Austin Journal of Nutrition and Food Sciences

Open Access

Austin Publishing Group

Special Article – Eating Disorder

Eating Habits as a Common Risk Factor for Obesity and Oral Health Disorders in School Children

Fasoulas A[1], Pavlidou E[1]*, Petridis D[2], Mantzorou M[1], Seroglou K[3] and Giaginis C[1]**

[1]Department of Food Science and Nutrition, School of Environment, University of the Aegean, Greece

[2]Department of Food Science and Technology, International Hellenic University, Greece

[3]Department of Statistics and Insurance Science of the University of Piraeus, Greece

***Corresponding author:** Pavlidou E, Department of Food Science and Nutrition, University of the Aegean Mitropoliti Ioakim 2, Myrina, Lemnos, 81440, Greece

Giaginis C, Department of Food Science and Nutrition, University of the Aegean, Mitropoliti Ioakim 2, Myrina, Lemnos, 81440, Greece

Received: August 21, 2019; **Accepted:** October 01, 2019; **Published:** October 08, 2019

Abstract

Healthy body weight and oral health are fundamental components of the healthy psychosomatic development and well-being of children and adolescents. Hence, identifying the factors that affect them constitutes an essential issue. The purpose of this study was to investigate the risk factors related to Body Mass Index (BMI) and oral health to develop preventive programs for children and adolescents and to adopt best practices. The study was conducted in three consecutive school years among 536 schoolchildren (4–18 y). Eating habits were assessed using a weighted eating behavior questionnaire, also anthropometric measurements, intraoral and extra oral examinations were performed. This study indicates the following: Increased prevalence of Orthodontic Disorders (OD) (>50%) and overweight (preobesity and obesity) (40%) was recorded. The rates of overweight classes were higher in boys than in girls. The increased number of Chewing Cycles (CC) and choice of hard instead of soft foods were associated with a lower risk of OD. "Obese" boys are more at risk of OD than "obese" girls. Significant relationships among BMI, meal duration, sweets and breakfast consumption, chewing habits and distracted eating were confirmed. The caries risk was significantly affected by the structure of food (hard, soft) and consumption of sweets. Periodontal disease also appeared to be strongly influenced by age and number of CC. Prevention programs for schoolchildren have had a positive impact on BMI. Conclusion, this research suggests the strong relationship between eating habits, BMI and oral health and supports the necessity for health education and health promotion programs for schoolchildren.

Keywords: Eating habits; Body mass index; Obesity; Oral health; Prevention programs; Schoolchildren

Introduction

Eating habits affect all systems in the human body directly or indirectly [1,2] because optimal development and body functions depend on proper nutrition [3]. They also play an important role in tooth development, oral mucosa, gum integrity, bone formation and oral health [4]. However, the opposite, as part of a bidirectional relationship, also applies, which means that a healthy oral cavity affects not only the ability to intake food but also the digestive process [5].

Oral health is multifaceted and includes the ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with the involvement of the craniofacial complex [6]. The development and formation of the craniofacial complex and the Stomatognathic System (SS) as an important part of it occur during childhood and adolescence. Therefore, it is very useful to develop preventive programs for the healthy development of the SS and for the general health of both children and adolescents.

The oral cavity acts as a gateway to the human body and its condition can exert a significant effect on nutrition, overall health [7-9], quality of life and well-being. However, the interaction between the development of the SS and human diet in modern culture has been studied in only a limited number of studies [10]. Furthermore, studies that assess the relationship between oral health, obesity and dietary behavior are also limited [11-13].

Modern health systems should give high priority to promoting and maintaining health and preventing disease. The school community is ideal for promoting actions related to oral health, healthy body weight and eating behavior [14]. According to health education research and health promotion studies, the most effective interventions are carried out during the early years of life when the development of the human body takes place and behaviors that have a decisive effect on health throughout life are adopted and consolidated [15]. Prevention programs in schools can improve children's knowledge of healthy eating behaviors [16], oral health and oral hygiene instructions [17].

In this respect, the purpose of the present study was to detect the risk factors related to body weight and oral health, so that preventive programs and optimal healthy practices could be developed to contribute to an improvement in the quality of life for children and adolescents.

Methods

Population

This study comprised 541 children (4–18 years) out of a total of 711 children in 14 public schools, belonging to a rural area. The study excluded the participation of children with learning disabilities and special health care needs because of reduced oral hygiene and higher prevalence of oral diseases [18]. In addition, the study excluded

Citation: Fasoulas A, Pavlidou E, Petridis D, Mantzorou M, Seroglou K and Giaginis C. Eating Habits as a Common Risk Factor for Obesity and Oral Health Disorders in School Children. Austin J Nutri Food Sci. 2019; 7(7): 1129.

children who did not have the written consent of their parents and also the children who refused to participate although there was parental consent.

