

Assessing the Level of Knowledge and Attitudes of Young People About Nutrition and Oral Health

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Abstract. *Introduction:* Oral health considered to be an important component of general health that directly influences the quality of life. The purpose of this study was to assess the level of knowledge and attitudes regarding the interrelationship between diet and oral health, the testable hypothesis being that there are differences between the level of knowledge of food hygiene in the study group. *Material and method:* The study included 718 Romanian subjects, aged between 12-18 years old, randomly selected. The data was selected by the questionnaire method and collected using a link and were introduced into a database using SPSS 26.00 for Windows. There were 16 questions applied regarding the knowledge and attitudes on diet. *Results:* About 20% of the subjects do not know that there is a link between food and oral diseases, $p \leq 0.05$ and about a third do not know the connection between the consumption and frequency of consumption of carbonated drinks and the pathology of the oral cavity. Smoking is considered a harmful activity for the oral cavity by 79.1% (568) of the subjects, alcohol by 52.1% (374) and drugs by 49.7% (357) with $p \leq 0.05$. *Conclusion:* There are differences between the level of knowledge about diet in the studied group, according to gender and level of education. Subjects require a sustained and targeted education on important aspects that influence the quality of oral health.

Keywords: nutrition, diet, oral health, drugs, tobacco

Introduction

Health is an essential dimension of the quality of life, it includes the general body health as well as the health care services provided, the two combined would allow individuals to fulfill their roles in society. Oral health is an important component of general health, directly influencing the quality of life of the individual. Knowing and identifying the effects of non-cariogenic, cariogenic and karyostatic foods on the oral cavity will allow the development of targeted approaches to change deficient eating habits. Kassebaum et al., 2015 showed in a study on the incidence of dental caries that about 35% of the world's population has untreated carious lesions (1). This fact underlines that there are favorable

conditions for the development of bacterial, cariogenic species, aspects highlighted in other specialized studies (1-5). Numerous studies have also shown that certain species of bacteria, especially in the mutant group (*S. mutans* and *S. sobrinus*), and not only, are endowed with specialized metabolic mechanisms to make better use of free sugars compared to other substrates. fermentable foods such as starch (6-8). The analysis of the direct relationship between the amount of sugar and the incidence of carious lesions is further performed in numerous studies (9,10,11). In a 2003 report, the World Health Organization (WHO) amended the recommendation of reducing free sugar consumption from 10% to 5% on the daily energy intake in order to reduce obesity, type 2 diabetes and tooth decay

(12.13). The multifactorial etiology of carious lesions is surpassed in the current conception by the marked responsibility of sugar consumption. Thus, in this context, it is important to direct preventive efforts towards dietary modification, especially on individuals at high caries risk (14). The use of phenolic compounds or other sweeteners may be an option to reduce the incidence of tooth decay (15). The appearance of carious lesions is closely related to the rate of salivary flow. Thus, a low rate of salivary flow is generally associated with the presence of cervical lesions, periodontal pathology, dental mobility but also with the “dry mouth” syndrome (16). The rate of salivary flow is also influenced by tobacco intake. Maryam Rad et al, points out that in the case of long-term smokers, the rate of salivary flow is $0.38 (\pm 0.13)$ ml / min compared to a rate of salivary flow in non-smokers of $0.56 (\pm 0.16)$ ml / min (16). Tobacco use is often associated with alcohol consumption. The harmful effects of alcohol on the health of the oral cavity include decreased salivary flow, buffer function, aspects that are conducive to the appearance of carious lesions. Hyposalivation associated with a higher rate of bacterial plaque accumulation, food hygiene and poor oral hygiene create favorable conditions for the initiation and evolution of carious and periodontal lesions (17). In this context of sustained recommendations for reducing sugar intake both in quantity and frequency, our study aimed to assess certain habits adolescents have regarding various aspects of food hygiene. Thus, the aim of this study was to assess the level of knowledge and attitudes regarding the relationship between diet and oral health. The null hypothesis was that there was no difference between the level of knowledge about food hygiene. Although eating habits should be cultivated from a very young age, we believe that not all individuals show the same consensus regarding eating habits, so the testable hypothesis was that there are differences between the level of knowledge of food hygiene in the study group.

Material and Method

The study included 718 randomly selected subjects enrolled in schools from 7 counties of Romania (Tab.1). The questionnaire method was applied to assess the level of knowledge, it included 16 questions and was

distributed using a link. The questions included related to demographic data, age, sex, level of education, class of education, knowledge and attitudes of students about varieties of food involved in the occurrence of oral diseases. It also related to the relationship between food consumption the frequency of consumption and the occurrence of oral diseases, the harm of tobacco use as well as drugs on oral health. The questions looked at whether there is a link between: food and oral diseases; cereals consumption and oral health; meat consumption and oral health; fruit and vegetables and oral health; sweets and oral health; the frequency of sweets consumption and oral health; carbonated beverages and oral health; the frequency of consumption of carbonated beverages and oral health; smoking and oral health; alcohol consumption and oral health; drug use and oral health.

