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Relationship between dental erosion, food and beverages consumption in athletes

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Faculty of Health Sciences

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as part of the requirements for obtaining a master's Degree in Dental Medicine
under the supervision of Professor Maria Raquel Silva (PhD)
and Doctor Helena Neves.

Resumo:

Objetivo:

Numerosos estudos à escala internacional demonstraram a influência da alimentação na cavidade oral, levando à erosão dentária. Sabemos que os atletas têm um gasto energético importante, portanto, eles precisam adaptar a alimentação de acordo com as suas necessidades energéticas e nutricionais, recorrendo, por vezes, ao consumo de bebidas energéticas, muitas vezes envolvidas no processo de erosão dentária, devido a composição e ao pH reduzido. Assim, o objetivo deste estudo é relacionar a alimentação, incluindo o consumo de bebidas energéticas com a erosão dentária em atletas.

Métodos: Foi utilizado um questionário sobre os hábitos alimentares, incluindo o consumo de bebidas energéticas de um grupo de atletas (n=110: nadadores, fisiculturistas, jogadores de futebol, pugilistas, voleibol, corredores) repartidos em grupos: nadadores que consumem ou não bebidas energéticas, e atletas (exceto nadadores) que consumem ou não bebidas energéticas. O grau de erosão dentária de cada atleta foi avaliado através de um exame oral, utilizando o índice BEWE. Os dados foram tratados estatisticamente usando o programa SPSS, versão 23.

Resultados: Dos 110 participantes, 48 (43.6%) indivíduos não apresentaram risco de erosão, 54 (49.1%) indivíduos apresentaram baixo risco de erosão, 7 (6.4%) indivíduos apresentaram um risco médio de erosão, e 1 (0.9%) indivíduo apresentou alto risco de erosão.

Conclusões: Os seguintes fatores foram identificados como risco para erosão dentária: o consumo elevado de vinho tinto e citrinos, a frequência de escovagem dos dentes aumentada, e a prática desportiva, nomeadamente onde atletas consomem bebidas energéticas, com o maior risco para os nadadores que consumem bebidas energéticas.

Palavras-Chave: Erosão dentária, alimentação, bebidas energéticas, atletas.

Abstract:

Objective:

Numerous international studies have demonstrated the influence of the alimentation on the oral cavity, leading to tooth erosion. We know that athletes have an important energy expenditure, therefore, they need to adapt a diet according to their energy and nutritional needs, sometimes resorting to the consumption of energy drinks, often involved in the process of dental erosion, due to the composition and at a reduced pH.

Thus, the objective of this study is to relate alimentation, including the consumption of energy drinks with dental erosion in athletes.

Methods: A questionnaire on dietary habits was used, including the consumption of energy drinks in a group of athletes (n = 110: swimmers, bodybuilders, Footballers, boxers, volleyball players, runners) organized in groups: swimmers who consumed or not energy drinks, and athletes (except swimmers) who consumed or not energetic drinks. The degree of dental erosion of each athlete was evaluated through an oral exam using the BEWE index. Data were statistically treated using the SPSS program, version 23.

Results: Of the 110 participants, 48 (43.6%) had no erosion risk, 54 (49.1%) had low risk of erosion, 7 (6.4%) had an average risk of erosion, and 1 (0.9%) person presented high risk of erosion.

Conclusions: The following factors were identified as a risk for tooth erosion: high consumption of red wine and citrus fruits, increased tooth brushing frequency, and sports practice, especially where athletes consume energy drinks, but with the greatest risk in swimmers who consume energy drinks.

Keywords: Dental erosion, energy drinks, athletes, alimentation.

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BEWE	Basic Erosive Wear Examination
ETW	Erosive Tooth Wear
pH	Potential Hydrogen
AUC	Area Under the receiver characteristic Curve (ROC)

I. Introduction

Dental erosion is a condition of the oral cavity that occurs with a growing prevalence worldwide in the last few decades. It is defined as a progressive loss of tooth substance by a chemical process without the aid of bacteria, producing a hard, polished, smooth depression on the surface of the tooth (Dox *et al.*, 1993). It is a multifactorial phenomenon that can be related with intrinsic and/or extrinsic acids, not produced by bacteria.

According to Jaeggi *et al.* (2006), preschool children aged between 2 and 5 years showed erosion on deciduous teeth in 6-50% of the subjects and 14% of young schoolchildren (aged 5-9) already have erosive lesions on permanent teeth. In the adolescent group (aged between 9 and 17), 11-100% showed signs of erosion. In adults (aged between 18 and 88), prevalence data ranged between 4 and 82%. This increase of dental erosions lesions can be put in perspective with the diversification of behavioural and dietary habits in populations.

Dental erosion can be classified in different forms, regarding the etiological factors (Gandara *et al.*, 1999). Intrinsic dental erosion, which can be caused by the presence of intrinsic acids, when there is a condition of gastroesophageal reflux, gastric ulcers, bulimia, anorexia nervosa, or hernia of hiatus (Ren, 2011, Marsiglio *et al.*, 2009, Hurst *et al.*, 1997, Burke *et al.*, 1996). And extrinsic dental erosion caused by extrinsic acids, coming mainly from food, especially low pH foods and beverages (Table 1), the consumption of some medicines with low pH like aspirin (McCracken, 2000), or vitamin C for example (Giunta, 1983). In addition, the environment where the individual spends some time can also be an extrinsic factor. For example, some studies have showed that because of chemical agents in the pools water (Chlorhydric gas), swimmers are more exposed to a risk of dental erosion (Dawes *et al.*, 2008, Geurtsen, 2000).

Table 1 pH rate of common foods and drinks (adapted from Ren, 2011).

Category	pH	Category	pH
Carbonated drinks		Fruits	
Sprite	2.6	Citrus fruits	1.8 – 2.4
Coca cola / Pepsi	2.6	Apples	2.9 – 3.5
Lemon Nestea	3.0	Grapefruits	3.0 – 3.5
Fruit juices		Other food	
Grapefruit	3.2	Cranberry sauce	2.3
Orange juice	3.4	Pickles	2.5 – 3.0
Kiwi juice	3.6	Salad dressing	3.3
Ernergetic drinks		Sour cream	4.4
Isostar	2.4 – 3.8	Tomatoes	3.7 – 4.7
Red bull	3.4	Mustard	3.6
Gatorade	3.3	Yogurts	3.8 – 4.2

The oral cavity is at the crossroads of various interactions indispensable to the good function of the human body. In this sense, this environment needs to be in an optimal state of health, defined by the absence of disorders of any nature (Dox *et al.*, 1993).