Ethics and morality

The study was conducted according to the World Medical Association Declaration of Helsinki and conformed to the ICMJE Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals. Trained health professionals (dentist and dietitian who work at a public health center) carried out the research, with the permission of the appropriate Department of the Ministry of Health. The required approvals were obtained from the relevant Ministry of Education, Research of the country. The educational material used in the prevention programs was also approved by the same ministry. All aforementioned decisions of the Ministry of Education were forwarded to relevant directorates of primary and secondary education and afterward, these decisions were promoted to the schools' principals and visit programs were drawn up. As far as the participation of children in the study, a signed parental consent, as well as the verbal consent of the children, was provided. The clinical exam took place in the public health center clinic when this was feasible. Children who were unable to visit the health center because of distance were examined in school classes, by the same investigators. Each child was examined individually, while in the examination place there was the discreet presence of the teacher. After the examination, each child received an informative document which provided information on the findings of the clinical exam, prevention guidelines and contact information (phone and website for the dental therapy planning in a public health center).

Assessment of anthropometric characteristics

Anthropometric measurements were performed with a floor scale (Seca, 761, Hamburg, Germany) and stadiometer (Seca, 213, Hamburg, Germany). Body weight was measured with lightweight clothing (no shoes). Height was measured without shoes, with the participant is in the correct position, starting with heel, knee, buttocks, shoulders and back of the head in contact with the wall-plate and the head in position of "Frankfort Horizontal Plane" (looking horizontally). BMI was calculated as the ratio of weight to height squared (kg/m^2). BMI classification was performed with BMI child and adolescent growth curves [19].

Assessment of oral and dental health

A sterilized dental tool set containing a mirror (LS456 480/5, Carl Martin GmbH, and Solingen, Germany), dental explorer (LS1091/33, Carl Martin GmbH, Solingen, Germany) and periodontal probe (LS973/80 WHO, Carl Martin GmbH, Solingen, Germany) was used for the dental examinations. Decayed, Missing and Filled Teeth (DMFT) index was used for measuring caries. This widely used index estimates the prevalence of dental caries and treatment needs. The DMFT index was divided into three categories depending on the number of Dental Caries (DC): a) DMFT= 0 DC (no caries disease), b) DMFT= 1–5 DC (moderate caries disease) and c) DMFT= 6–10 DC (severe caries disease). Orthodontics Disorder (OD) diagnosis was established on the basis of 1) Facial analysis, 2) Intraoral examination (assessment of overall oral health status and determination of the functional status of the patient's occlusion), 3) Functional analysis (detection of temporomandibular joint functionality). Classification of OD was divided into two categories: a) absence and b) presence of disorder. Periodontal examination assessed gingival enlargement, gingival recession, bleeding on probing and pocket probing depth. Classification of the periodontal condition was divided into two categories: a) absence of disorder (healthy periodontium) and b) presence of a disorder, without further categorization.

Table 1: Odd ratios and 95% confidence intervals of the most significant variables affecting BMI and orthodontic status.

BMI			
Odds Ratios for Categorical Predictors			
Level A	**Level B**	**Odds Ratio**	**95% CI**
Obese Sex	(p<0.001)		
Boys	*Girls*	2.355	(1.4715; 3.7692)
Snacks at school	(p=0.010)		
b=-0.578		0.561	(0.3587; 0.8775)
Pre-Obese			
Sex	(p=0.031)		
Orthodontic status			
Odds Ratios for Categorical Predictors			
Food type	(p<0.001)		
Soft	*Hard*	3.0962	(1.9055; 5.0309)
Feed composition-1	(p<0.001)		
Fruit juice	*Fruit*	2.4749	(1.5947; 3.8410)
Feed composition-2	(p<0.001)		
Whole fruit	*Fruit pieces*	0.2653	(0.1698; 0.4146)
Bread	(p=0.015)		
No Crust	*Crust*	0.5694	(0.3621; 0.8954)
Times to chew	(p=0.001)		
11-20	*1-5*	0.2704	(0.1257; 0.5816)
11-20	*6-10*	0.4896	(0.2399; 0.9993)

Study design

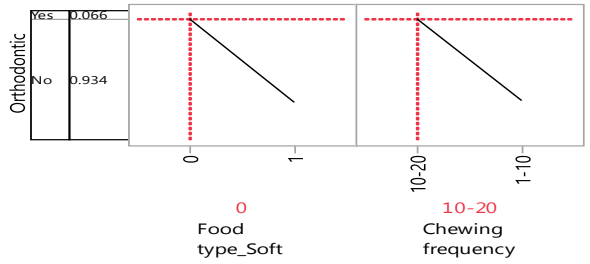
This research was conducted in three cycles during the school years 2015-2018 in the same schools, initially as a mapping study of the specific characteristics of children and adolescents. Subsequently, due to the findings of the high prevalence of obesity and oral health disorders, the study was expanded to investigate the possible causes that may affect these factors to develop targeted prevention programs.

In the first year, 390 schoolchildren (210 girls and 180 boys) of all education levels (preschool, primary, middle and higher school) were mapped. The anthropometric characteristics and oral health status (OD, periodontal disease and DMFT index) were recorded. In addition, preventive programs were implemented to improve nutritional behavior and ensure and improve oral health.