Statistical analysis

The data was introduced into a database according to specific codes. The processing of statistical data was performed with the program SPSS 26.00 for Windows, establishing a threshold of statistical significance of $p \leq 0.05$. The Chi-square test was used for comparative analysis of different factors by G (gender), EO (environment of origin) and SL (study level).

Results

Demographic data

The study included a number of 718 subjects with a mean age of $14.54 (\pm 2.22)$ ranged between a minimum of 10 years and a maximum of 19 years (Figure 1).

Depending on the sex and level of education, the subjects were distributed as follows: 34.8% (250) males and 65.2% (468) females, 49.4% (354) middle school students and 50.6% (364) high school students. The majority of school students came from urban areas 79.9% (574). The participating subjects were from different classes, according to the data recorded in Figure 2.

The analysis of the frequency of the number of snacks per day showed that 80.6% (579) of the subjects had three snacks per day, 9.1% (65) had 4 snacks, 6% (43) had 5 snacks, 3.9% (28) have two snacks, 0.3% have 6 snacks and 0.1% (1) 1 snack as shown in Figure 3.

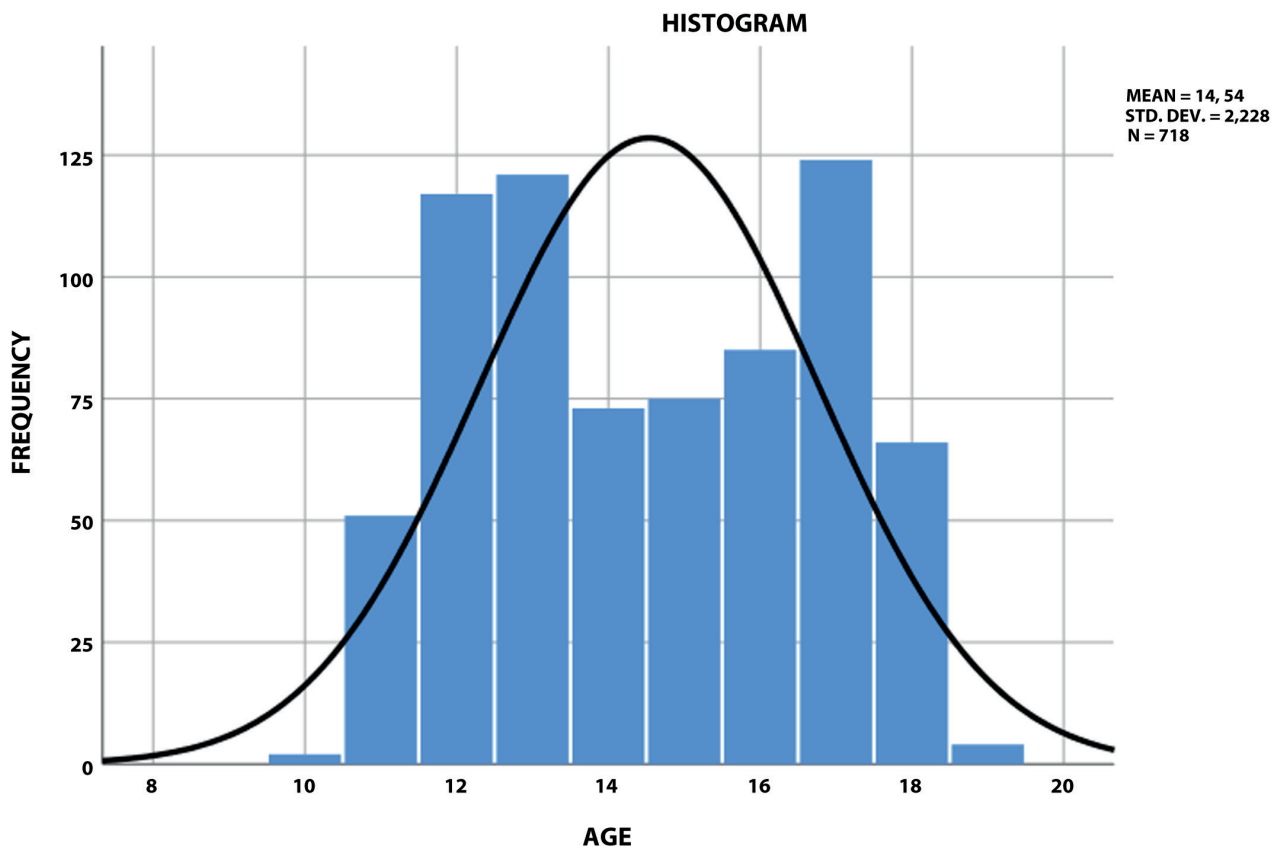


Figure 1. Distribution of subjects according to age

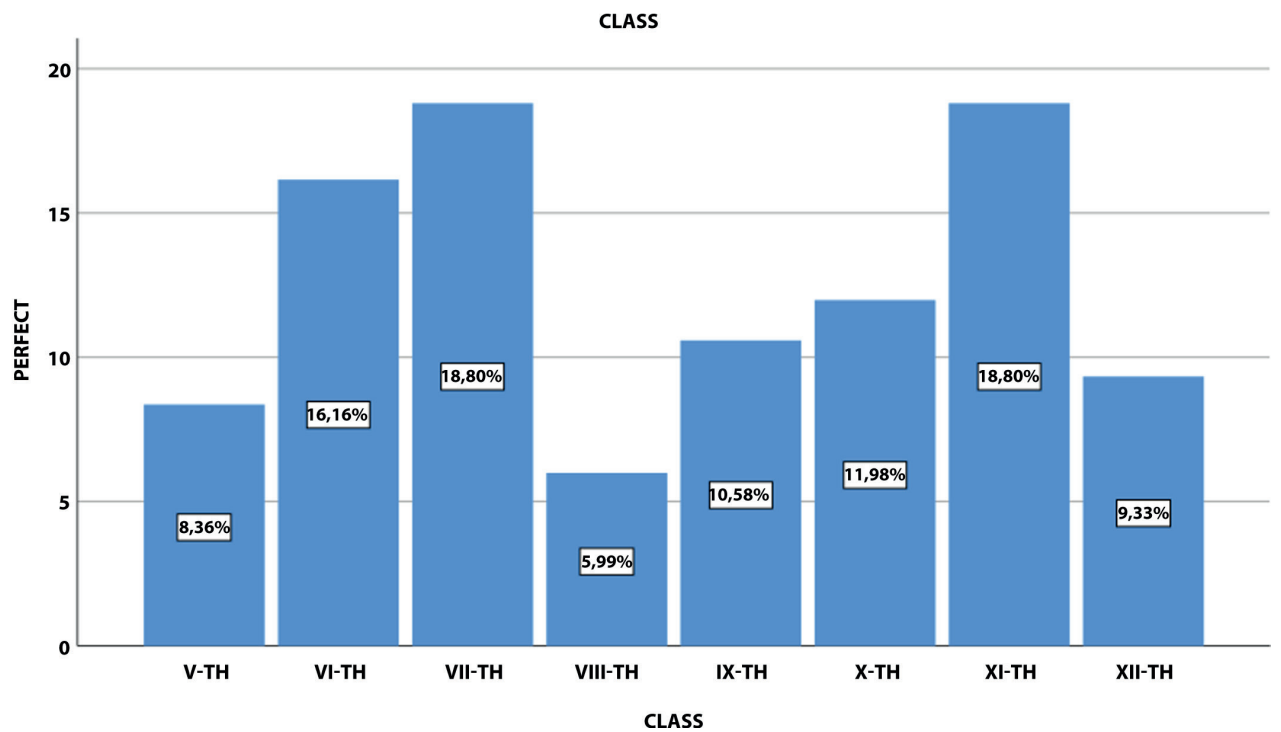


Figure 2. Distribution of subjects (percent) according to class

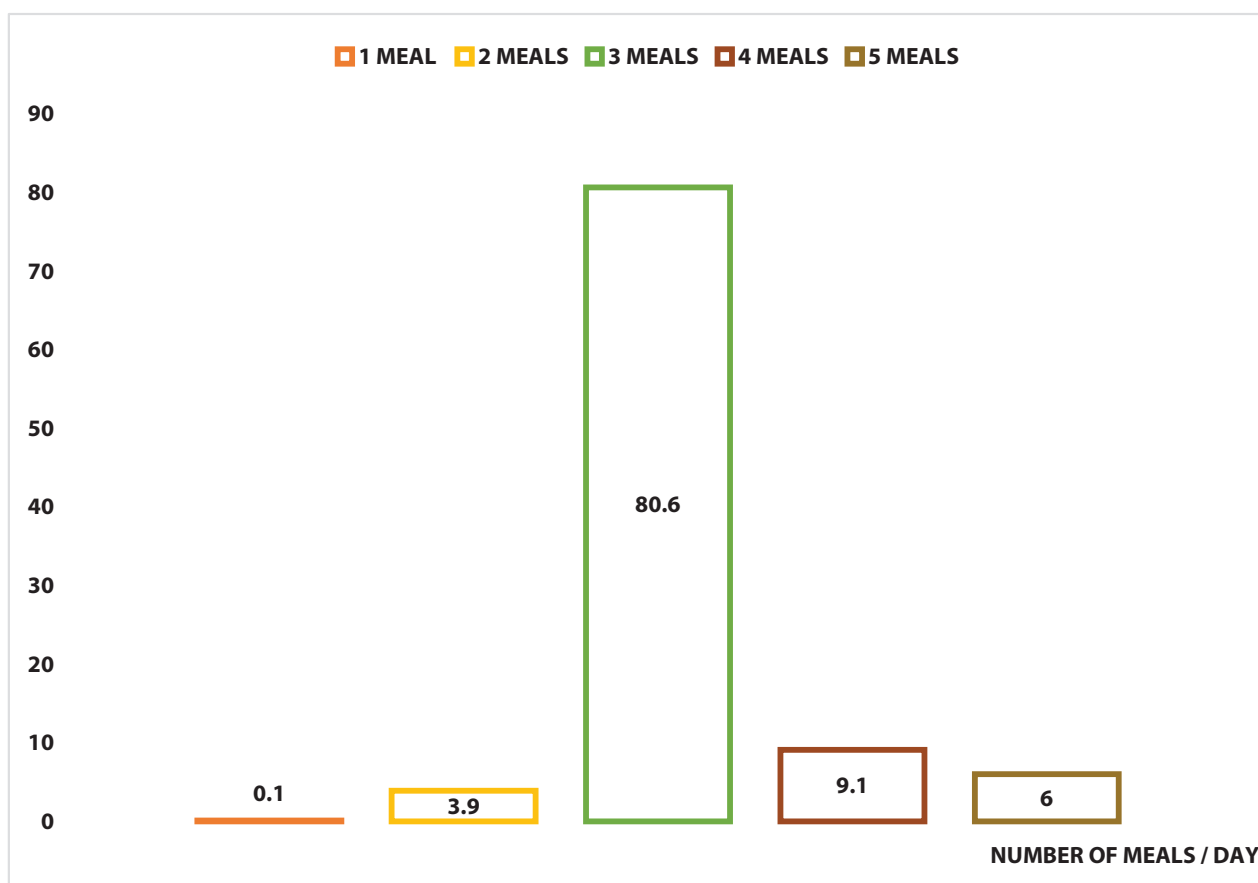


Figure 3. Distribution of answers about diet frequency

Knowledge of the influence the following factors have on oral health: types of foods, frequency and number of snacks; as well as the influence of cereals, meat and fruit consumption on oral health

Subjects know that there is a link between food and oral diseases, the frequency of consumption of carbonated beverages and oral health and that the cereals, meat and fruits consumption influenced oral health $p \leq 0.05$ Figure 4 and Table 1.

Knowledge of the influence, the consumption of sugar and carbonated drinks have on oral health

A large part of the subjects, 92.9% (667) make a positive correlation between the consumption of sweets and the occurrence of oral diseases $p \leq 0.05$. Also, 87.5% (628) are aware that the frequency of consumption of sweets is involved in the occurrence of oral lesions, the differences not being significant depending on the level of education $p = 0.67$. About a quarter of the subjects

do not know the connection between the consumption and the frequency of consumption of carbonated drinks and the pathology of the oral cavity, the differences being statistically significant Figure 4 and Table 2.

Knowledge of the influence the consumption of tobacco, alcohol and drugs have on oral health

Knowledge of the relationship between cigarette, alcohol and drug use and oral health is not known to all subjects in the study. Thus, smoking is considered a harmful activity for the oral cavity by 79.1% (568) of the subjects, alcohol by 52.1% (374) and drugs by 49.7% (357) with $p \leq 0.05$ Table 3.

Discussions

Disruption of the demineralization-remineralization balance of hard dental tissues will cause carious

