

# Oral hygiene habits in adolescents with disturbances in the nutritional status

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## Abstract

**AIM:** The aim of the study is to determine the quality of oral hygiene in adolescents aged between 11-17 years with disturbances in the nutritional status.

**Material and Methods:** The study was conducted in 2023-2024. 300 children participated in the study, of which 157 (52.3%) were boys with a median age of 13 years, and 143 (47.6%) were girls with a median age of 14 years. An analysis of the nutritional status of the examined children was made using the BMI-Z Percentile anthropometric indicator. Adolescents were divided into 2 groups: first-normal body weight, second-with disturbed nutritional status. With the help of a survey, the means, frequency and duration of oral hygiene of the examined children were determined. The DMFT index was used to evaluate the teeth affected by the carious process. To assess oral hygiene and gingival inflammation, we used OHI-S and GI.

**Results:** There is a difference between the DMFT index in girls and boys with impaired nutritional status, with the median in girls being 6 (4-9), and in boys - 4 (3-6), ( $p < 0.001$ ). Of the total number of examined children, 60.3% have a disturbed nutritional status, of which 9% are overweight, and 51.3% are at risk of obesity. 39.7% are of normal body weight. No statistically significant difference was found in the values of OHI-S ( $p < 0.298$ ) and GI ( $p < 0.423$ ) in the two studied groups. Unsatisfactory oral-hygiene habits are registered among those with disturbances in the nutritional status: 86.2% of them brush their teeth only in the morning, and in 66.9% the procedure lasts less than 1 minute. 84.3% of these children use a manual toothbrush and only 0.6% use toothpaste and dental floss.

**Conclusion:** Poor oral hygiene habits in the two groups of children studied led to a greater prevalence of caries.

**Keywords:** oral hygiene, adolescent, nutritional status, carious process, gingival inflammation

## Introduction

The cases of adolescents at risk of obesity and overweight are increasing significantly. Globally, there has been a fourfold increase in the percentage of children between 5-19 years of age who are overweight. (1) Obesity is a chronic, global disease that is emerging as a worldwide public health problem. (2) The reason lies in the frequency of intake of large amounts of calories and low physical activity. According to the World Health Organization, the intake of simple sugars should be reduced to less than 10% of the total daily energy intake. (3) For teenagers, free time for play is replaced by long stays on phones, tablets, computer games, watching TV, which further immobilizes children. (4) A study by Ravishankar et al. found that more than half of overweight children studied ate while watching television. (5) This way of life - intake of larger amounts of calories than the body needs and poor physical activity - lead to a battle with obesity in the future.

In childhood and adolescence, the specific body mass index (BMI)-for-age percentile is used to diagnose the risk of obesity and overweight. Children fall into the column "at risk of obesity" when their BMI Z-score is between the 85th and 95th percentile, "overweight" when they are above the 95th percentile, and "severe obesity" above the 99th percentile. (6) This index shows total fat tissue only, as additional index systems are used to estimate distribution.

Adolescence is a period of transition between childhood and adulthood. A number of functional, physical, psychological, sexual, and emotional changes occur. (7) A period of acquiring habits and manners of conduct which will be established in life through adulthood. Adolescence is a pivotal moment for any adolescent, leaving a lifelong mark. Early adolescence includes the period 12-15 years and is a critical social period on which future oral health depends. (8) The period is associated with many risk factors - unhealthy and insufficient nutrition, poor oral hygiene, nicotine experiments, orthodontic treatments. (9) Watching television while eating is a distracting activity that leads to overconsumption of food because the feeling of satiety is lost. (10)

Overweight in childhood and adolescence is associated with an increased risk of developing systemic diseases such as diabetes, hypertension, cancer. (11, 12) The risk of developing dental caries and its complications, as well as the development of periodontal diseases, increases. These diseases are behavioral, and lifestyle plays a significant role in their development (13, 14). In recent years, there have been numerous epidemiological studies related to overweight and the development of dental caries, all of which conclude that these two major health problems share common risk factors. These are diet, socioeconomic status and parental behavior. (15)

Oral health is an important part of systemic health and quality of life (16, 17) and depends on the adolescent's daily oral hygiene at home and the motivation to perform it. (18) Poor oral hygiene leading to biofilm accumulation is a proven cause of dental caries (19) and gingival inflammation (20). A significant increase in inflammatory processes in the gingiva was observed in adolescents with excess body weight compared to adolescents with a normal body weight. (21,22). Van. Dyke et al. prove the connection between overweight and increased susceptibility to periodontal diseases, due to increased metabolic and immune parameters. (23) Adolescents with overweight are prone to the development of inflammatory reactions due to increased production of adipokines proportional to the amount of adipose tissue (24).