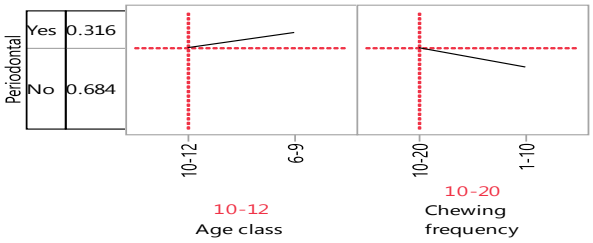
During the second year, the possible relationship between OD and BMI was searched (due to the high rates detected in the first year of the study). At this examination cycle, 541 schoolchildren of all education levels (265 girls and 276 boys) of the same schools were enrolled. A new recording of the anthropometric characteristics and the presence or absence of OD was held. In addition, the Eating Behavior Questionnaire (EBQ) (adapted for the purposes of this

Table 2: Proportion distribution and prediction profiler of the statistically significant dietary behavior effects on orthodontic and periodontal and DMFT (dental caries) response according to binary logistic regression.

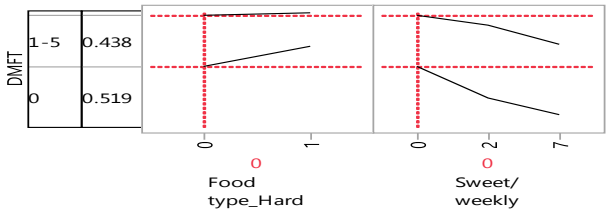
Food type Soft	Chewing frequency	Probability (Orthodontic=No)	Probability (Orthodontic=Yes)
No	10-20	0.9338	0.0662
No	1-10	0.2992	0.7008
Yes	10-20	0.285	0.715
Yes	1-10	0.0119	0.9881



Age Group	Chewing frequency	Prob (Periodontal=No)	Prob (Periodontal=Yes)
10-12	10-20	0.6840	0.3160
10-12	1-10	0.5206	0.4794
6-9	10-20	0.8127	0.1873
6-9	1-10	0.6853	0.3147



Food type Hard	Sweet/weekly	Probability (DMFT=0)	Probability (DMFT=1-5)	Probability (DMFT=6-10)
0	0	0.5192	0.4382	0.0426
0	2	0.2482	0.6247	0.1271
0	7	0.1048	0.6041	0.2912
1	0	0.6919	0.2872	0.0210
1	2	0.4070	0.5275	0.0655
1	7	0.1958	0.6393	0.1649

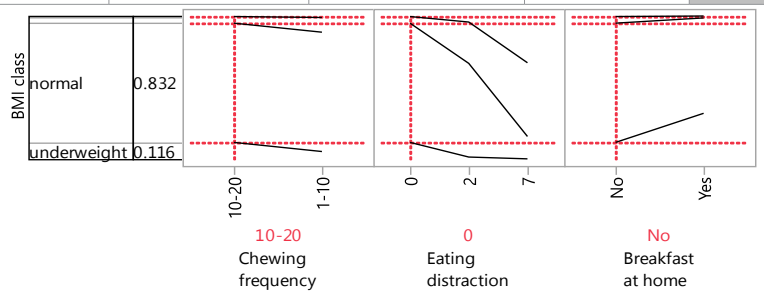


survey, after a pilot validation and reliability check and related adjustments/improvements) was also implemented by personal interview. More specifically, the questionnaire included questions about a) the composition of food (hard or soft), b) choice of fruit or fruit juice, c) consumption of cut or whole fruit, d) choice of consumption of bread (with or without crust), e) consumption of cereal moistened with milk or cereal bars, f) consumption of breakfast at home or not, g) consumption of snacks at school, h) feeling of satiation or hunger, i) good energy levels or fatigue until the end of the lessons, j) the duration of the meal and k) the number of Chewing Cycles (CC). To understand the question about the number of CC, a detailed explanation and demonstration of the CC process and duration were presented. The use of the EBQ was authorized by the Ministry of Education.

In the third year, new research was performed on 246 primary schoolchildren aged 6–12 years (125 girls and 121 boys) of the same schools. In this screening, anthropometric characteristics and the oral health status were recorded and a new extended questionnaire was

Table 3: Proportion distribution and prediction profiler of the statistically significant dietary behavior effects on BMI classes according to ordinal logistic regression.

Chewing frequency	Eating distraction	Breakfast at home	Prob(=underweight)	Prob(=normal)	Prob(=Pre-obesity)	Prob(=obesity)
10-20	0	No	0.1160	0.8323	0.0467	0.0049
10-20	0	Yes	0.3194	0.6656	0.0136	0.0014
10-20	2	No	0.0142	0.6539	0.2886	0.0433
10-20	2	Yes	0.0489	0.8291	0.1095	0.0125
10-20	7	No	0.0013	0.1562	0.5147	0.3277
10-20	7	Yes	0.0048	0.3960	0.4793	0.1200
1-10	0	No	0.0523	0.8330	0.1030	0.0117
1-10	0	Yes	0.1649	0.8002	0.0317	0.0033
1-10	2	No	0.0060	0.4524	0.4443	0.0972
1-10	2	Yes	0.0212	0.7305	0.2190	0.0292
1-10	7	No	0.0006	0.0724	0.3903	0.5368
1-10	7	Yes	0.0020	0.2176	0.5357	0.2447



also applied. The new questions related to the "frequency of sweets consumption per week" and distracted eating.