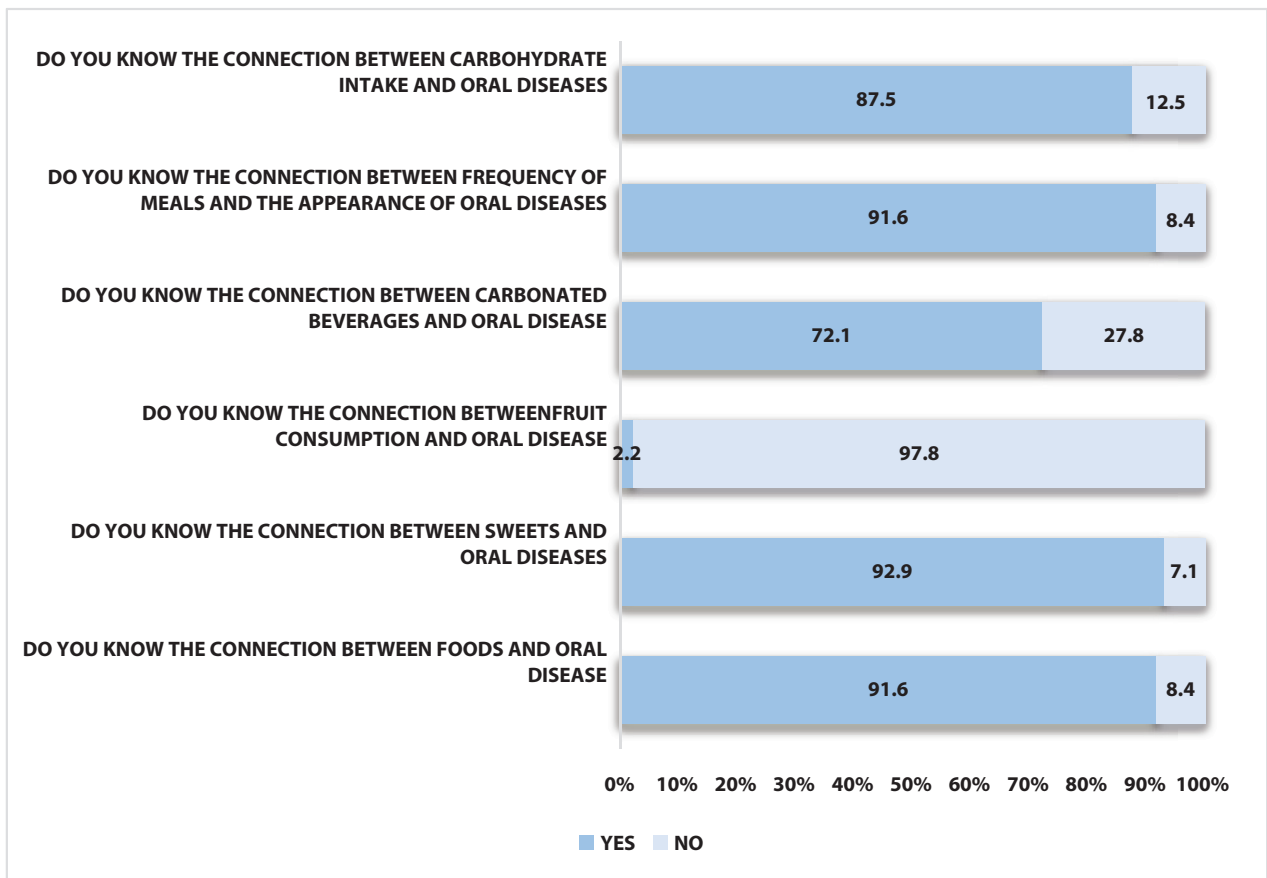


Figure 4. Distribution of answers about the influence of food on oral health.

lesions. If carious lesions do not stop evolving, they will progress to local complications affecting the quality of life of the individual. An extensive caries process can require, in some situations, the application of a laborious treatment, quite expensive and in severe cases even the extraction of the tooth in question. The situations mentioned above can also affect the relationship between doctor and patient, in the sense that the patient may develop a phobia towards the medical staff and towards medical treatments, thus becoming uncooperative. It has been shown that there is a positive association between the consumption of sugary foods and the prevalence of tooth decay, regardless of oral hygiene (18). It has also been shown that vegetarians have a much higher risk of tooth decay and erosion compared to individuals on a non-vegetarian diet. Foods such as bananas or melons are considered cariogenic foods due to their high sugar content, and

due to their adhesion to the surface of the teeth (19). Some studies recommend that health practitioners should focus their dietary advice on reducing both the amount and frequency of sugar intake (20-25). The true erosive potential of a product is given by the titratable acidity which is the volume of alkali (0.1 molar NaOH) needed to increase the pH of a standardized volume of erosive agent to a value of 7. Drinks such as Pepsi and Coca-Cola have a value of the pH of 2.7 and 7-Up a pH of 3.5. There is a close link between the consumption of carbonated beverages and the occurrence of dental erosions, in the sense that carbonated beverages can destroy or reduce the calcium substrate in dental structures, aspects highlighted by electron microscopy studies (26). Drug use is also often associated with the appearance of rampant caries, due to the fact that it can cause a decrease in salivary flow with the installation of an accentuated xerosome.

