Review by

From: Assoc. Prof. Dr. Janet Kirilova Nikolova, PhD

Department of Conservative Dentistry,

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Medical University – Sofia, member of the scientific jury under Order No R-109-200 / 15.07.2024 of the Rector of MU-Varna

Concerning: Dissertation on the topic "Study of the influence of some factors on teeth whitening" by Dr. Silvia Evtimova Stankova for awarding the educational and scientific degree **"Doctor"** in the doctoral program "Therapeutic Dentistry" in the professional field 7.2. Dental Medicine, the field of higher education 7. Health and sports.

Author: Dr Silvia Evtimova Stankova, PhD student at the Department of Operative Dentistry and Oral Pathology, Faculty of Dental Medicine – Varna.

Supervisor: Prof. Dr. Vladimir Panov, PhD.

1. General presentation of the procedure and the PhD student

The presented set of paper materials is complete following the procedure for acquiring a doctorate degree at MU-Varna and the regulations of MU-Varna.

The PhD student, Dr. Silvia Evtimova Stankova, has made a significant and commendable contribution to the field by attaching 3 published articles related to the dissertation.

2. Brief biographical data of the PhD student

Dr Silvia Evtimova Stankova's academic journey began with her secondary education at the Language High School in Vidin in 1997. 2003 she graduated from the Medical University of Plovdiv, Faculty of Dental Medicine. Since 2008, she

has been an assistant professor at the Department of Operative Dentistry and Endodontics at the Medical University of Plovdiv, FDM. She acquired a speciality in Operative Dentistry and Endodontics in 2012. The PhD student is proficient in both spoken and written English and Russian.

3. Relevance of the topics and appropriateness of the set goals and objectives

Teeth whitening is a sought-after and desired procedure in everyday dental practice. Today, our patients are incredibly demanding of appearance, and smiling is essential to everyday communication. Teeth whitening is a procedure performed with acidic products in different concentrations to affect the colour of the teeth. However, the discolouration of the teeth is accompanied by undesirable effects, such as hypersensitivity of the treated teeth and disruption of the enamel structure. Studying factors related to teeth whitening, such as the duration of the procedure, the concentration of the whitening agent, changes in enamel and others, is essential to optimise the effects of whitening.

Given the increasing demand for teeth whitening procedures and the potential associated risks, the dissertation topic is relevant and significant. Dr Silvia Evtimova Stankova's study on the influence of factors on teeth whitening is a crucial contribution to dental medicine.

The dissertation, presented in a structured manner, contains 173 typewritten pages, 94 figures, and 22 tables. It is organised into sections such as an introduction, literature review, purpose and objectives, materials and methods, results and discussion with conclusions, conclusion, main contributions, publications, and announcements related to the dissertation. The comprehensive bibliography, consisting of 424 sources, further underscores the depth of the research.

4. Knowledge of the problem

The introduction is on 1 page. It is written clearly and introduces precisely to the problem.

The Literature Review

The literature review, purposefully designed to provide a deep understanding of the topic, is 44 pages long. It explores problems related to teeth whitening, the mechanism of whitening, the methods for evaluating the whitening effect, the

influence of various physical and chemical agents on the whitening effect, and possible adverse effects after teeth whitening.

Dr. Stankova logically deduces the purpose of the dissertation to study the experience of dentists and patients regarding teeth whitening methods and to investigate the influence of some physical and chemical factors on the mechanism of whitening and the effects of whitening products on teeth. To solve the goal, the author works on four tasks with six subtasks, which is enough to achieve the goal.

5. Methodology of the study

The attached materials and the selected methodologies are described in detail on 17 pages. We work with 150 dentists and 122 patients, with 43 extracted teeth. The author applied a test to idometrically determine the actual concentration of hydrogen peroxide in the bleaching agent; UV-VIS spectroscopy to determine the base substance and compare the bleaching effect of hydrogen peroxide on black tea extract, Study of the result of bleaching by different concentrations of hydrogen peroxide; Study of enamel morphology and roughness as a result of bleaching.

6. Characteristics and evaluation of the dissertation

Results and discussion are written on 82 pages. The results are described in detail and illustrated with figures and tables. Judgment follows the results of each task and ends with conclusions.

Task 1. A survey of the opinion of dentists and patients regarding whitening methods. The results and conclusions establish that doctors of dental medicine are well aware of whitening procedures. In-office whitening with a 25-40% concentration of hydrogen peroxide, activated with light, is preferred. As a side effect of whitening, tooth hypersensitivity is mainly indicated, and calcium-phosphorus compounds are preferred to affect it.