Statistical analysis

The chi-square test, Student's t test, and binomial logistic regression were applied to detect possible effects of eating behavior in SS and BMI at a reference level of statistical significance 0.05.

The profile of eating behavior is described by six elements: a) Food Type: soft-hard-both, b) Chewing Frequency: <10 & >10, c) Meal Duration: <10, 10–20, >20 minutes, d) Breakfast at Home: yes, no, e) Distracted Eating: never, weekend, daily, f) Sweets' consumption (per week: never, weekend, daily). The type of food and breakfast are in qualitative form, while the rest are categorical variables (classified, e.g., sex).

A Multiple Correspondence Analysis (MCA) was performed to map the eating behavior regarding the food structure, aiming to detect categories of different items (juice instead of fruit, etc.) that show common responses among individuals in the sampling data.

Eating behavior for statistical purposes was considered as an independent set, while both the oral disorders (DMFT, OD and periodontal disease) and BMI classes were considered as dependent sets. Each dependent variable was regressed against the eating behavior using multiple binary or ordinal regression analysis combined with a forward selection of only statistically significant variables at a 0.05 probability level of entrance in the equations. Sex and education level classes of schoolchildren were also examined for potential interaction effects. Minitab® 18.1 (Minitab Inc.) and JMP 13.2 (SAS Institute Inc.) software were used for the statistical analysis.

Results

1st year of research: 2015–2016

Forty percent of the schoolchildren were recorded as overweight (preobese and obese) in equal percentages (20%) (Figure S1 (Supplemental material)). Further analysis by age group and sex showed an increasing trend for risk of obesity by age that culminated at the children of middle-school, from 37% to 54% and a sharp drop at the children of high school (15–18 years) from 54% to 28% according to the pattern:

Preschool Primary Middle High 37% < 39% < 54% > 28%

Boys have higher rates of overweight (preobesity and obesity) than girls.

The prevalence of OD occurred at a percentage greater than 50%. An upward trend in caries (DMFT index) from 37% in preschool-aged children to 70% in the rest of the classes was observed. In addition, an increasing trend in periodontal disease was recorded with the rise of age, culminating in high school students:

Preschool Primary Middle High 0% < 18% < 27% < 51%

2nd year of research: 2016–2017

The results are shown in (Table 1 and Figure 1). "Obese" boys showed a 2.36 times greater risk for OD than "obese" girls. The increased number of CC (11–20 times) compared with the low number of CC (6–10 and 1–5 times), was associated with a lower risk of OD by 73% and 51%, respectively. Higher probability of developing OD occurred in school children who consumed soft, rather than hard food (by 3.1 times), fruit cut into pieces instead of whole fruit (by 3.77