## Aim

The aim of this study was to investigate the oral hygiene habits of adolescents with disturbances in the nutritional status, by questionnaire examining the means, frequency and duration of daily oral hygiene procedures.

## Materials and Methods

The research was conducted in the period 2023-2024 at Medical University "Prof. Dr. Paraskev Stoyanov"-Varna, University Medical-Dental Center at the Faculty of Dental Medicine and clinical rooms at the Department of Pediatric Dentistry at the Faculty of Dental Medicine-Varna. A clinical examination was conducted to register plaque and/or calculus by the OHI-S index, caries involvement by the DMFT index, gingival inflammation by GI. Questionnaires were developed to assess the level of individual oral hygiene, in relation to frequency, duration and types of means for home use.

### Oral hygiene:

In the adolescent clinical study, a simplified oral hygiene index-OHI-S was used. The index is used to check for plaque accumulation by evaluating tooth surfaces covered with plaque and/or calculus. OHI-S contains two components - Simplified Debris Index (DI-S) and Simplified Calculus Index (CI-S) (25). Ramfjord teeth (buccal surfaces of 16, 11, 26, 31 and lingual surfaces of 36 and 46) are examined by pre-application of Plaque Test Indicator, after which the oral cavity is rinsed and dental plaque, food residues, materia alba, exogenous coloring by photopolymer lamp.

Criteria for classifying DI-S: 0=No presence of debris or stain; 1=Soft debris covering not more than one-third of the tooth surface, or presence of extrinsic stains without other debris regardless of surface area covered; 2=Soft debris covering more than one third, but no more than two-third, of the exposed tooth surface; and 3=Soft debris covering more than two-thirds of the exposed tooth surface (26).

CI-S scoring criteria: 0-no calculus; 1-supragingival calculus covering no more than 1/3 of the examined tooth surface; 2-supragingival calculus or the presence of separate spots of subgingival calculus around the cervical part of the tooth; 3-Supragingival calculus covering more than 2/3 of the tooth surface or a continuous band of subgingival calculus around the cervical part of the tooth.

The OHI-S score categorizes oral hygiene as excellent (score 0), good (score 0.1-1.2), satisfactory (1.3-3.0), and poor (3.1-6.0) (26).

### Dental caries:

The most universal index for reporting the prevalence of dental caries-DMFT-was used. D-indicates the teeth with a carious lesion, M-missing teeth in the dentition due to a complication of the carious process. F-teeth that have been restored after caries treatment. According to the WHO, caries diagnosis registered by DMFT-index is based on visual diagnosis only (27).

### Gingival inflammation:

GI was used to assess gingival inflammation. Grading is done based on color, consistency, and presence of bleeding on gingival probing. Four tooth surfaces (medial, distal, vestibular and oral) are examined at 16, 22, 24, 36, 42, 44. The GI for each patient is calculated as the sum of the recorded values for all examined surfaces divided by the number of examined surfaces.

The score of is interpreted as: 0-healthy gingiva; (0.1-0.9)-mild gingival inflammation; (1.0-1.9)-moderate gingival inflammation; (2.0-3.0)-severe gingival inflammation (28).

The collected data were coded, and a statistical analysis was carried out by using Microsoft Excel 2010 and Jamovi Version 2.4 Analysis of the data was carried out by frequency distributions and descriptive statistics (chi-square test, Fisher's exact test, Mann-Whitney U test). The effect size measurement used Cramér's V. Level of significance -  $p < 0.05$ .