In our case, it is important knowing the numerous activities taking place in the mouth to put in evidence the homeostasis system present in the oral cavity. Despite the effect of intrinsic and extrinsic acids in the mouth, there is a balance between demineralization and remineralization processes to maintain an optimal health state. If there is a disorder in this equilibrium, clinical manifestation of dental erosion can be observed (Lussi *et al.*, 2006).

Dental demineralization is caused when the oral cavity reaches a critical value of pH around 5.5 according to various studies (Hicks *et al.*, 2004).

Saliva plays an important role in the dental erosion process and its limitation. Indeed, saliva has a buffering capacity thanks to the calcium and phosphates ions present in saliva, and that can neutralize acids within minutes, when there is a sudden change of pH inside the oral cavity (Marsiglio *et al.*, 2009, Wiegand *et al.*, 2006).

Thus, it is very important to approach the diagnosis of dental erosion, knowing interactions between the risks factors on the patient side, and the risk factors on the nutrition side. As



Figure 1 Erosive tooth wear factors on the nutrition and the patient side (Lussi *et al.*, 2006, with the written permission of the authors).

illustrated on the Figure 1 (Lussi *et al.*, 2006), on the patient side, risk factors can be such as the saliva rate, gastro intestinal reflux, eating and drinking habits, or even drug use. On the nutrition side risk factors concern the type of acid, the buffering capacity, the calcium, fluoride, phosphate rates. Accordingly, to these factors, this study is going to be oriented on athletes. Due to its many benefits, the practice of sport is a common habit in our societies.

From an early age, sport can increase health, personal and mental well-being.

The practice of sport can be done at a recreational or a competitive level, depending on the objectives of everyone. To achieve their athletic goals, athletes need to have a healthy diet, rich and varied (Silva, 2015), with a high caloric intake, to cover their energetic needs, usually higher than sedentary people. Often, the use of sports drinks, protein bars and other nutritional supplements is essential. It has been proved in various studies that sports drinks are useful to prevent dehydration, to provide a lot of the nutrients lost during the physic exercise, also to increase the fluid consumption (Coombes, 2005). In the meantime, it is also known that sports drinks have usually an acid pH, because of the various acids they contain. A regular intake of energetic drinks is a risk factor that can expose to dental decay and dental erosion (Milosevic, 1997).

Studies have shown that in 13 sport drinks, 9 contained citric acid, 2 contained malic acid and 2 contained an unknown acid, with evidence of a higher potential of erosion in the drinks containing citric acid (Meurman *et al.*, 1990).

However, in the state of Ohio in United States of America, in 2001, a study has been made on a sample of 304 athletes from various sports (at the exception of swimmers), to evaluate the relationship between sport drinks and dental erosion and results have showed no evidence of relationship between the consumption of sports drinks and dental erosion (Matthew *et al.*, 2002).

Therefore, the objective of this research is to study in athletes, including competitive swimmers, the eventual relationship between dental erosion and dietary habits including the consumption of sports drinks.

II. Material and methods

This study was conducted in a sample composed by 110 athletes. The access to the participants has been done directly by contacting sports clubs. Thereafter, it has been arranged a schedule with the ones who were likely to participate in the study by applying a questionnaire to collect socio-demographical characteristics, sports drinks, medical history and oral hygiene habits. The study was approved by the Ethical Committee of University Fernando Pessoa (Oporto, Portugal). Written informed consent was obtained from all participants.

2.1. Socio-demographical characteristics

Some characteristics were evaluated: age, sex, race, sports practiced and frequency of practice per week, average duration of each training session and months of physical practice.

2.2. Sports drinks related factors:

It was asked to the participant as well the use of energy drinks the brand and the frequency of use. The age of first consumption of energy drinks, the use of energy drinks non-related with physical practice, the intake of energy drinks per week, any alteration in the frequency use in the last 6 months.

The weekly consumption of the following drinks: Coca-Cola, other sodas, fruit juice, lemonade, coffee, plain tea, lemon tea, Ice tea, red wine, green wine, beer, other alcoholic beverages.

The weekly consumption of the following aliments: citrus fruits, tomatoes, cheese, curry food, spicy food, vinegar, pickles, salad with dressing, yogurts, peppermint, bittersweet sauce, tartar sauce, acid candies

The number of meals per day and the habit of snacks and/or drinks between the meals.

2.3. Medical history and oral hygiene habits

Questions about the medical history of the participants were asked, like the existence of eating disorders, medical disorders. The medications intakes, with names and dose, if any.

The use of Iron supplements, vitamine C and multivitamins in the last 5 years

The history of the following signs and symptoms during the physical practice: chest pain, acidic taste, dry mouth, sensitive teeth, heartburn, regurgitation, vomiting, sharp teeth.

The type of diet: strict vegetarian, lacto-ovo-vegetarian, non-vegetarian, presence of unusual dietary habits.

Questions about dental hygiene like the toothbrush frequency per day, toothpaste brand, the use of tooth Whitening. Bruxism habit, orthodontic treatment.

Also, the participant were asked about the influence of oral health on the sport performance, on a scale from 0 to 5 and if they already or not had information about influence of oral care on athletic performance.

Also, an oral examination for evaluating dental erosion of each participant has been performed in the same condition for all participants using: chirurgical gloves, masks, frontal lighting, an exploration kit composed by a mirror nº4 and a probe.

Prior to this, all participants have been carefully informed about the purpose of this study, that has been performed according to good clinical practices.

The BEWE index (Basic Erosive Wear Examination) has been used in this study to evaluate the presence or absence of erosion lesions on the participants during the oral examination. It is an index that has been created to offer a simple, reproducible and transferable scoring system of dental erosion status of the patient, in the clinical practice, and to help dentists in the diagnostic and treatment of dental erosion (Barlett *et al.*, 2008).

It consists in dividing the teeth in sextant, excluding the 3rd molars, and to register for each sextant the highest loss of hard tissue, examining each teeth of the sextant. Only the highest score of erosion is registered for the sextant.