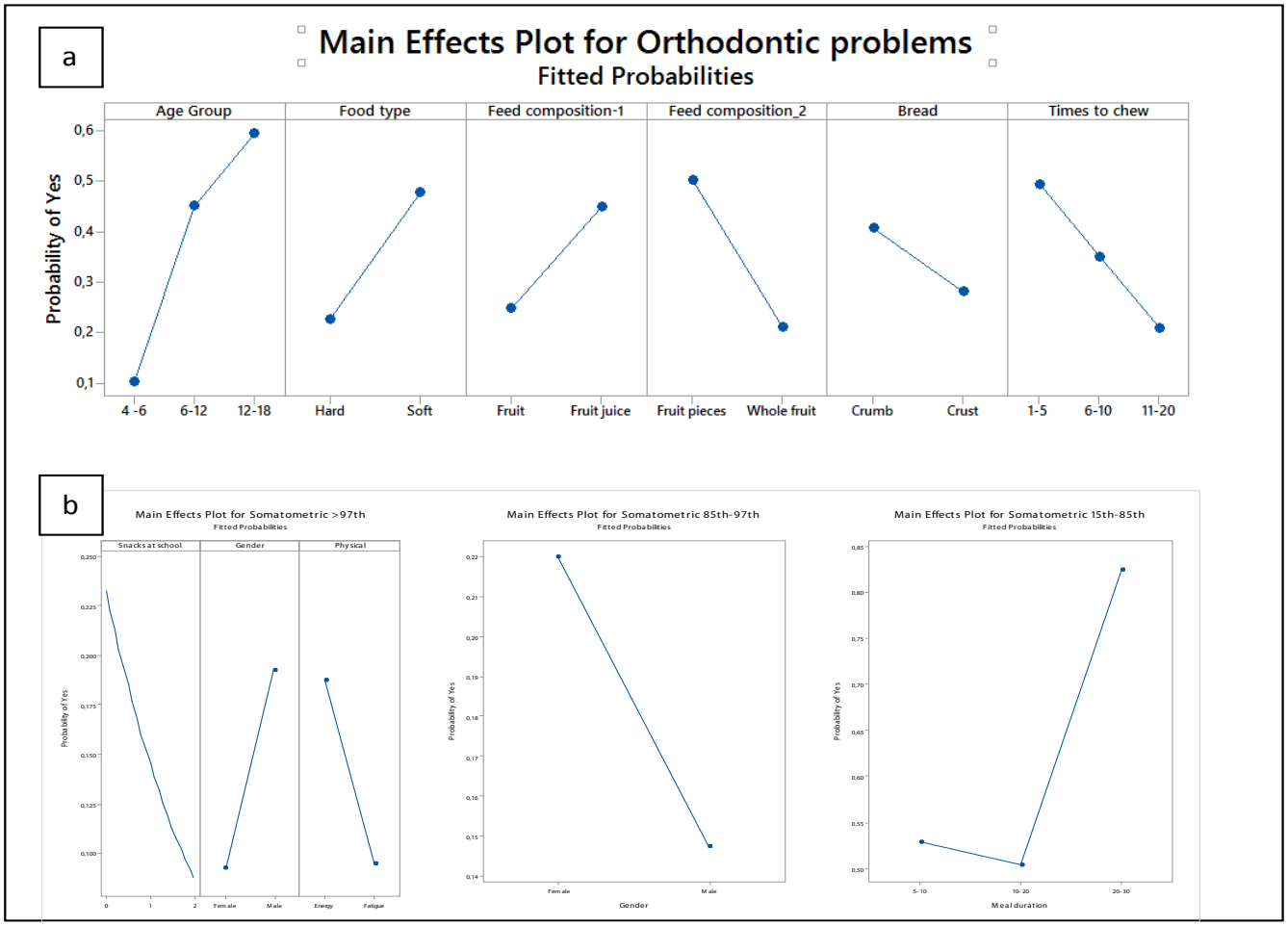


Figure 1: Effects of nutritional behavior of children and adolescents on their a) Orthodontic condition, b) Somatometric measurements.

times), fruit juices instead of fruit (by 2.47 times) and bread without the crust(by 1.76 times). Moreover, there was a negative correlation between the number of snacks and OD (b= –0.578).

3rd year of research: 2017–2018

Table S1 (Supplemental material) presents the descriptive statistics of all the variables that have been evaluated. The set of variables of all controlled categories (dietary behavior, oral diseases and anthropometric characteristics) showed a significant frequency of occurrence, apart from the underweight class, where just about 4% of the study population (8 out of 230 children) was recorded in this category.

The categorical variables in the eating behavior set are presented in detail in Table S2 (Supplementary Material) and their interrelationships in (Figure S2). Following the implementation of the MCA procedure, three sets, each with common relationships, were observed among categories of different items.

The short meal duration (5–10 minutes) was associated with undistracted eating and "absence" of sweets' consumption. The average meal duration (10–20 minutes) was associated with distracted eating twice weekly (only at weekend) likewise with the consumption of sweets twice weekly (only at the weekend). The maximum meal duration (20–30 minute) was associated with daily distracted eating.

The OD depicted statistically significant findings only with the structure of the food (soft, hard) and the number of CC (<10 &>10 times) (Table 2). The absence of soft food in meals combined with an increased number of CC (>10 times) seems to be associated with lower OD by up to 6.62%.In contrast, soft food combined with a smaller number of CC (<10 times) appears to increase the incidence of OD up to 98.9%.

Periodontal disease was found to be mainly affected by age, as well as by the number of CC (Table 2).

The lower the age of children (6–9 years old) and if their chewing behavior was >10 CC, the incidence of periodontal disease was limited to 19%. The greater the age of children (10–12 years old) and if their chewing behavior was <10 CC, the occurrence of periodontal disease was increased to 48%. Dental caries, which are depicted by the DMFT index, were significantly affected by the structure of the food (soft, hard), as well as sweets' consumption (Table 2). Oral health was significantly improved when choosing hard food and avoiding sweets in meals (69.2% probability of dental caries absence). Even when hard food is not selected on meals, the probability of caries does not seem to be so high (51.9%) when there is no daily consumption of sweets.

The body weight status was significantly affected by the number of CC, distracted eating and the consumption of breakfast at home (Table 3). "Underweight" in schoolchildren was related to a higher occurrence (31.94%) of breakfast consumption, and the lack of distracted eating when combined with the increased number of CC (>10). A decreasing trend of this percentage (16.49%) by reducing the number of CC (<10) was noted. "Normal weight" in schoolchildren was associated with increased incidence (66.56%) of daily breakfast consumption at home, absence of distracted eating and increased number of CC (>10). "Preobese" schoolchildren were distinguished from the schoolchildren of the other BMI categories by their consistent high proportions with daily "distracted eating," regardless of breakfast consumption at home and the number of CC. "Obesity" in schoolchildren was strongly associated not only with daily distracted eating and the constant lack of breakfast consumption at home but also with the short repetition of CC (53.68%), compared with the most CC (32.77%).