Results

Of the 300 children examined, 60.3% had a disturbed nutritional status, of which 9% were overweight, and 51.3% were at risk of obesity. 39.7% are of normal body weight.

Our results show a statistically significant difference between the indicators of oral hygiene in children with normal and with disturbances in the nutritional status ( $p < 0.001$ ). Only 13.3% of adolescents with disturbances in the nutritional status brush their teeth twice a day (Figure 1), a large part of them brush only in the morning 86.2% and 0.6% only in the evening. Only 6.1% brush their teeth for the respective recommended duration, 66.9% with a duration of up to a minute and 27.1% between 1-2 minutes. (Figure 2).

The results of our study with statistical significance ( $p < 0.001$ ) show that only 4.4% of adolescents with impaired nutritional status brush their teeth with an ultrasonic toothbrush, 83.4% use a mechanical toothbrush, and 12.2% use an electric brush. (Figure 3).

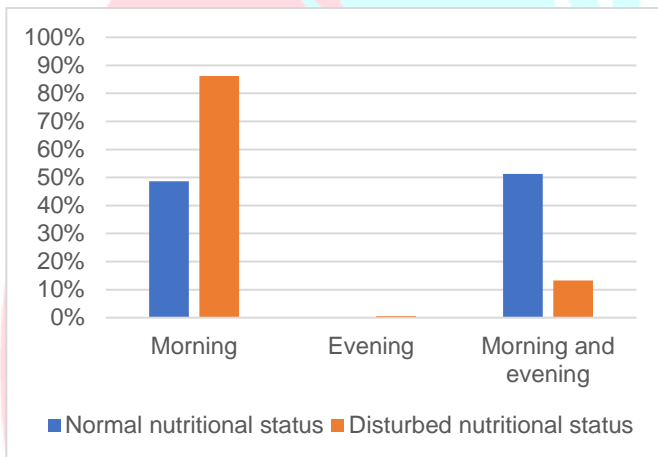


Figure 1. Distribution of tooth brushing frequency in the studied groups

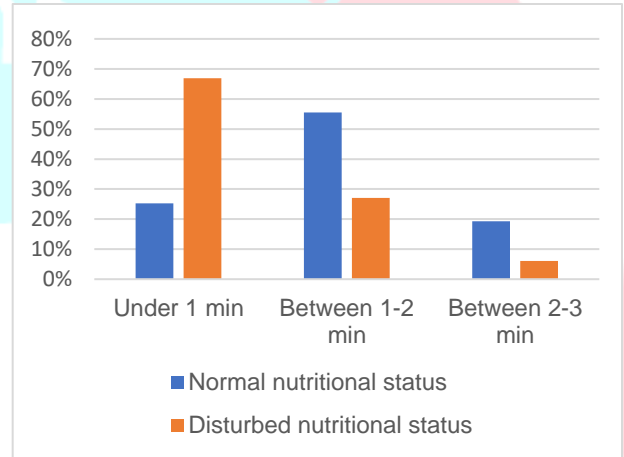


Figure 2. Duration of tooth brushing in the studied groups

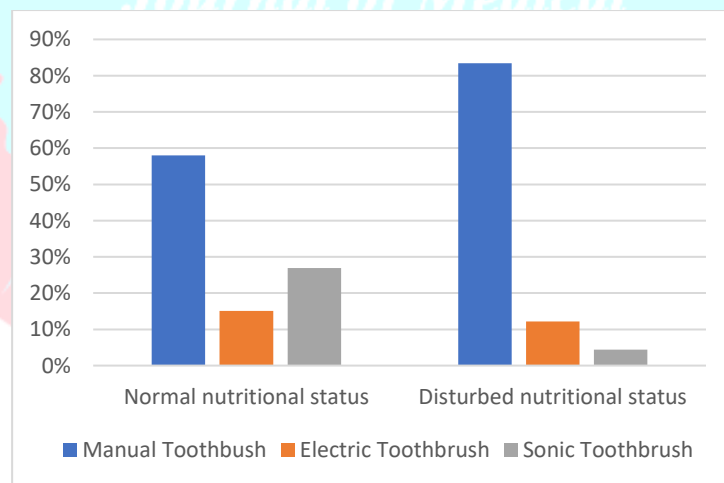
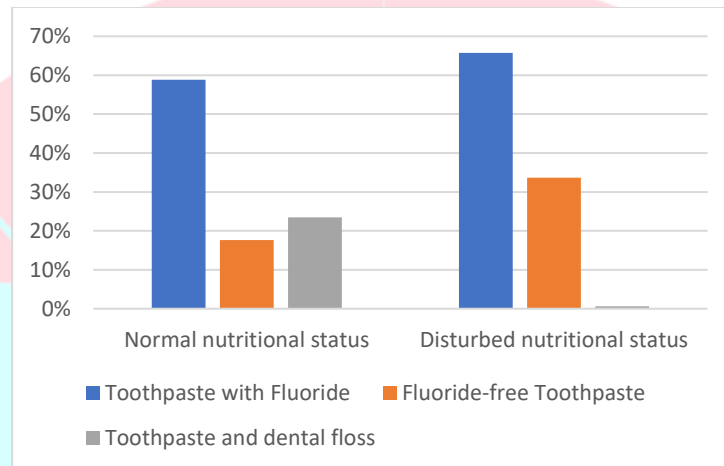


Figure 3. Prevalence of toothbrush use among the studied groups of adolescents

The survey found that some of the adolescents use fluoride-free toothpaste (Figure 4). For children with a normal weight, they are 17.6%, and for those with disturbances in the nutritional status, 33.7%. Only 0.6% of the studied adolescents at risk of obesity and overweight use toothpaste and floss as an auxiliary means of oral hygiene. A statistically significant difference was again observed between the two studied groups, ( $p < 0.001$ ).



**Figure 4. Prevalence of use of toothpaste and dental floss for oral hygiene**

The strength of the relationship between nutritional status and means of performing oral hygiene is medium (Cramer's  $V=0.34$ ).