Table 2 BEWE index registration table

BEWE INDEX		
Sextant 1	Sextant 2	Sextant 3
Sextant 6	Sextant 5	Sextant 4
TOTAL =		

The scoring is proceeded according to the following punctuation criteria:

0 = no erosion

1 = Initial texture loss of the superficie of the tooth

2 = Distinct erosion, loss of hard tissue less than 50% of the superficie

3 = Loss of hard tissue superior than 50% of the superficie

After completing the examination of each sextant, scores were added together and results are interpreted according to the following:

- BEWE score ≤ 2 = No risk of erosion
- BEWE score from 3—8 = low risk of erosion
- BEWE score from 9—13 = medium risk of erosion
- BEWE score ≥ 14 = High risk of erosion

In the statistical analysis, having dental erosion was registered as having at least code 1 BEWE in at least one sextant. Prevalence of ETW was calculated dividing the number of individuals with the previous condition by the total number of participants.

2.4. Statistical analysis

All statistical analysis was done using IBM® SPSS® statistics, version 23.0, considering a significance level of 0.05 for all statistic inference situations.

The description of continuous variable was performed using the average and standard deviation, while categorical variables were described using counts and percentages.

The identification of the univariate risk factors associated with the presence of ETW was measured using the odds ratio (OR). After that, to explore more results in details,

a multivariate logistic analysis was conducted with the potential risk factors identified previously in association with ETW, in relation with the BEWE index score “at least low risk”, using a backward Wald stepwise method ($p=0.05$ for variable inclusion and $p=0.20$ for variable exclusion). The quality of the model was assessed using the AUC values.

III. Results

This study was conducted on a sample of 110 athletes (55 swimmers, 44 bodybuilders, 5 Footballers, 1 boxer, 2 volleyball players, 3 runners). Of the 110 participants 50.9 % of the participants were male and 49.1 % females. The average age was 27.9 ± 12.0 years (range from 13 to 62); 73.6 % of the participants were Caucasian, 10.9 % Hispanic, 6.4 % African and 9.1 % from other races. The weekly frequency of sport practice was in average 4.2 ± 1.2 times per week, with a training duration of 60-90 minutes for 38.2 %, and 70 % of the participants have been practicing sport for more than 24 months (Table 3).

Considering the type of sport (swimmers or other athletes) and the use or non-use of sports drinks, 4 groups of athletes have been constituted. The first group is composed by 24 swimmers who consume sports drinks (21.8 %), the second group contains 31 swimmers who don't consume energetic drinks (28.2 %), the third group is composed of 16 athletes (at the exception

of swimmers) who consume energetic drinks (14.5 %), and the fourth group is composed by 39 athletes (at the exception of swimmers) who don't consume energetic drinks (35.5 %).

Regarding to the sports drinks consumption, 39 of the participants (35.5 %) consumed sports drinks, with 22 of them consuming at least once a week (20%), 13 using sports drinks during each training (11.8%) and 18 of the sports drinks users (16.4 %) admitted a consumption non-related to their sport activities. The average age debut of sports drinks consumption was of 21.2 ± 11.20 years, with a mean of 7.2 ± 5.3 years of on-going consumption (Table 3).

Almost all athletes (95.5%) had a non-vegetarian diet; 68.2 % had a number of daily meals >3 , 26.4 % had a maximum of three meals daily, and 5.5% had only two meals per day. When asked about the consumption of snacks and/or drinks between the meals, 81.8 % of the participants answered positively (Table 3).

In relation with general health status, none had eating or health disorders, or a prescript medication intake that could have influenced the study results. Over the last 5 years, 54.5 % of the participants admitted to consume multivitamin supplements, 44.5 % have taken vitamin C, and only 17.3 % have taken iron supplements. The results have showed that during the practice of their physical activity, 47.3 % of the participants referred to have dry mouth, 22.7 % already experienced heartburn, 20 % have had sensitive teeth, while 18 % admitted to have acidic taste, and 15.5 % have already been subject to regurgitation (Table 4).

Concerning oral health, 52.7 % of the participants had tooth brushed two times daily, 31.8 % tooth brushed three times daily, 10 % tooth brushed more than 3 times daily, and 5.5 % tooth brushed only one time daily. Colgate® toothpaste was used by 60.9 % of the participants; 32.7% have already had already used a professional or domestic tooth whitening; 36.4 % have had an orthodontic treatment and 20 % referred bruxism history (Table 4).

Amongst the 110 participants, 83.6 % presented at least one erosion lesion (independent of the severity). In relation with the BEWE index scoring, a total 48 athletes (43.6%) presented no risk of erosion (BEWE score ≤ 2), 54 (49.1%) had a low risk of erosion (BEWE score 3-8), 7 (6.4%) presented a medium risk of erosion (BEWE score 9-13), and only 1 athlete (0.9%) had a high risk of erosion (BEWE score ≥ 14). The sextants 2 and 5 were amongst the more subject to the ETW presence with respectively 69.1% and 59.1% (Table 4).

According to the multivariate logistic analysis (Table 5), when considered a BEWE score of "at least low risk", the following elements have been identified as significant risk factors of dental erosion: red wine (OR = 1.6; $p=0.048$), citrus fruit (OR = 1.3; $p= 0.047$), frequency of tooth brushing (OR = 2.3; $p= 0.018$), swimmers who consume sports drinks (OR = 15.2; $p< 0.001$), and athletes who consume energetic drinks (OR = 6.3; $p= 0.003$).

On another hand, it was identified as protective erosive wear factor, with an increase of 36 %, the consumption of spicy food (OR = 0.64; p= 0.024).

Regarding the risk of dental erosion, swimmers who consumed energetic drinks represented the group with the highest risk, followed by the athletes (except swimmers) who consume energetic drinks; the group of athletes (except swimmers) who don't use energetic drinks has been considered as the control group.

When asked about the influence of oral health on sport practice, from all the participants, 14.5 % said there was no influence or it was very low, 19.1 % reported low influence, 28.2 % for moderate influence and 11.8 % considered that oral health influences a lot and has an essential influence

Only 26.4 % have already had information about oral health and sport, and 76.4% admitted the need for a better information about oral health and sport practice.

Table 3. Socio-demographic characteristics, training and sports drinks use of participants (n=110).