The results of task 1.2 are based on a patient survey. It is proven that 37% of women use whitening to improve aesthetics, and a large percentage of respondents, 79%, want teeth whitening. The results of this task establish the socially significant effect of the teeth whitening procedure and the need for the professional work of the doctors of dental medicine. **This is a substantial**

original contribution to the dissertation development, highlighting the value of research.

Task 2. Dr Stankova compares the different concentrations of hydrogen peroxide in bleaching agents and how the products are activated. He used an iodometric methodology. He found that activation with light with a wavelength of 450 nm and an electric current leads to an increase in the concentration of hydrogen butterfly with a peak of 5 minutes. The author found that when bleaching products with blue light are activated, the whitening effect occurs twice as fast as those without blue light activation. **This is an original contribution to the dissertation development.**

Proving these effects in teeth whitening, Dr Stankova considers the need for this to be reflected in the application protocols but with additional tests.

Task 3. Dr Stankova reports on the application of various products, such as ferrous sulfite, catalase, and horseradish peroxidase, added to the activation system of bleaches to reduce the concentration of hydrogen peroxide. Adding metal oxides and enzymes aims to reduce the side effects of teeth whitening, such as damage to odontoblasts and the cytotoxic effect on dental pulp.

Dr Stankova proves that adding metal oxides and enzymes reduces the need for high concentrations of hydrogen peroxide from 35 to 10%. However, a violent exothermic reaction is observed, and therefore, further research is needed to include these products in bleaching agents. This is an original contribution to the dissertation development.

In task 3.2, Dr Stankova compares two methods of measuring the effect of bleaching: the visual Vita method and the spectrometric method. The author does not find a statistically significant difference between the two methods. This is a **confirmatory contribution.**

Task 4. Side effects after applying whitening procedures are associated with changes in the enamel tissue of the teeth - an increase in the roughness and micropermeability of the tooth surface or a decrease in superficial and subsurface microhardness. Dr. Stankova investigated changes in the roughness of the enamel after applying a bleaching agent with various activators. He found that the roughness after applying ferrous sulfate to the activating system was most significant. It is the smallest when using a factory product. This study proves the

results obtained objectively and has a **confirmatory contribution to the dissertation.**

7. Contributions and relevance of the development to science and practice

There are three contributions of the original character and 4 of the confirmatory character.

8. Evaluation of the publications on the dissertation

In the main parts of the dissertation, Dr Stankova is a leading author in the research, emphasising the doctoral student's contribution. Some of the tasks were done with collaborators, which shows Dr Stankova's ability to work in a team. The clinical studies were done and followed personally by the dissertation.

9. Abstract

The content and quality of the abstract, with a conclusion, are 64 pages and meet the requirements. It reflects the main results, findings, and contributions of the dissertation.

10. Personal impressions

Dr. Stankova has done significant work, which resulted in the dissertation. The way the research is presented and the logical and detailed discussion of the results are impressive.

11. Recommendations for future use of dissertation contributions and results

Dr Stankova reports that changes in the teeth whitening protocol can be examined based on the tests carried out, but additional tests are needed in this area. Dr Stankova, in his dissertation, made some technical inaccuracies, which did not reduce the results achieved.

Dr Stankova is welcome to present the results of her dissertation to dentists. The current work can also be delved into to create a new whitening product.

CONCLUSION

The dissertation **contains scientific, scientifically applied and applied results that represent an original contribution to science** and **meet all the requirements** of the Law on the Development of the Academic Staff in the Republic of Bulgaria (RASRB), the Regulations for the Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the relevant Regulations of the Medical University - Varna. The presented materials and dissertation results **fully** comply with the specific requirements of MU-Varna.

The dissertation shows that the PhD student **Dr Silvia Evtimova Stankova** has in-depth theoretical knowledge and professional skills in the scientific specialty "Therapeutic Dentistry", in the professional field 7.2. Dental Medicine, a field of higher education 7. Health and Sports by demonstrating qualities and skills for independent scientific research.

Because of the above, I confidently give my positive assessment of the research carried out, presented by the above-reviewed dissertation, abstract, results achieved and contributions. ***I propose to the honourable scientific jury to award the educational and scientific degree of 'Doctor' to Dr Silvia Evtimova Stankova*** in the doctoral program in "Therapeutic Dentistry" in the professional field 7.2. Dental Medicine, a field of higher education 7. Health and sports.

01.09.2024 Assoc.Prof. DR Janet Kirilova

Sofia