Table 1. Correlation of the answers regarding the knowledge of the influence of the types of foods and of the frequency of the number of snacks with the oral health and correlation of the answers regarding the knowledge of the influence of cereals, meat and fruit consumption on oral health

A	G		Sig. <i>p</i>	CS		Sig. <i>p</i>
	M	F		m-ss	h-ss	
	N (%)	N (%)		N (%)	N (%)	
Q = Is there a link between food and oral diseases?						
Y	218(30.36)	440(61.28)	.002*	316(44.01)	342(47.63)	.001*
N	32(4.45)	28(3.89)		42(5.84)	18(2.50)	
Q = Is there a link between the frequency of consumption of carbonated beverages - oral health?						
Y	171(23.81)	357(49.72)	.023*	248(34.54)	280(38.99)	.010*
N	79(11.002)	111(15.45)		110(15.32)	80(11.14)	
Q = Is there a link between cereal and oral health?						
Y	21(2.92)	33(4.59)	0.51	29(4.03)	25(3.48)	0.56
N	229(31.89)	435(60.58)		329(45.82)	335(46.65)	
Q = Is there a link between meat and oral health?						
Y	14(1.94)	27(3.76)	0.93	15(2.08)	26(3.62)	0.08
N	236(32.86)	441(61.42)		343(47.77)	334(46.51)	
Q = Is there a link between fruit and vegetables and oral health?						
Y	7(0.97)	9(1.25)	0.45	9(1.25)	7(0.97)	0.61
N	243(33.84)	459(63.92)		349(48.6)	353(49.16)	

Table notes: Results are based on nonempty rows and columns in each innermost subtable. a. More than 20% of cells in this sub table have expected cell counts less than 5. Chi-square results may be invalid. b. The minimum expected cell count in this subtable is less than one. Chi-square results may be invalid.

*Significance level $p \leq 0.05$

A= answer; M=male; F=female; Q=question; Y=yes; N=No.

Hyposaliva will increase the consumption of drinks that are generally rich in caffeine and sugar. In addition, the lack of buffer capacity and the decrease in associated clearance and poor oral hygiene will lead to increased exposure to carious lesions. Periodontal disease is a consequence of poor hygiene and low blood supply to periodontal tissues. Smoking drugs such as methamphetamine release muriatic and sulfuric acids which can destroy the enamel very quickly. Used for longer periods, this drug can cause rapidly evolving carious lesions, with patients noticing their appearance within the first 3 months. The most commonly affected areas are smooth, vestibular and proximal to the front teeth. Smoking has a negative impact on the health of the oral cavity. Smoking is a risk factor that slows down the healing process of tissues and is incriminated in the occurrence of oral cancer, periodontal disease,

pathology related to the salivary glands (xerostomia), nicotinic stomatitis and halitosis. Most subjects are aware of the harmful effects that smoking can have on the oral cavity. 51.9% (375) say that alcohol use and 49.7% (359) use of drugs do not affect the oral cavity. This suggests that some subjects are not well enough informed in this regard. Such problems are quite rare in developed countries, as there are numerous campaigns in these countries to combat alcohol and drug use. Another important aspect is the unhealthy habits of parents, habits that can influence children's behavior. Taking into account these aspects and the fact that adolescents tend to accumulate as much information as possible during school, it can be considered that the school is the ideal place where the primary prevention actions of the main diseases of the oral cavity can be promoted.

Table 2. Correlating the answers regarding the knowledge of the influence, the consumption of sugar and carbonated drinks have on oral health

A	M	F	Sig.	m-ss	h-ss	Sig.
	N (%)	N (%)	p	N (%)	N (%)	p
Q = Is there a connection between sweets and oral health?						
Y	225 (31.33)	442(61.55)	.027*	335(46.65)	332(46.23)	0.48
N	25 (3.48)	26(3.62)		23(3.20)	28(3.89)	
Q = Is there a link between the frequency of sweets and oral health?						
Y	211(29.38)	417(58.07)	0.07	315(43.87)	313(43.59)	0.67
N	39(5.43)	51(7.10)		43(5.98)	47(6.54)	
Q = Is there a link between carbonated beverages and oral health?						
Y	170(23.67)	348(48.46)	0.07	239(33.28)	279(38.85)	.001*
N	80(11.14)	120(16.71)		119(16.57)	81(11.28)	
Q = Is there a link between the frequency of consumption of carbonated beverages and oral health?						
Y	171(23.81)	357(49.72)	.023*	248(34.54)	280(38.99)	.010*
N	79(11.00)	111(15.45)		110(15.32)	80(11.14)	

*Significance level $p \leq 0.05$

A= answer; M=male; F=female; Q=question; Y=yes; N=No.