Variable	Category	Statistics	Values
Gender	Male	n (%)	56 (50.9%)
	Female	n (%)	54 (49.1%)
Age		Mean ± sd	27.92 ± 11.96
		Min–Max	13–62
Race	African	n (%)	7 (6.4%)
	Asian	n (%)	0 (0%)
	Caucasian	n (%)	81 (73.6%)
	Hispanic	n (%)	12 (10.9%)
	Other	n (%)	10 (9.1%)
Sport practice	Swimmer who consume energetic drinks	n (%)	24 (21.8%)
	Swimmer who don't consume energetic drinks	n (%)	31 (28.2%)
	Athlete (except swimmer) who consume energetic drinks	n (%)	16 (14.5%)
	Athlete (except swimmer) who don't consume energetic drinks	n (%)	39 (35.5%)
Frequency of sport practice per week		Mean ± sd	4.2 ± 1.21
		Min–Max	2–7
Duration of training	0-60 minutes	n (%)	23 (20.9%)
	60-90 minutes	n (%)	42 (38.2%)
	90-120 minutes	n (%)	24 (21.8%)
	>120 minutes	n (%)	21 (19.1%)

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Variable	Category	Statistics	Values
Months of practice	Less than 12 months	n (%)	24 (21.8%)
	Less than 24 months	n (%)	9 (8.2%)
	>24 months	n (%)	77 (70%)
Years of swimming practice		Mean ± sd	5.1 ± 8.49
		Min–Max	1–40
Use of energy drinks	yes	n (%)	39 (35.5%)
	no	n (%)	71 (64.5%)
Brand of energy drinks	Red Bull	n (%)	12 (10.9%)
	PowerAde	n (%)	4 (3.6%)
	Gatorade	n (%)	3 (2.7%)
	Monster	n (%)	2 (1.8%)
	Isostar	n (%)	4 (3.6%)
	Gold Nutrition	n (%)	8 (7.3%)
	Other	n (%)	6 (5.5%)
Age of start of using energetic drinks		Mean ± sd	21.2 ± 11.20
		Min–Max	10–52
Period of use of energetic drinks		Mean ± sd	7.2 ± 5.3
		Min–Max	1–25
Domestic use	yes	n (%)	18 (16.4%)
	no	n (%)	92 (83.6%)
Frequency of use of energetic drinks	At least once a day	n (%)	4 (3.6%)
	At least once a week	n (%)	22 (20%)
	During each training	n (%)	13 (11.8%)
	No use	n (%)	71 (64.5%)
Frequency of use change < 6 months	yes	n (%)	13 (11.8%)
	no	n (%)	97 (88.2%)
Numbers of daily meals	2	n (%)	6 (5.5%)
	3	n (%)	29 (26.4%)
	>3	n (%)	75 (68.2%)
Snacks/drinks between meals	Yes	n (%)	90 (81.8%)
Iron supplements <5years	Yes	n (%)	19 (17.3%)
Vitamin C supplements <5Years	Yes	n (%)	49 (44.5%)
Multivitamin supplements <5 years	Yes	n (%)	60 (54.5%)

Table 4. Oral health and erosive tooth wear status of the participants (n=110).

Variable	Category	Statistics	Values
Chest pain	Yes	n (%)	14 (12.7%)
Acidic taste	Yes	n (%)	18 (16.4%)
Dry Mouth	Yes	n (%)	52 (47.3%)
Sensitive teeth	Yes	n (%)	22 (20%)
Heartburn	Yes	n (%)	25 (22.7%)
Regurgitation	Yes	n (%)	17 (15.5%)
Vomiting	Yes	n (%)	13 (11.8%)
Sharp teeth	Yes	n (%)	9 (8.2%)
Strict Vegetarian	Yes	n (%)	1 (0.9%)
Lacto-ovo-Vegetarian	Yes	n (%)	3 (2.7%)
Non-vegetarian	Yes	n (%)	105 (95.5%)
Frequency of daily tooth brushing	0	n (%)	0 (0%)
	1	n (%)	6 (5.5%)
	2	n (%)	58 (52.7%)
	3	n (%)	35 (31.8%)
	>3	n (%)	11 (10%)
Toothpaste brand	Signal	n (%)	2 (1.8%)
	Oral B	n (%)	14 (12.7%)
	Colgate	n (%)	67 (60.9%)
	Sensodyne	n (%)	12 (10.9%)
	Arthrodont	n (%)	1 (0.9%)
	Email diamant	n (%)	1 (0.9%)
	Aquafresh	n (%)	3 (2.7%)
Tooth whitening	Professional	n (%)	14 (12.7%)
	Domestic	n (%)	22 (20%)
	No	n (%)	74 (67.3%)
Bruxism	Yes	n (%)	22 (20%)
Orthodontic treatment	Yes	n (%)	40 (36.4%)
Influence of oral health on sport practice	No influence	n (%)	16 (14.5%)
	Very low influence	n (%)	16 (14.5%)
	Low influence	n (%)	21 (19.1%)
	Moderate influence	n (%)	31 (28.2%)
	Influence a lot	n (%)	13 (11.8%)
	Essential influence	n (%)	13 (11.8%)
Information about oral health and sport	Yes	n (%)	29 (26.4%)
	No	n (%)	81 (73.6%)

Variable	Category	Statistics	Values
Need a better information about oral health and sport	Yes	n (%)	84 (76.4%)
	No	n (%)	26 (23.6%)
ETW 1 sextant		n (%)	36 (32.7%)
ETW 2 sextant		n (%)	76 (69.1%)
ETW 3 sextant		n (%)	45 (40.8%)
ETW 4 sextant		n (%)	35 (31.8%)
ETW 5 sextant		n (%)	65 (59.1%)
ETW 6 sextant		n (%)	45 (40.8%)
BEWE	No risk ≤ 2	n (%)	48 (43.6%)
	Low risk 3–8	n (%)	54 (49.1%)
	Medium risk 9–13	n (%)	7 (6.4%)
	High risk ≥ 14	n (%)	1 (0.9%)
Erosion	Yes	n (%)	92 (83.6 %)
	No	n (%)	18 (16.4 %)

Table 5 Risk factors of "at least low risk" of dental erosion (using BEWE score) for univariate and multivariate logistic analysis

