

REVIEW

from

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Member of the scientific jury appointed by order of the Rector of MU-Varna

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Regarding: Competition for the acquisition of the scientific degree "Doctor" by Dr. Kristiyana Lyubomirova Mineva.

Dr. Mineva was born on January 14, 1994. She graduated from the Geo Milev Mathematics High School in Pleven with outstanding academic performance in 2013. In 2019, she graduated from the Medical University "Prof. Dr. Paraskev Stoyanov," Faculty of Dental Medicine - Varna, with excellent results.

Professional Development:

- In 2020, she was appointed as a dentist at the University Medical-Dental Center in Varna.
- In 2021, she enrolled in a specialization in **Pediatric Dentistry**.

Academic Development:

- Since 2020, following a competitive selection process, she has been appointed as a full-time assistant in Pediatric Dentistry.
- In 2021, she commenced a full-time doctoral program on the topic of "Nutrition and its influence on oral health during adolescence".

Publications: 3

Participation in International Congresses: 2

Membership in professional organizations:

- Bulgarian Dental Union;
- Bulgarian Association of Pediatric Dentists;
- International Association of Pediatric Dentistry

Languages: Bulgarian, English.

The topic of the dissertation work of Dr. Kristiyana Lyubomirova Mineva is:

"Nutrition and its influence on oral health in adolescence".

"Let food be your medicine and medicine be your food"

Hippocrates

The days of following traditional family diets are gone. Modern lifestyle changes, such as shifts in maternal employment and decreased time for food preparation, have led us to rely more on fast food without really considering what we eat or how much. As a result, our children are increasingly gaining weight, which once was considered a sign of "good health" according to old standards. The consumption of pizzas, hamburgers, chips, and carbonated drinks has risen among school-age children. Visiting McDonald's has become common for many families, as children not only enjoy the food but also get toys there. Additionally, food and drink advertising, especially for sweets and snacks, appeal to children, fueling their desire to consume more. When diet becomes unmanageable, parents often turn to dieting methods and restrict the child's food, sometimes too late. During adolescence, overeating in relation to fitness and exercise presents another challenge, along with the use of energy drinks and stimulants that can cause health problems later. In some cases, due to social or economic factors, children have a limited or monotonous diet, which can also be damaging to their health.

Doctoral candidate Dr. Kristiyana Mineva has developed a critically significant research topic that addresses substantial health issues among adolescents: **"Nutrition and its influence on oral health in adolescence."** The submitted dissertation comprises 291 pages and draws upon 503 scholarly references, of which five are in Cyrillic script and 498 are in Latin script. The work includes 44 tables, 20 figures, and 20 appendices. The dissertation is structured into

Literature Review

The literature review is thorough and written with competence. It demonstrates the doctoral student's familiarity with nutrition, as well as the features and characteristics of a crucial developmental period in childhood—adolescence. The review describes the main nutrients, including macro and micronutrients, their properties, and the foods in which they are contained. It examines the features of adolescence and provides a characterization of this developmental stage. The structure adheres to the classifications of early adolescence (ages 10-13), middle adolescence (ages 14-17), and late adolescence or young adulthood (ages 18-21). The review gives particular attention to various food pyramids and their significance for health, emphasizing the principles of balanced nutrition. Additionally, the review underscores the significance of nutrition and nutrients in promoting oral health.

Based on the literature review, the justification for the research topic is established. Unhealthy nutrition during childhood and adolescence impacts overall health, increasing the risk of obesity, iron deficiency, dental caries, and periodontal disease. The role of nutrition in the development of caries is highlighted. Evidence from the literature indicates that impaired nutritional status in adolescents correlates with plaque accumulation, gingival inflammation, and the presence of oral lesions. *This provides the doctoral candidate with a rationale to demonstrate the impact of nutrition on adolescent oral health.*

The aim is formulated clearly and precisely.

The objectives are delineated as follows:

1. To evaluate a comprehensive analysis of the nutritional status of children aged 11-17 years. This task encompasses:
 - Examination of anthropometric indicators;
 - Evaluation of diet quality;

- Investigation of dietary indicators in adolescents.
- 2. To undertake a comparative assessment of oral health among children aged 11-17 years with compromised nutritional status, with or without considerations of the implementation of specific preventive measures and nutritional recommendations.
- 3. To formulate contemporary recommendations and guidelines for regulated, balanced nutrition concerning oral health in adolescents aged 11-17 years, based on a review of current literature and the results obtained.

The hypotheses are precisely delineated and are consistent with the established aim and objectives.