Conclusively, the number of CC appeared to be the most important key variable in most cases, followed by the type of food and the consumption of sweets, the consumption of breakfast at home and the age group.

The profile of eating behavior as depicted by the MCA analysis substantiated the components, which composed the eating profile of BMI classes of primary school students of the particular population, reinforcing the common attitude–behavior of the groups.

Discussion

This study is significant because the data presented a) provide important new information about the influence of eating behavior on the occurrence of OD, b) supply information on the highest risk of periodontal disease in children who chew less and especially in younger ages, c) provide information about the relation among BMI, distracted eating and other eating behaviors, d) report important information about the correlation among meal duration, "distracted eating" and habit of eating sweets, e) can be used by health professionals for further research, reference and design of prevention programs.

The results from this study support the relationship between eating behavior, BMI and OD with obese boys to manifest a double risk of developing OD compared with obese girls. The same risk is supported by children who chew each mouthful less than 10 times when compared with those chewing more from 10 times. In addition, a threefold to fourfold increase in the probability of developing OD is supported for children consuming soft instead of hard foods more frequently. In the current literature, there are limited studies among the aforementioned factors, focusing mainly on the effect of orthodontic treatment on dietary intake and behavior [20,21], BMI and body fat percentage [22,23]. The aforementioned studies have shown both positive and negative results, without mentioning similar correlations to those identified in our study.

The findings of the present study indicated a low prevalence of periodontal disease during preschool age, followed by a gradual increase to 51% in adolescence. In addition, they support evidence for the relationship between periodontal disease and chewing behavior, with 1 out of 2 children aged 10–12 years, who chew each mouthful <10 times, exhibiting periodontal disease. In the existing literature, no studies were found to associate the two variables listed above (periodontal disease and chewing behavior). However, there are studies that outline the high prevalence of periodontal disease among children in this age group [24].

One of the interesting findings of this study is related to the high prevalence of caries. Two out of five preschool children and four out of five secondary schoolchildren had caries and 20% of those had a high number of caries teeth (6-10 carries). In addition, this study indicates the relationship between caries and food choices. Seven out of ten children who choose to consume hard food and do not consume sweets do not show cares. This number is reduced to five out of ten children when they have chosen soft instead of hard food, even when no sweets are consumed. Costacurta et al. in an analysis of food intake, lifestyle and caries in obese children found that eating habits could be considered as a common risk factor for both obesity and for caries [25]. However, no bibliographic references were found regarding the effect of hard food on the manifestation of caries.

Significant findings of the present study concern the nutritional behavior analysis. The children who consume their meals over a longer time (>20 minutes) have both "distracted eating" and sweets' consumption daily. This finding is possibly linked to unconscious overeating (due to lack of attention) [26] and not with the healthy side of longer meal duration [27]. Some studies have linked the fastest eating speed with a weight change [28] and higher body mass index [29] and others suggest mindfulness and mindful eating to promote better eating habits and weight control [30-32].

Moreover, the findings of this study indicate the prevalence of overweight because two out of five schoolchildren (4–18 years old) were classified as "preobese" and "obese." More specifically, the upward trend (two out of five children) culminates between the ages of 12 to15 (three out of five) and regressed at the age 16–18 years (one in five children). Similar results are reported in the recent EYZHN study, which states that boys and girls may pass from childhood to adolescence with more favorable levels of body fat [33]. These results were consistent with bibliographic references describing significant changes during the transition from puberty to young adulthood [34].

A particularly important aspect of this study is about dietary habits associated with BMI. It seems that "underweight" and "normal-weight" children do not have "distracted eating" habits and chew every bite more than 10 times. On the other hand, "overweight" children present "distracted eating" and "skipped breakfast." A significant number of studies have documented the correlation between watching television during meals and obesity [35]. These studies have attributed this relationship to a series of behaviors related to the influence of television advertising of food and beverages targeting children, the low nutritional quality, the increased energy intake and the reduced time for physical activity [36]. The combination of "skipping breakfast" and "eating fast" has been shown to increase the risk of being overweight [37]. Moreover, the dependence on extremely pleasurable foods or their substances, it could be a further component of childhood obesity [38,39]. However, a relevant study corroborating the findings of our study has not been identified.

One of the major findings of this study concerns the 4%

improvement (from 40% to 36%) of overweight, with one-year preventive programs. These results are consistent in part with literature references [40-42].

Limitations and Strengths of the Research

Some of the strengths of this study are listed below: a) the controlled study population was adequate, b) the findings were confirmed in three survey cycles and in three consecutive years, c) the questionnaires were applied by health professionals, in face-to-face interviews and d) the questions were cross-referenced (each variable, such as the food composition intersected from a series of questions like choosing crust or no crust of bread, fruit or juice, whole or cut fruit, etc.).