Groups	Category	Univariate analysis		Multivariate analysis	
		<i>p</i>	OR (95 % CI)	<i>p</i>	OR (95 % CI)
I) Socio-demographic characteristics					
	Age	0.058	1.034 (0.999-1.071)		
	Sex	0.172	1.700 (0.794-3.639)		
	Race:				
	African	0.270	0.321 (0.043-2.417)		
	Caucasian	0.353	0.510 (0.123-2.111)		
	Hispanic	0.867	0.857 (0.141-5.228)		
II) Drink consumption					
	Energy drinks	0.006	3.339 (1.418-7.866)		
	Cola	0.774	1.040 (0.797-1.355)		
	Other sodas	0.218	1.324 (0.883-1.724)		
	Fruit juice	0.555	1.053 (0.088-1.247)		
	Lemonade	0.737	0.955 (0.728-1.252)		
	Coffee	0.051	1.129 (0.999-1.276)		
	Plain tea	0.792	0.976 (0.816-1.168)		
	Lemon tea	0.808	1.038 (0.770-1.399)		
	Ice tea	0.450	0.922 (0.747-1.138)		
	Red wine	0.113	1.283 (0.943-1.746)	0.048	1.607 (1.005-2.571)
	Green wine	0.778	1.084 (0.621-1.891)		
	Beer	0.344	1.120 (0.886-1.416)		
	Other alcoholic drinks	0.511	0.905 (0.672-1.219)		

Relationship between dental erosions, food and beverages consumption in athletes

Groups	Category	Univariate analysis		Multivariate analysis	
		<i>p</i>	OR (95 % CI)	<i>p</i>	OR (95 % CI)
III) Food consumption					
	Citrus	0.060	1.208 (0.992-1.471)	0.047	1.285 (1.003-1.646)
	Tomatoes	0.748	1.030 (0.859-1.236)		
	Cheese	0.444	1.078 (0.890-1.305)		
	Curry food	0.625	0.926 (0.679-1.261)		
	Spicy food	0.067	0.792 (0.618-1.016)	0.024	0.637 (0.431-0.942)
	Vinegar	0.958	1.005 (0.831-1.215)		
	Pickles	0.882	1.025 (0.740-1.419)		
	Salad with dressing	0.843	1.015 (0.872-1.182)		
	Yogurts	0.545	0.952 (0.810-1.117)		
	Peppermint	0.379	0.885 (0.673-1.163)		
	Sweet and sour sauce	0.621	1.099 (0.756-1.596)		
	Tartar sauce	0.716	0.862 (0.388-1.916)		
	Sour candy	0.674	1.077 (0.762-1.524)		
IV) Dietary habits					
	Number of daily meals	0.490	1.254 (0.660-2.381)		
	Snacks/drinks between meals	0.108	2.250 (0.837-6.049)		
	Non-vegetarian	0.131	5.545 (0.599-51.332)		
V) Sport environment					
	Sport practice:				
	Athletes who don't consume energetic drinks	<0.001	1.000	0.001	1.000
	Swimmers who consume energetic drinks	<0.001	12.727 (3.538-45.784)	<0.001	15.19 (3.564-64.742)
	Athletes who consume energetic drinks	0.001	6.222 (2.193-17.657)	0.003	6.279 (1.901-20.744)
	Swimmers who don't consume energetic drinks	0.055	3.273 (0.977-10.966)	0.123	3.134 (0.733-13.391)
	Frequency of sport practice	0.418	1.139 (0.832-1.559)		
	Duration of training	0.370	1.186 (0.817-1.724)		
	Months of physical practice	0.006	1.948 (1.208-3.141)		
	Years of swimming practice	0.071	1.051 (0.996-1.110)		
VI) Health condition during sport practice					
	Chest pain	0.950	1.037 (0.334-3.219)		
	Acidic taste	0.339	1.680 (0.581-4.861)		
	Dry mouth	0.790	1.108 (0.521-2.358)		
	Sensitive teeth	0.773	1.150 (0.445-2.968)		
	Heartburn	0.186	1.889 (0.736-4.846)		
	Regurgitation	0.205	2.064 (0.673-6.326)		
	Vomiting	0.432	0.628 (0.196-2.007)		
	Sharp teeth	0.519	1.607 (0.381-6.786)		

Groups	Category	Univariate analysis		Multivariate analysis	
		<i>p</i>	OR (95 % CI)	<i>p</i>	OR (95 % CI)
VII) Vitamin supplement < 5 years					
	Iron supplement	0.102	2.508 (0.834-7.542)		
	Vitamin C	0.358	1.431 (0.667-3.070)		
	Multivitamins	0.752	0.885 (0.415-1.888)		
VIII) Oral health					
	Frequency of tooth brushing	0.066	1.650 (0.968-2.815)	0.018	2.283 (1.152-4.522)
	Orthodontic treatment	0.169	1.754 (0.787-3.908)	0.057	2.725 (0.971-7.646)
	Bruxism condition	0.848	0.912 (0.357-2.333)		
	Tooth whitening	0.869	0.962 (0.603-1.533)		
	Constant (multivariate model)			0.001	0.026
AUC= 0.837 (0.763-0.911); Percentage of correctly predicted “at least low risk of dental erosion” is 72.7%.					
Variables included in the first step of the model: Age, Sex, Energy Drinks, Coffee, Red wine, Citrus fruits, Spicy food, Snack drinks between meals, Sport Practice, Months of practice, Years of swimming practice, Iron supplement, Frequency of tooth brushing, Orthodontic treatment.					

IV. Discussion

The sample used for this study was composed by 110 participants, which is acceptable for the representation of the targeted population and the identification of possible risk factors. This survey had 55 swimmers and 55 athletes (except swimmers). However, a higher number of participants would have been more interesting to analyse and to get more precise results. The population targeted was an actual limitation to the study, because it was constraining to arrange an acceptable schedule for all participants, also to proceed to the interview and the oral examination was a bit difficult on the training time of the athletes, particularly for swimmers. But of all the participants included on this survey, all were very cooperative and enthusiastic. The questionnaire used was structured in a way to obtain a maximum of useful information, and to cross a lot of data to see if there was any relationship between dietary habits and the consumption of sports drinks in relation with dental erosion in athletes. However, questions regarding the way of absorption of the sports drinks (sipping or with a straw by example), the use of mouth rinses, and the use of fluoride would have been interesting to include, for inquiry purposes on this sample of athletes, as many studies have put them in relationship with dental erosion (Lussi *et al.*, 2006, Pretty *et al.*, 2003, Pontefact *et al.*, 2001, Nobre-dos-Santos *et al.*, 2007).