Material and Methods

The material and procedures outlined in this dissertation are organized and systematic, aligning with the specified objectives.

Material and Methods for Objective 1

A cross-sectional study was executed over a one-year period (2023-2024). A purposive sample comprising 300 adolescents aged 11 to 17 years, who attended a primary dental examination at the University Medical and Dental Center at Varna Medical University, was selected.

The selection process adhered to rigorously defined inclusion and exclusion criteria. The participants were monitored for a duration of six months. The study population consisted of 300 adolescents within the age range of 11 to 17 years (157 males and 143 females) from the city of Varna and the surrounding region.

Observation units and criteria for observation were explicitly delineated.

Methods

- The following preparations were made: a questionnaire, a food diary, and two outpatient cards (pertaining to nutritional status and oral health).
- Documentary methods included an outpatient card for recording height, weight, BMI, and research indices related to nutritional status.
- An in-depth interview was employed as a qualitative method for data collection, aimed at achieving comprehensive insights into the subject of the study. A key component of this interview involved recording food and fluid intake for nutritional assessment. This encompassed aspects such as dietary diversity, dietary quality, dietary balance, dietary adequacy, and dietary excess.
- *The survey method* consisted of 38 questions, which were conditionally divided into a direct, individual, and anonymous survey designated for each research participant. The questions were grouped into three categories:
 - Physical activity, access to food, lifestyle, and valuable habits of the child;
 - Risk factors and frequency of eating;
 - Personal preferences and eating habits.

Material and Methods for Objective 2

A randomized controlled clinical trial featuring two parallel groups was conducted. The patients were observed over a period of six months. A total of 210 children, aged 11-17 years, presenting

with disturbances in the nutritional status from the city of Varna and its surrounding region, participated in the study. The participants were allocated into two groups: experimental and control.

The selection of patients was based on precisely defined inclusion and exclusion criteria. Observation units and specific signs to be observed were clearly delineated.

The following methodologies were employed:

- *Clinical methods:* Clinical and paraclinical techniques were utilized to evaluate oral hygiene status. All data were recorded using a specially designed outpatient chart. The children received treatment and prophylactic care from a single dentist.

The following indices were utilized:

- DMFT index - the most widely accepted index for reporting the prevalence of dental caries, examining 28 permanent teeth;
 - DMFS index — representing the total number of superficial caries, missing, and filled teeth;
 - Significant Caries Index — reflecting higher caries rates within each study population;
 - International Caries Detection and Scoring System;
 - Oral Hygiene Index Simplified (OHI-S);
 - Plaque Control Record (PCR);
 - Papillary Bleeding Index (PBI);
 - Gingival Index (GI).
- Statistical methods:
 - Descriptive statistical methods;
 - Hypothesis testing procedures.

Material and Methods for Objective 3

The study integrates international and Bulgarian scientific publications conducted in Varna, educational literature, guidance from international professional organizations, and results from own research on an experimental cohort of adolescents aged 11-17 years, with $1 \leq \text{BMIZ}$ score, from the city and surrounding region. The study spans a period of one year (2023-2024).

The units of observation include: dietary indicators, dental status, plaque accumulation, and gingival inflammation.

Signs of observation include:

- Oral health assessment indices (DMFT, DMFS, SiC, ICDAS, CarieScan Pro system, activity - A, and reversibility - R of carious lesions, PUFA, OHI-S, PCR, PFS, PBI, GI) - documented in an outpatient record created specifically for this study;
- A three-day food diary;
- A detailed questionnaire.

To accomplish the third task, data collection involved conducting a direct survey anonymously completed by participants, along with a three-day food diary, aimed at gathering information regarding personal dietary preferences, physical activity levels, food accessibility, lifestyle, harmful habits, risk factors, eating frequency, and habits. Additionally, a clinical trial was conducted to examine the progression of oral health indicators among the adolescents in the experimental group before and after the implementation of a preventive program focused on nutritional correction. This involved the use of a three-day food diary and a questionnaire to identify eating errors. Each participant in the experimental group received personalized nutritional advice. Based on the survey data and the summarized results from previous studies, 29 nutritional guidelines related to adolescent oral health were formulated. Moreover, informative and motivational materials were prepared for patients and their parents, emphasizing the influence of nutrition on overall health during adolescence.

Statistical Methods:

- Descriptive Methods

Frequency analysis was employed to determine the absolute and relative frequencies (%) of qualitative variables (nominal and ordinal). The results are presented in tabular format.

