevant result of this research is that athletes who had a low level of knowledge about oral health care, inadequate tooth brushing, a cariogenic diet, and, consequently, poor oral hygiene are the most exposed to developing dental caries, and chronic gingivitis, coinciding with a similar study [9]. In relation to this, it is considered necessary to implement systematic prevention actions in these athletes. To obtain greater effectiveness, prevention should contain educational actions combined with an increase in the application of substances or medications with preventive action on dental caries. Several recent studies have confirmed the positive effects of fluoride, casein phosphopeptide-amorphous calcium phosphate, and biomimetic hydroxyapatite on oral health [22-24].

Despite the value of the findings obtained, the research design does not offer the possibility of explaining how the relationships between modifiable risk factors configure a certain risk of developing caries and chronic gingivitis in these athletes. It is not possible to identify how the change in a risk factor can favor the state of oral health during a given period. Therefore, the present study should be replicated in other sports to determine differences in the distribution of risk factors and the presence of oral diseases, identifying their relationships, which will allow the establishment of prevention programs considering the particularities of the athlete populations.

#### CONCLUSION

The findings obtained guide the prevention of oral health problems in the analyzed population, which must integrate educational actions in the case of modifiable risk factors and cures for the main oral diseases. Based on these results, it is recommended to systematically implement a prevention program through an experimental research design to stimulate knowledge about self-care and modify inadequate tooth brushing habits, the cariogenic diet, and oral hygiene in general.

#### AUTHORS' CONTRIBUTIONS

The authors confirm their contribution to the paper as follows: study conception and design by JRG; data analysis and interpretation of results by JMR. All authors reviewed the results and approved the final version of the manuscript.

#### ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The research was duly authorized by the Scientific Council of the Provincial Center of Sports Medicine of Villa Clara and by the Research Ethics Committee of the institution No. 0101/2018 (8/1/2018).

#### HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

## CONSENT FOR PUBLICATION

The parents would agree with their participation after signing the informed consent term.

## STANDARDS OF REPORTING

STROBE guidelines were followed.

## AVAILABILITY OF DATA AND MATERIALS

The data supporting the findings of the article is available upon the author's request.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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