In our study, red wine has been identified as a risk factor for erosive wear lesions. This is in accordance with results of previous studies. Due to its low pH, a frequent intake of alcoholic

drinks such as red wine can expose the oral cavity to higher quantities of acids, and increase the risk of ETW (Ferguson *et al.*, 1996, Manarte *et al.*, 2009, Teixeira *et al.*, 2016).

Results have also showed a risk factor for dental erosion in the consumption of citrus fruit. It can be explained by the fact that the pH of citrus fruit is between 1.8 and 2.4 (table 1), which is under the critical pH value of 5.5 where demineralization occurs. Therefore, a frequent intake of citrus fruit can increase that risk, and the occurrence of gastrointestinal reflux (Sirimaharaj *et al.*, 2002). This finding is in accordance with other studies that have come to the same conclusion regarding citrus fruit.

The dental erosion risk associated with tooth brushing found in this study can be explained by the fact that mechanic action of tooth brushing removes the dental plaque and exposes the enamel surface, disturb the saliva composition and its buffering capacity (Lantheaume, 2015).

If an acid is introduced in the oral cavity right after tooth brushing or before the saliva is at full potential of buffering capacity, it will increase the risk of erosive lesions. This kind of situation can occur by example when an athlete takes a pre-workout snack, brush his teeth and during the workout hydrate himself with a low pH sports drink. Thus, a study conducted by Wiegand *et al.* (2008) suggested in order of minimizing erosive tooth wear, to proceed to tooth brushing prior than after an acidic episode.

Regarding to the presented results, it has been showed a relationship between the ETW status of the participants, registered using the BEWE index, with the sport practice. The higher risk relationship with ETW has been found in the group of swimmers who consume energetic drinks with an OR of 15.2 followed by the group of athletes who consume energetic drink with an OR of 6.3. This can be explained by the double exposure to acid that the swimmers who consume energetic drinks suffers. The exposure to acids from the pools (chlorhydric-gas) and the acids from the low pH beverages.

Although other studies didn't found an association between ETW and energetic drinks consumption, like the study done by Milosevic *et al.*, in 1997, on a sample of 45 competitive swimmers and cyclists, even if the prevalence of erosion lesions was of 100%.

This result from our study is in accordance with results from other studies done in the past (Centerwall *et al.*, 1986, Matthew *et al.*, 2002). The non-unanimous finding of association between energetic drinks and ETW might point that the criteria of evaluation in the studies completed weren't precisely specific to the consumption of energetic drinks, as part of the general diet, some other elements of food can influence results regarding the association (Coombes *et al.*, 2005).

Surprisingly, spicy food has been identified as a protective factor against ETW, with an increase of 36%. This came out as an unexpected result, since it is known that spicy food should be avoided by patients who suffer from gastrointestinal reflux, a disease that can lead to intrinsic erosion. Even if no proper study has identified spicy food as protective factor against ETW, a possible explanation can be that sources of spicy food can come from vegetable such as capsicum (red bell pepper), which contains important amount of vitamin A, known to be good for bones and teeth, also for the gums health (Saini, 2011).

Regarding to the ETW analysis using the BEWE index, it would have been interesting to use other ETW indices for more results comparison purposes on the repartition of the erosion lesions. As we know there are several ETW indices to help fulfil the needs of dental professionals (Bradsley, 2008).

In this study, 76.4% admitted to need better information about oral health and sport practice. This result point out the lack of information of athletes about oral health and the impact it can have on sport, and is in accordance with the conclusion of the study done by Needleman *et al.* (2012) on high level athletes participating in the London 2012 Olympic Games, which pointed out the urgent need of preventive and promotion action in the competitive athlete population.

V. Conclusion

In this study the following factors have been identified as a risk in relationship with erosive tooth wear: red wine and citrus fruit consumption, frequency of toothbrush, sport practice: swimmers and other athletes who consume energetic drinks, with the higher risk for swimmers who consume sports drinks.

It has been seen that dental erosion is constantly increasing in populations, and often there is a lack of information about this condition. In this way, dentists must know how to do a correct diagnosis of this type of lesions and provide a correct prevention and treatment if needed.

This study has been structured and conducted for a targeted population: athletes. Therefore, results must not be extrapolated to populations with other characteristics. More studies should be done in this population of athletes for more specific identification of ETW risk factors, using different and more specific ETW indexes.

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VI. Annexes

- 1 Parecer da comissão ética da Universidade Fernando Pessoa.
- 2 Authorisation to use the figure 1.
- 3 Authorisation to use the questionnaire
- 4 Informed consent under 18 years old
- 5 Informed consent above 18 years old
- 6 Questionnaire about the risk factors for dental erosion used in the study

Annex 1



Universidade Fernando Pessoa
www.ufp.pt

Exmo. Senhor
Prof. Doutor Luís Martins
Director da FCS

Porto, 13 de Janeiro de 2017

Exmo. Senhor Prof. Doutor,

A Comissão de Ética, depois de apreciado o projeto de investigação de Mohamed-Amine, intitulado "O consumo alimentar e de bebidas energéticas e a erosão dentária em participantes de exercício físico", considera nada haver a opor à realização deste estudo.

Com os melhores cumprimentos.

A Vice-Presidente da
Comissão de Ética da UFP


Susana Teixeira



Fundação Ensino e Cultura "Fernando Pessoa"

MIPC 542 257 602 - Reg. Comercial n.º 26 Conservatória do Registo Comercial de Porto

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Annex 2

AW: Authorization to use a figure

A

adrian.lussi@zmk.unibe.ch

Hier, 13:45

Vous



Répondre |

Dear Amine
No Problem
Best regards

Prof. Dr.med dent Adrian Lussi; dipl. Chem.Ing. ETHZ

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Chairman
Department of Preventive, Restorative and Pediatric Dentistry
University of Bern
Freiburgstrasse 7
CH-3010 Bern

Von: amine chetti <aminechetti@hotmail.fr>

Gesendet: Dienstag, 4. Juli 2017 13:43:41

An: Lussi, Adrian (ZMK)

Betreff: Authorization to use a figure

Good afternoon Dr Lussi,

I am doing a thesis about dental erosion and i would like to use a figure (that im going to attach in this mail) , about the interactions of the differents factors for the development of erosive tooth wear.