Table 3. Correlation of answers regarding the knowledge of the influence, consumption of tobacco, alcohol and drugs on oral health

A	G		Sig.	CS		Sig.
	M	F		m-ss	h-ss	
	N (%)	N (%)	p	N (%)	N (%)	p
Q=Is there a link between smoking and oral health?						
Y	177(24.65)	391(54.45)	.000*	249(34.67)	319(44.42)	.000*
N	73(10.16)	77(10.72)		109(15.18)	41(5.71)	
Q=Is there a link between alcohol consumption and oral health?						
Y	103(14.34)	241(33.56)	.009*	164(22.84)	(25.06)	0.26
N	147(20.47)	227(31.61)		194(27.01)	180(25.06)	
Q=Is there a link between drug use and oral health?						
Y	108(15.04)	253(35.23)	.006*	163(22.70)	198(27.57)	011*
N	142(19.77)	215(29.94)		195(27.15)	162(22.56)	

*Significance level $p \leq 0.05$

A= answer; M=male; F=female; Q=question; Y=yes; N=No.

Conclusions

Within the limits of this study we can draw the following conclusions: There are differences between the level of knowledge of food hygiene in the studied group. Subjects need a sustained and targeted education on important issues that

influence the quality of oral health. Approximately one third of subjects are unaware of the harmful effects of increased hydrocarbon consumption, sour drinks and frequency of their use on oral health. About half of the subjects are unaware of the harmful effects alcohol and drug use have on oral cavity health.

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All authors have equal contributions to the first author.

References

- Kassbaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJ, Marcenes W. Global burden of untreated caries: a systematic review and meta-regression. *J Dent Res* 2015;94(5):650-8. doi: 10.1177/0022034515573272. Epub 2015 Mar 4. PMID: 25740856.
- Sheiham A, James WP. Diet and Dental Caries: The Pivotal Role of Free Sugars Reemphasized. *J Dent Res* 2015;94(10):1341-7. doi: 10.1177/0022034515590377. Epub 2015 Aug 10. PMID: 26261186.
- Giacaman RA. Sugars and beyond. The role of sugars and the other nutrients and their potential impact on caries. *Oral Dis* 2018;24(7):1185-1197. doi: 10.1111/odi.12778. Epub 2017 Oct 6. PMID: 28898520.
- Rypins RF. The Incidence of Dental Caries in the Preschool Age. *Journal of Dental Research* 1922;4(3):369-373. doi:10.1177/00220345220040030701
- Robert M. Stephan, Changes in Hydrogen-Ion Concentration on Tooth Surfaces and in Carious Lesions, *The Journal of the American Dental Association*, Volume 27, Issue 5, 1940, Pages 718-723, ISSN 0002-8177.
- Aires CP, Del Bel Cury AA, Tenuta LM, et al. Effect of starch and sucrose on dental biofilm formation and on root dentine demineralization. *Caries Res* 2008;42(5):380-6. doi: 10.1159/000154783. Epub 2008 Sep 10. PMID: 18781066.
- Ccahuana-Vásquez RA, Tabchoury CP, Tenuta LM, Del Bel Cury AA, Vale GC, Cury JA. Effect of frequency of sucrose exposure on dental biofilm composition and enamel demineralization in the presence of fluoride. *Caries Res* 2007;41(1):9-15. doi: 10.1159/000096100. PMID: 17167254.
- Cury JA, Rebello MA, Del Bel Cury AA. In situ relationship between sucrose exposure and the composition of dental plaque. *Caries Res*. 1997;31(5):356-60. doi: 10.1159/000262418. PMID: 9286518.
- Bernabé E, Vehkalahti MM, Sheiham A, Lundqvist A, Suominen AL. The Shape of the Dose-Response Relationship between Sugars and Caries in Adults. *J Dent Res*. 2016 Feb;95(2):167-72. doi: 10.1177/0022034515616572. Epub 2015 Nov 9. PMID: 26553884.
- Saido M, Asakura K, Masayasu S, Sasaki S. Relationship between Dietary Sugar Intake and Dental Caries Among Japanese Preschool Children with Relatively Low Sugar Intake (Japan Nursery School SHOKUIKU Study): A Nationwide Cross-Sectional Study. *Matern Child Health J*. 2016 Mar;20(3):556-66. doi: 10.1007/s10995-015-1854-3. PMID: 26576592.
- Sheiham A, James WP. Diet and Dental Caries: The Pivotal Role of Free Sugars Reemphasized. *J Dent Res*. 2015 Oct;94(10):1341-7. doi: 10.1177/0022034515590377. Epub 2015 Aug 10. PMID: 26261186.
- Moynihan PJ, Kelly SA. Effect on caries of restricting sugars intake: systematic review to inform WHO guidelines. *J Dent Res*. 2014 Jan;93(1):8-18. doi: 10.1177/0022034513508954. Epub 2013 Dec 9. PMID: 24323509; PMCID: PMC3872848.
- WHO (2015). Guideline: sugars intake for adults and children. Geneva(Switzerland): WorldHealthOrganization. Retrieved from http://who.int/nutrition/publications/guidelines/sugars_intake/en. Last accessed: May 25, 2016.
- Sheiham, A., James, W.P.T. A reappraisal of the quantitative relationship between sugar intake and dental caries: the need for new criteria for developing goals for sugar intake. *BMC Public Health* 14, 863 (2014). <https://doi.org/10.1186/1471-2458-14-863>.
- Yoo S, Murata RM, Duarte S. Antimicrobial traits of tea- and cranberry-derived polyphenols against *Streptococcus mutans*. *Caries Res*. 2011;45(4):327-35. doi: 10.1159/000329181. Epub 2011 Jun 30. PMID: 21720161; PMCID: PMC3130978.
- Rad M, Kakoie S, Niliye Brojeni F, Pourdamghan N. Effect of Long-term Smoking on Whole-mouth Salivary Flow Rate and Oral Health. *J Dent Res Dent Clin Dent Prospects*. 2010 Fall;4(4):110-4. doi: 10.5681/joddd.2010.028. Epub 2010 Dec 21. PMID: 23346336; PMCID: PMC3429961.
- Khairnar MR, Wadgave U, Khairnar SM (2017) Effect of Alcoholism on Oral Health: A Review. *J Alcohol Drug Depend* 5: 266. doi: 10.4172/2329-6488.1000266.
- Skafida V, Chambers S. Positive association between sugar consumption and dental decay prevalence independent of oral hygiene in pre-school children: a longitudinal prospective study. *J Public Health (Oxf)*. 2018 Sep 1;40(3):e275-e283. doi: 10.1093/pubmed/fox184. PMID: 29301042; PMCID: PMC6166585.
- Staufenbiel I, Adam K, Deac A, Geurtsen W, Günay H. Influence of fruit consumption and fluoride application on the prevalence of caries and erosion in vegetarians--a controlled clinical trial. *Eur J Clin Nutr*. 2015 Oct;69(10):1156-60. doi: 10.1038/ejcn.2015.20. Epub 2015 Mar 18. PMID: 25782429.
- Van Loveren C. Sugar Restriction for Caries Prevention: Amount and Frequency. Which Is More Important? *Caries Res*. 2019;53(2):168-175. doi: 10.1159/000489571. Epub 2018 Aug 8. PMID: 30089285; PMCID: PMC6425816.
- Liviu Gavrilă-Ardelean, Mihaela Gavrilă-Ardelean, Agnes K. Lackner, Doriana Agop Fornă, Andrei Kozma, Nutrition In The Prophylaxis Of Oral And Dental Injuries – Review *RJMDE* January-February 2021;10, N. 1:6
- Popescu Veronica, Musat George Cosmin, Petcu Damian, Georgescu Adrian, Octavian Barna; The relationship