The limitations to be mentioned relate to (1) the diagnosis of OD, which was not confirmed by X-ray imaging and (2) the lack of data from an urban area.

Conclusion

Consequently, the high prevalence of childhood obesity and oral health disorders constitutes a major public health issue. Eating habits constitute a crucial factor that affects both body weight and oral health (dental caries, periodontal diseases, orthodontic disorders). Preventive programs, which are implemented in schools, seem to bring satisfactory results because this age is the most appropriate for embedding proper eating habits and timely diagnosis and treatment of oral health and weight management problems. Thus, the findings of the present study are particularly important and noteworthy because they could be used as a base to develop essential health education programs in schoolchildren. However, due to the limited studies that currently examine the influence of eating behavior, further research is needed, which will eventually target more specific research topics.

References

1. Kito K, Kuriyama A, Takahashi Y, Nakayama T. Impacts of skipping breakfast and late dinner on the incidence of being overweight: a 3-year retrospective cohort study of men aged 20-49 years. J Hum Nutr Diet. 2019; 32: 349-355.
2. Mitsopoulou AV, Magriplis E, Dimakopoulos I, Karageorgou D, Bakogianni I, Michas R, et al. Association of meal and snack patterns with micronutrient intakes among Greek children and adolescents: data from the Hellenic National Nutrition and Health Survey. J Hum Nutr Diet. 2019; 32: 455-467.
3. Flynn MA. Empowering people to be healthier: public health nutrition through the Ottawa Charter. Proc Nutr Soc. 2015; 74: 303-312.
4. Najeeb, S, Zafar MS, Khurshid Z, Zohaib S, Almas K. The Role of Nutrition in Periodontal Health: An Update. Nutrients. 2016; 30: 8.
5. Touger-Decker R, Mobley C. Position of the Academy of Nutrition and Dietetics oral health and nutrition. J Acad Nutr Diet. 2013; 113: 693-701.
6. Glick M, Williams DM, Kleinman DV, Vujicic M, Watt RG, Weyant RJ. A new definition for oral health developed by the FDI World Dental Federation opens the door to a universal definition of oral health. Am J Orthod Dentofacial Orthop. 2016; 147: 915-917.
7. Azarpazhooh A, Leake JL. Systematic review of the association between respiratory diseases and oral health. J Periodontol. 2006; 77: 1465-1482.
8. Meurman JH, Sanz M, Janket SJ. Oral Health, Atherosclerosis and Cardiovascular Disease. Crit Rev Oral Biol Med. 2004; 15: 403-413.
9. Cullinan MP, Ford PJ, Seymour GJ. Periodontal disease and systemic health: current status. Aust Dent J. 2009; 54: S62-69.
10. Fasoulas A, Pavlidou E, Petridis D, Giaginis C. Current evidence for the possible interactions of nutritional behavior with the development and formulation of the stomatognathic system within the craniofacial complex. J Food Nutr Disord. 2017; 6: 2.
11. Kesim S, Cicek B, Aral AC, Ozturk A, Mazıcıoglu MM, Kurtoglu S. Oral Health, Obesity Status and Nutritional Habits in Turkish Children and Adolescents: An Epidemiological Study. Balkan Med J. 2016; 33164-33172.
12. Sonoda C, Fukuda H, Kitamura M, Hayashida H, Kawashita Y, Furugen, R, et al. Associations among Obesity, Eating Speed, and Oral Health. Obes Facts. 2018; 11: 165-175.
13. Khadri FA, Gopinath VK, Hector M, Davenport ES. Evaluating the risk factors that link obesity and dental caries in 11–17-year-old school going children in the United Arab Emirates. Eur J Dent Educ. 2018; 12: 217-224.
14. Pasqui F, Baldini M, Biagi P, Maranesi M. Dietary habits and related psychological and social factors: influence on the body weight of elementary school children. Int J Food Sci Nutr. 2006; 57: 159-167.
15. Sapon-Shevin M. Widening the Circle: The power of inclusive classrooms. 1st Edition. Boston: Beacon Press. 2007.
16. Hart KH, Bishop JA, Truby H. An investigation into school children's knowledge and awareness of food and nutrition. J Hum Nutr Diet. 2002; 15: 129-140.
17. Blake H, Dawett B, Leighton P, Rose-Brady L, Deery C. School-Based Educational Intervention to Improve Children's Oral Health-Related Knowledge. Health Promot Pract. 2015; 16: 571-582.
18. Anders PL, Davis EL. Oral health of patients with intellectual disabilities: A systematic review. Spec Care Dentist. 2010; 33: 110-117.
19. World Health Organization WHO. Physical Status: the use and interpretation of anthropometry: Tech Rep Series 854. Geneva. 1995.
20. Johal A, Abed A, Jawad F, Marcenes W. Does orthodontic treatment harm children's diets? J Dent. 2013; 41: 949-954.
21. Von Bremen J, Wagner J, Ruf S. Correlation between body mass index and orthodontic treatment outcome. Angle Orthod. 2013; 83: 371-375.
22. Sandeep KS, Singaraju GS, Reddy VK, Mandava P, Bhavikati VN, Reddy R. Evaluation of body weight, body mass index, and body fat percentage changes in early stages of fixed orthodontic therapy. J Int Soc Prev Community Dent. 2016; 6: 349-358.
23. Saloom HF, Papageorgiou SN, Carpenter GH, Cobourne MT. Impact of Obesity on Orthodontic Tooth Movement in Adolescents: A Prospective Clinical Cohort Study. J Dent Res. 2017; 96: 547-554.
24. Das UM, Vadakkekuttical RJ, Kanakkath H, Shankunni SP. Dental health awareness, attitude, and dental health-care seeking practices as risk indicators for the prevalence of periodontal disease among 15-17-year-old school children in Kozhikode district, Kerala, India. J Indian Soc Periodontol. 2017; 21: 144-151.
25. Costacurta M, DiRenzo L, Sicuro L, Gratteri S, De Lorenzo A, Docimo R. Dental caries and childhood obesity: analysis of food intakes, lifestyle. Eur J Paediatr Dent. 2014; 15343-1538.
26. Sato W, Sawada R, Kubota Y, Toichi M, Fushiki T. Unconscious Affective Responses to Food. PLoS One. 2016; 11: e0160956.
27. Hamada Y, Kashima H, Hayashi N. The Number of Chews and Meal Duration Affect Diet-Induced Thermogenesis and Splanchnic Circulation. Obesity (Silver Spring). 2014; 22: E62–E69.
28. Tanihara S, Imatoh T, Miyazaki M, Babazono A, Momose Y, Baba M, et al. Retrospective longitudinal study on the relationship between 8-year weight change and current eating speed. Appetite. 2011; 57: 179-183.
29. Leong SL, Madden C, Gray A, Waters D, Horwath C. Faster self-reported speed of eating is related to higher body mass index in a nationwide survey of middle-aged women. J Acad Nutr Diet. 2011; 111: 1192-1197.
30. Mantzios M, Wilson JC. Mindfulness, Eating Behaviors, and Obesity: A Review and Reflection on Current Findings. Curr Obes Rep. 2015; 4: 141-146.
31. Sibbald Barbara BJ. Mindful eating. CMAJ. 2015; 187: 359.