In the studied groups of children, a statistically significant difference was observed in the DMFT index, the median of which in children with normal body weight was 4 (2-7), and in those with disturbances in the nutritional status it was 6 (3-8), ( $p < 0.002$ ). (Table 1) The results obtained in the first group for OHI-S have a median of 1.3 (1-2), and for the second group-2 (1.2-2.33) ( $p < 0.298$ ). No statistically significant difference was observed for GI, as the median in children with normal body weight was 0.4 (0.3-0.916), and in those with disturbances in the nutritional status it was 0.7 (0.4-1.29), ( $p < 0.423$ ).

**Table 1. Prevalence of DMFT, OHI-S and GI in the two studied groups**

	Group*	N	Median	Minimum	Maximum	Q1	Q3	p
DMFT	1	119	4	0	26	2	7	0.002
	2	181	6	0	32	3	8	
OHI-S	1	119	1.3	0.3	3.5	1	2	0.298
	2	181	2	0.3	4	1.2	2.33	
GI	1	119	0.4	0	2	0.3	0.916	0.423
	2	181	0.7	0	2.4	0.4	1.29	

\*1-group-adolescents with normal body weight; 2-group-adolescents with disturbances in nutritional status; DMFT=Decay-missing-filled index; OHI-S=Simplified Oral Hygiene Index; GI=Gingival index; Q1-25th percentile; Q3-75th percentile



In 60.3% of the examined children with disturbances in the nutritional status, a difference in the DMFT index was observed between the two sexes, with a median of 6 (4-9) for girls, while a median of 4 (3-6) for boys ( $p<0.001$ ) (Table 2). No statistically significant difference was observed in the OHI-S, which in girls with disturbances in the nutritional status had a median of 1.8 (1.2-2.3) and in boys with disturbances in the nutritional status had a median of 2 (1.3-2.5), ( $p<0.36$ ). No statistically significant difference was observed between genders and GI, with a median of 0.5 (0.4-1.34) for girls and 0.75 (0.4-1.29) for boys ( $p<0.49$ ).