- between physical activity, eating attitudes, and body image dissatisfaction of Romanian students *Progr Nutr* January-February 2020; Vol. 22, N. 3.
23. Catalin Vasile Savu, Aurelian Gheorghiu, Marius Trandafir, Cristian Serea, Octavian Barna, Influence of food behavior and physical activity in relation to the overall physical condition of Romanian students *Progr Nutr* 2019; Vol.21, N. 4: 1003-1010 DOI: 10.23751/pnv21i4.8943.
24. Catalin Vasile Savu, Aurelian Gheorghiu, Marius Trandafir, Cristian Serea, Octavian Barna, Influence of food behavior and physical activity in relation to the overall physical condition of Romanian students *Progr Nutr* 2019; Vol.21, N. 4: 1003-1010 DOI: 10.23751/pnv21i4.8943.
25. Aurelian Gheorghiu, Catalin Savu Vasile, Marius Trandafir, Cristian Serea, Octavian Barna. The relationship between physical activity and food habits of students. A case study *Progr Nutr* 2019; Vol.21, N. 4: 1029-1033 DOI: 10.23751/pnv21i4.8823.
26. Amirfirooz Borjian, Claudia C. F. Ferrari, Antoni Anouf, Louis Z. G. Touyz, "Pop-Cola Acids and Tooth Erosion: An In Vitro, In Vivo, Electron-Microscopic, and Clinical Report", *International Journal of Dentistry*, vol. 2010, Article ID 957842, 12 pages, 2010. <https://doi.org/10.1155/2010/957842>.

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