I would like to have your permission to use this figure inside my thesis.

Thank you in advance for your answer,

Best regards,

Amine CHETTI.

Annex 3



Mohamed-Amine Chetti <30664@ufp.edu.pt>

Dental use: Permission to use the questionnaire mentioned in an article.

4 messages

Mohamed-Amine Chetti <30664@ufp.edu.pt>

14 décembre 2016 à 16:04

À : mathew.15@osu.edu

Hello,

I am a final year dental dental student, and i am doing a study about dental erosion , sport drinks and swimmers.

I found your article

"Relationship between SportsDrinks and Dental Erosion in 304 University Athletes in Columbus, Ohio, USA"

very helpful for my study and i would like to have the permission to use the questionnaire mentioned in your study ?

In waiting of your answer,

Best Regards

Amine CHETTI .

This is the questionnaire in question:

Table 1. Questionnaire factors tested for relationship with dental erosion

- 1 Age
- 2 Sex
- 3 Race
- 4 Sports team (competitive)
- 5 Sports team (noncompetitive)
- 6 Number of months of sports activity 7 Sports drink-related factors:
Usage or not, sports drink brand name in order of frequency of use, age of onset of sports drink use, nonsport-related/home use of sports drink, frequency and quantity of intake of sports drink, change in frequency or quantity of intake in last 6 months
- 8 Use and frequency of intake of following drinks:
Cola drinks, other soft drinks, fruit juices, lemonade, coffee, plain tea, lemon tea, wine, beer, other alcoholic drinks and apple cider
- 9 Use and frequency of intake of following food items:
Citrus fruits, tomatoes, hard cheese, curried foods, spicy foods, vinegar, pickles, salad with dressing, yogurt, peppermint, sweet and sour sauce, tartar sauce and sour candy
- 10 Number of meals per day
- 11 Snacking/drinking between meals
- 12 Eating disorders
- 13 Medical disorders/health problems
- 14 Medications with names and dosage, if any
- 15 Iron supplement use in the last 5 years
- 16 Vitamin C use in the last 5 years
- 17 Multivitamins use in the last 5 years
- 18 History and frequency of following signs and symptoms:
Chest pain, acidic taste, dry mouth, sensitive teeth, heartburn,

regurgitation, vomiting and sharp teeth 19 Type of diet:

Strict vegetarian, lacto-ovo-vegetarian, nonvegetarian

20 Unusual dietary preferences or habits

21 Indoor swimming, history and frequency

22 Tooth brushing frequency, toothpaste brand

23 Professional or home tooth whitening system

24 History, frequency, age of onset and cessation of clenching and

grinding habit

25 Orthodontic treatment, history, onset and duration

Mathew, Tanya <mathew.15@osu.edu>
À : Mohamed-Amine Chetti <30664@ufp.edu.pt>
Cc : "Casamassimo, Paul" <casamassimo.1@osu.edu>

15 décembre 2016 à 20:53

Hello Amine Chetti!

Yes, I'm happy to share this questionnaire with you! I'd love to know more about your study too. You are in Portugal, correct?

Thanks,

Dr. Tanya Mathew

From: Mohamed-Amine Chetti [30664@ufp.edu.pt]
Sent: Wednesday, December 14, 2016 10:04 AM
To: Mathew, Tanya
Subject: Dental use: Permission to use the questionnaire mentioned in an article.

[Texte des messages précédents masqué]

Mohamed-Amine Chetti <30664@ufp.edu.pt>
À : "Mathew, Tanya" <mathew.15@osu.edu>

16 décembre 2016 à 23:50

hello Doctor Mathew,
thank you very much, i am very happy that you give me the permission to use it, it will be very helpful to structure my study.
basically to sum it up, im going to try to evaluate the dental erosion in competitive swimmers who consume sports drinks. the objective is to see what causes more erosion sport drinks or gas chlorinated water of the pools.
if you want, when it will be more structured i can tell you more about it.
And yes i am in portugal, in porto :)
again thank you very much !
Amine CHETTI.

[Texte des messages précédents masqué]

Mathew, Tanya <mathew.15@osu.edu>

17 décembre 2016 à 19:19

À : Mohamed-Amine Chetti <30664@ufp.edu.pt>

Excellent!

Best wishes on your project,
Dr. Mathew

From: Mohamed-Amine Chetti [30664@ufp.edu.pt]

Sent: Friday, December 16, 2016 5:50 PM

To: Mathew, Tanya

Subject: Re: Dental use: Permission to use the questionnaire mentioned in an article.

[Texte des messages précédents masqué]

Annex 4

DECLARAÇÃO DE CONSENTIMENTO INFORMADO

Designação do Estudo (em português):

O consumo alimentar e de bebidas energéticas e a erosão dentaria em praticantes de exercício físico.

Eu, abaixo-assinado (nome completo) -----

-----,

responsável pelo participante no projecto (nome completo) -----

-----, compreendi a explicação que me foi fornecida acerca da sua participação na investigação que se tenciona realizar, bem como do estudo em que será incluído. Foi-me dada oportunidade de fazer as perguntas que julguei necessárias, e de todas obtive resposta satisfatória.

Tomei conhecimento de que a informação ou explicação que me foi prestada versou os objectivos e os métodos. Além disso, foi-me afirmado que tenho o direito de recusar a todo o tempo a sua participação no estudo, sem que isso possa ter como efeito qualquer prejuízo pessoal.

Foi-me ainda assegurado que os registos em suporte papel e/ou digital (sonoro e de imagem) serão confidenciais e utilizados única e exclusivamente para o estudo em causa, sendo guardados em local seguro durante a pesquisa e destruídos após a sua conclusão.

Por isso, consinto em participar no estudo em causa.

Data: ____/____/20__

Assinatura do Responsável pelo participante no projecto: _____

O Investigador responsável:

Nome: Amine CHETTI

Assinatura:

Annex 5

DECLARAÇÃO DE CONSENTIMENTO INFORMADO

Designação do Estudo (em português):

O consumo alimentar e de bebidas energéticas e a erosão dentária em praticantes de exercício físico.

Eu, abaixo-assinado, (nome completo do participante no estudo) -----

-----, compreendi a explicação que me foi fornecida acerca da participação na investigação que se tenciona realizar, bem como do estudo em que serei incluído. Foi-me dada oportunidade de fazer as perguntas que julguei necessárias, e de todas obtive resposta satisfatória.