Variance analysis of quantitative variables involved calculating measures of central tendency, including the arithmetic mean and median, as well as variability indicators such as standard deviation, quartiles, interquartile range, and 95% confidence intervals.

Graphical methods were utilized to visually represent the results.

- Hypothesis Testing Methods

For assessing the normality of the distribution of quantitative variables, the Kolmogorov-Smirnov test was applied to samples over 30, and the Shapiro-Wilk test was used for groups of fewer than 30 participants.

Comparative analyses between two independent samples employed Student's t-test, Mann-Whitney U test, and Wilcoxon signed-rank test, depending on the distribution characteristics. For comparisons involving more than two groups, analysis of variance (ANOVA) and Kruskal-Wallis tests were performed, with subsequent Post Hoc analyses for multiple comparisons.

Categorical variable analysis utilized Pearson's χ^2 test, Fisher's exact test, and Cramér's V. To examine correlations, Pearson's correlation coefficient or Spearman's rank correlation coefficient were used.

Statistical analyses were conducted using the SPSS software for Windows, version 25, Jamovi version 2.4, and Microsoft Excel.

Results and Discussion

- A total of 300 adolescents participated in the study, comprising 157 boys and 143 girls aged 11 to 17 years, with a mean age of 13 years.
- The majority of children exhibited normal growth parameters. Based on the reviewed literature and the sample of 300 adolescents aged 11-17 years, a direct correlation between anthropometric indicators and oral health was not identified.

- 36.8% of the participants demonstrated normal body weight. The remaining subjects, who were overweight, showed changes in oral health status, including carious lesions, plaque accumulation, and gingival inflammation.
- The survey provided insights into physical activity, food access, lifestyle habits, harmful behaviors, risk factors, eating frequency, dietary practices, and personal preferences.
- Regarding nutritional assessment and DQI-A scores, a statistically significant difference was observed ($p < 0.05$). Notably, the highest percentage of participants exhibited low diet quality.
- A correlation was identified between physical activity levels and diet quality. Adolescents with moderate physical activity tended to have an average diet quality, whereas all boys with no physical activity demonstrated low diet quality. Most girls without physical activity also had low diet quality.
- The highest stress levels were recorded among adolescents with low diet quality. A moderate negative correlation was found between total stress levels and hours of sleep, where increased stress was associated with fewer hours of sleep per day and night. Additionally, a relationship between sleep duration and screen time was noted.
- No definitive relationship was established between daily smoking and diet quality. A weak positive correlation was observed between stress levels and the consumption of various types of coffee. Gender distribution indicated that higher levels of stress, smoking, and coffee intake were more common among females.
- Gastrointestinal complaints were most prevalent among adolescents with poor diet quality. Conversely, those with high-quality diets reported symptoms such as heartburn, nausea, bloating, flatulence, diarrhea, and constipation to a lesser extent. A correlation was identified between overeating, gastrointestinal symptoms, and oral health status, noting that females who ate irregularly were more likely to have a low or medium diet quality, alongside increased active carious lesions, caries complications, plaque formation, and gingival inflammation.
- Violations in dietary regimens in both groups contributed to lower diet quality and concomitant worsening of oral health conditions.
- Food preparation methods significantly impact diet quality and oral health, regardless of whether they pertain to main or intermediate meals.
- Adolescents adhering to high-quality diets tend to overeat the least, which positively influences oral and gastrointestinal health.
- Legume consumption correlates with enhanced diet quality and fewer alterations in oral health status.
- Most adolescents displayed resistance to fruit intake. Poor diet quality and reversible oral changes were observed among this group.
- The processing of food plays a crucial role; consuming raw foods correlates with better diet quality and oral health. Conversely, intake of fried foods is associated with average to low diet quality, plaque buildup, caries formation, and gingivitis.
- Adequate hydration, including water and other fluids, is essential. Reduced water intake—due to various reasons—contributes to lower diet quality, with beverages such as teas, juices, carbonated drinks, and energy drinks further exacerbating this issue.
- All adolescents with impaired nutritional status, including overweight and obese individuals, exhibited signs of dental caries, such as lesions, restorations, or

complications, along with increased plaque accumulation and gingival inflammation, as indicated by various indices (DI-S, CI-S, OHI-S, PCR, PFS, PBI, and GI).

- Enhancing dietary quality results in improved nutritional and oral health status among the adolescents studied. Specifically, a 22% increase in the DQI-A score was associated with notable improvements in oral health indices, including reduced activity of carious lesions, dentinal caries development, caries complications, plaque accumulation, and gingival inflammation, thereby improving the overall oral health risk profile.