**Table 2. Prevalence of Age, DMFT, OHI-S and GI in boys and girls with disturbances in the nutritional status**

	Group**	N	Median	Minimum	Maximum	Q1	Q3	p
Age	1	98	12.5	11	17	11	14	0.012
	2	83	14	11	17	14	16	
DMFT	1	98	4	0	12	3	6	<0.001
	2	83	6	1	32	4	9	
OHI-S	1	98	2	0.5	4	1.3	2.5	0.36
	2	83	1.8	0.3	4	1.2	2.3	
GI	1	98	0.75	0	2.4	0.4	1.29	0.49
	2	83	0.5	0	2.2	0.4	1.34	

\*\*1-group-boys; 2-group-girls; DMFT=Decay-missing-filled index; OHI-S=Simplified Oral Hygiene Index; GI=Gingival index; Q1-25th percentile; Q3-75th percentile

## Discussion

In the present study, oral hygiene behavior was observed in adolescents with normal body weight and those with disturbances in the nutritional status. The results observed in the study by Frisbee et al. found a significant relationship between oral hygiene habits and excess body weight (29).

Brushing your teeth is important for removing plaque and food debris, but it is also not enough. This habit must be learned and started in early childhood. (30) A study makes some important findings regarding the oral hygiene habits of adolescents. According to the Bulgarian National Guidelines for the prevention of oral health, in the period of development, adolescents should brush their teeth twice a day-morning and evening, lasting between 2 and 3 minutes.

A study by Stecksén-Blicks and Gustafsson found that the use of fluoride toothpaste reduced caries risk and also the level of Lactobacilli (31). A study by Ashi proved this by examining the level of Lactobacilli in children who used fluoridated and non-fluoridated toothpaste (32). The cariostatic effect of toothpastes is well described and proven in the studies of Marinho et al. (33,34), an overall improvement in oral health was also observed with their use (35,36).

A survey conducted in Kosovo in 2020. found that more than 50% of the studied adolescents brush their teeth only once a day (37), which is also confirmed by our results.

The proximal surfaces of the teeth can hardly be cleaned with just a brush and toothpaste, so dental floss comes to the rescue. A study by Ericsson et al. found that only 4% of the adolescents studied flossed daily (38), which comes close to our results. According to a study by Mattos-Silveira et al. the main reason for

neglecting flossing among teenagers is lack of desire and time, as well as an unpleasant memory of previous dental treatment. (39) A study conducted among teenagers in Sweden, Portugal, and Romania found that 54% of the children surveyed never flossed, and 14.4% flossed daily (40).

In a study by Sbricoli et al. the majority of adolescents studied use a manual toothbrush, the use of an electric one is less prevalent and the use of an ultrasonic one is absent at all (41).

Results show poorer oral hygiene among boys with disturbances in the nutritional status. In a study by Olczak-Kowalczyk et al. the oral hygiene status of teenagers was investigated, finding higher values of gingival inflammation among males. (42) A study among adolescents in Portugal found higher DMFT index values in girls (43), which was also observed in us. In a study by Schmidt et al. the results show that boys have a lower prevalence of caries than girls (44). Other epidemiological studies (45) found differences between sex, oral-hygiene status and habits, with male oral-hygiene habits being unsatisfactory.

In a study by Marro et al., the relationship between excess body weight, prevalence of the carious process and gingival inflammation was demonstrated. (22) In addition, adolescents with disturbances in the nutritional status preferred the use of a manual toothbrush ( $p < 0.001$ ) and significantly lower use of dental floss ( $p = 0.05$ ). Results similar to our study. Panagiotou et al. concluded in their study that overweight and obese children are predisposed to plaque accumulation, development of carious process and gingival inflammation, reduced salivary flow and buffer capacity compared to children of normal body weight (15).

Poor oral hygiene and the development of caries significantly affect the adolescent's quality of life. Lack of aesthetics can lead to low self-esteem, negative emotional and social connections (47).

## Conclusion

Despite the established poor oral-hygiene habits of children with disturbances in the nutritional status, a major statistical difference was observed in the DMFT index. There was no significant difference in plaque accumulation and gingival inflammation in the studied groups.

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Mineva K, Georgieva-Dimitrova M, Bakhova A, Oral hygiene habits in adolescents with disturbances in the nutritional status, *Medinform* 2024; 11(2):1901-1909.