Tomei conhecimento de que a informação ou explicação que me foi prestada versou os objectivos e os métodos. Além disso, foi-me afirmado que tenho o direito de recusar a todo o tempo a minha participação no estudo, sem que isso possa ter como efeito qualquer prejuízo pessoal.

Foi-me ainda assegurado que os registos em suporte papel e/ou digital (sonoro e de imagem) serão confidenciais e utilizados única e exclusivamente para o estudo em causa, sendo guardados em local seguro durante a pesquisa e destruídos após a sua conclusão.

Por isso, consinto em participar no estudo em causa.

Data: ____/____/20__

Assinatura do participante no projecto: _____

O Investigador responsável:

Nome: Amine CHETTI

Assinatura:

Annex 6

Questionário : Fatores testados em relação com a erosão dentária

Este questionário faz parte de um inquerito para o estudo denominado " O consumo alimentar e de bebidas energeticas e a erosão dentaria em praticantes de exercicio fisico" do senhor Amine Chetti, para a elaboraçao de uma tèse, para obtenção do mestrado de medicina dentaria , na universidade Fernando Pessoa, Porto.

Question 1

Idade:

Question 2

Sexo:

un seul choix possible

- Masculino
 Feminino

Question 3

Raça:

un seul choix possible

- Africano
 Asiatico
 Caucasiano
 Hispanico
 Outro

Question 4

Nome do desporto principal e frequencia da pratica fisica por semana ?

Sélectionner un choix

0 1 2 3 4 5 6 7

Commentaires

Question 5

Duração, em média, da actividade fisica?

un seul choix possible

- 0-60 minutos
 60-90 minutos
 90-120 minutos
 mais de 120 minutos

Question 6

Número de meses de actividade desportiva:

un seul choix possible

- Menos de 12 meses
 Menos de 24 meses
 Mais de 24 meses

Fatores relacionados as bebida energéticas:

Question 7

Utilização de bebidas energéticas?

un seul choix possible

- Sim
 Não

Question 8

Marca de bebida energética (por ordem de frequência de utilização):

Question 9

Idade de início do consumo de bebidas energéticas:

Question 10

Consumo de bebida energética não relacionada com o desporto; uso doméstico?

un seul choix possible

- Sim
 Não

Question 11

Frequência e quantidade de ingestão de bebida energética:

un seul choix possible

- Ao mínimo 1 vez por dia
 Durante cada exercício físico
 Ao mínimo uma vez por semana
 Não uso

Commentaires

Question 12

Alteração da frequência ou quantidade de ingestão nos últimos 6 meses?

un seul choix possible

- Sim
 Não

Question 13

Utilização e frequência (por semana) de ingestão das seguintes bebidas:

Sélectionner un choix par ligne

	0	1	2	3	4	5	6	7
Cola	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Outros sodas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sumos de fruta	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Limonada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Café	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cha simples	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cha de limao	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ice tea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vinho vermelho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vinho verde	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cerveja	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Outras bebidas alcoólicas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

red bull:
powerade:
garotade:

Question 14

Utilização e frequência de ingestão dos seguintes alimentos (por semana) :

Sélectionner un choix par ligne

	0	1	2	3	4	5	6	7
Citrinos	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tomates	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Queijo duro	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alimentos com curry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alimentos picantes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vinagre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Picles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Salada com molho	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
logurte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Peppermint	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Molho doce e azedo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Molho tartar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Doces azedo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Commentaires	<input type="text"/>							

Question 15

Número de refeições por dia:

un seul choix possible

2
 3
 Mais de 3

Question 16

Snacking / beber entre as refeições ?

un seul choix possible

Sim
 Não

Question 17

Transtornos alimentares ? (se sim, por favor indique qual)

un seul choix possible

- Sim
- Não

Commentaires

Question 18

Transtornos médicos / Problemas de saúde ? (se sim, por favor indique qual)

un seul choix possible

- Sim
- Não

Commentaires

Question 19

Medicamentos com nomes e dosagem, se houver:

Question 20

Uso de suplementos de ferro nos últimos 5 anos?

un seul choix possible

- Sim
- Não

Question 21

Utilização de vitamina C nos últimos 5 anos?

un seul choix possible

- Sim
- Não

Question 22

Uso de multivitaminas nos últimos 5 anos?

un seul choix possible

- Sim
- Não

Question 23

História e frequência dos seguintes sinais e sintomas durante a prática da sua actividade física:

plusieurs choix possibles

- Dor torácica
- Gosto ácido
- Boca seca
- Dentes sensíveis
- Azia
- Regurgitação
- Vômitos
- Dentes afiados

Commentaires

Question 24

Tipo de dieta:

un seul choix possible

- Vegetariano estrito
- Lacto-ovo-vegetariano
- Não vegetariano
- Outros

Question 25

Preferências ou hábitos dietéticos incomuns?

Question 26

Natação em Piscina interior:

plusieurs choix possibles

- Desde quanto tempo ?
- Durante quanto tempo ?

Commentaires

Question 27

Frequência de escovagem dos dentes por dia ?

un seul choix possible

- O vez
- 1 vez
- 2 vezes
- 3 vezes
- Mais de 3 vezes

Question 28

Marca da pasta dentífrica?

Question 29

Sistema de branqueamento dental :

un seul choix possible

- Profissional
- Doméstico
- Nenhum

Question 30

Hábito de bruxismo ?

plusieurs choix possibles

- Sim
- Não
- Idade de início
- Idade de cessação

Commentaires

Question 31

Tratamento ortodôntico?

un seul choix possible

- Sim
- Não
- Idade de início
- Duração

Commentaires

Question 32

Numa escala de 0 a 5, como achas que a sua saúde oral influencia o seu desempenho atlético?

- 0 *nao influencia*
- 1 *muito pouco*
- 2 *pouco*
- 3 *influencia normal*
- 4 *influencia muito*
- 5 *influencia essencial*

Sélectionner un choix

- 0 1 2 3 4 5
-

Question 33

Voce já foi informado da importância de uma boa saúde oral no seu rendimento atlético ?

un seul choix possible

- sim
- nao
- se nao, voce gostaria de ser melhor informado a esse nível?
- sim
- nao

Muito Obrigado pela sua participação e disponibilidade !!!