Implications

Following an extensive review of the subject "Nutrition and Its Influence on Oral Health in Adolescence," seven key conclusions have been drawn. Each underscores the significance of nutrition for adolescent health, particularly concerning oral health.

- The prevalence of overweight and obesity is identified as a primary concern during adolescence. More than two-thirds of the studied adolescents are classified as overweight or at risk of obesity.
- It is confirmed that the majority of adolescents exhibit poor dietary quality.
- Evidence indicates that age and gender affect dietary quality, with gender-specific influences impacting the nutritional status of the studied individuals. Females demonstrate poorer nutritional indicators compared to their male counterparts.
- The research reveals that low dietary quality correlates with increased stress levels, prolonged screen time, lack of physical activity, minimal water consumption, overeating, preference for high-calorie snacks, daily intake of confectionery and foods with added sugars or honey, fast foods, iced teas, sweetened teas, fruit and natural juices, soft and energy drinks, and detrimental habits such as smoking, alcohol consumption, and coffee intake.
- Conversely, adolescents with higher dietary quality tend to consume home-cooked meals, favor raw foods, seeds, nuts, higher quantities of dairy products, white meats, artificial sweeteners, food additives, and show interest in nutritional labels, including components, caloric content, and food quality.
- **An essential conclusion, based on comprehensive nutritional studies, is that improving dietary effectiveness primarily benefits the reduction of carious lesions, limits the progression of dentinal caries and associated complications, decreases plaque accumulation and gingival inflammation, and enhances the overall oral health profile of adolescents.**

Contributions

Original Contributions:

1. *For the first time in our country, the DQI-A score has been utilized to investigate the efficacy of the diet and a correlation with anthropometric indicators in adolescents aged 11-17 years has been established.*
2. It has been demonstrated that the decline in the diet quality index (DQI-A score) is influenced by gender and age of the adolescents studied, as well as their dietary patterns, frequency of meals, diet composition, type, quantity, and quality of consumed foods during main and intermediate meals, alongside risk factors, personal preferences, and eating habits.

3. It has been confirmed that adolescents who scrutinize the composition, content, and caloric value on food labels tend to have higher DQI-A scores.
4. *For the first time, the progression of key oral health indicators following dietary improvement (measured by the DQI-A score) has been documented, through the implementation of specific nutritional recommendations within a preventive program targeting the studied adolescents.*
5. *An algorithm comprising 29 nutritional suggestions has been developed and validated to enhance dietary practices related to oral health in adolescents.*

Confirmed Contributions:

1. *It is confirmed that the primary concern among adolescents pertains to their body weight, which accounts for the majority of studies focusing on overweight conditions and the classification of individuals within the "risk of obesity" group.*
2. A direct correlation has been established between various physical activities, the efficacy of dietary interventions, and water intake in adolescents.
3. It has been substantiated and demonstrated that the overall stress level in adolescents is influenced by limited sleep duration on weekdays, increased coffee consumption, prolonged screen time, and eating in front of screens, factors which also contribute to a suboptimal dietary quality.
4. *It is confirmed that the intake of sweetened foods and beverages, as well as "fast foods," correlates with a lower DQI-A score in adolescent girls and boys with compromised nutritional status, along with deterioration in their oral health indicators.*
5. A robust functional relationship has been affirmed between the criteria for the severity of carious lesions, as per the ICDAS system, and spectroscopy measurements obtained via the CarieScan Pro device.

The dissertation entitled "Nutrition and Its Influence on Oral Health in Adolescence" serves as a testament to the knowledge and competencies of the doctoral candidate, Dr. Kristiyana Mineva. The conducted research and analysis of the results distinctly demonstrate the variations in oral health among adolescents, influenced by factors such as obesity, stress, and dietary habits.

Having a clear concept and defined objective facilitates successful implementation. The doctoral work has accomplished these aims, thereby affirming the adage that "Theory is a treasure, the key to which is good clinical practice."

In conclusion, the work presents a clearly articulated goal, completed objectives, well-interpreted results, and precise, unambiguous implications.

It is with great respect that I propose to the esteemed scientific jury to confer upon Dr. Kristiyana Lyubomirova Mineva the educational and scientific degree of "Doctor" in the professional field 7.2 "Dentistry" with specialization in "Pediatric Dentistry."

26.06.25

Prepared

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/Professor Dr. Dimitrichka Bliznakova, DM, PhD/