32. Daly P, Pace T, Berg J, Menon U, Szalacha LA. A mindful eating intervention: A theory-guided randomized anti-obesity feasibility study with adolescent Latino girls. Complement Ther Med. 2016; 28: 22-28.

33. Tambalis KD, Panagiotakos DB, Psarra G. Current data in Greek children indicate decreasing trends of obesity in the transition from childhood to adolescence; results from the National Action for Children's Health EYZHN program. J Prev Med Hyg. 2018; 59: E36–E47.

34. Lenz B. The transition from adolescence to young adulthood: a theoretical perspective. J Sch Nurs. 2001; 17: 300-306.

35. Vik FN, Bjornara HB, Overby NC, Lien N, Androutsos O, Maes L, et al. Associations between eating meals, watching TV while eating meals and weight status among children, ages 10–12 years in eight European countries: the ENERGY cross-sectional study. Int J Behav Nutr Phys Act. 2013; 10: 58.

36. Pate RR, Mitchell JA, Byun W. Sedentary behavior in youth. Br J Sports Med. 2011; 45: 906-913.

37. Lee JS, Mishra G, Hayashi K, Watanabe E, Mori K, Kawakubo K. Combined eating behaviors and overweight: eating quickly, late evening meals, and skipping breakfast. Eat. Behav. 2016; 21: 84-88.

38. Han P, Bagenna B, Fu M. The sweet taste signalling pathways in the oral cavity and the gastrointestinal tract affect human appetite and food intake: a review. Int J Food Sci Nutr. 2019; 70: 125-135.

39. Pretlow RA. Addiction to Highly Pleasurable Food as a Cause of the Childhood Obesity Epidemic: A Qualitative Internet Study. Eat Disord. 2011; 4: 295-307.

40. Hendrickson KL, Rasmussen EB. Mindful eating reduces impulsive food choice in adolescents and adults. Health Psychol. 2017; 36: 226-235.

41. Stice E, Shaw H, Marti CN. A Meta-Analytic Review of Obesity Prevention Programs for Children and Adolescents: The Skinny on Interventions that Work. Psychol Bull. 2006; 132: 667-691.

42. Manios Y, Moschandreas J, Hatzis C, Kafatos A. Health and nutrition education in primary schools in Crete: Changes in chronic disease risk factors following a 6-year intervention program. Br J Nutr. 2002; 889: 315-324.

Austin J Nutri Food Sci - Volume 7 Issue 7 - 2019
ISSN : 2381-8980 | www.austinpublishinggroup.com

Citation: Fasoulas A, Pavlidou E, Petridis D, Mantzorou M, Seroglou K and Giaginis C. Eating Habits as a Common Risk Factor for Obesity and Oral Health Disorders in School Children. Austin J Nutri Food Sci. 2019; 7(7): 1129.