

REVIEW

by Assoc. Prof. Petya Georgieva Hadzhigeorgieva-Kanazirska, DDM, PhD

Faculty of Dental Medicine, Medical University – Plovdiv

**regarding the dissertation submitted for the award of the Educational and Scientific Degree
“Doctor (PhD)”**

Professional Field: 7.1 Medicine

Doctoral Programme: “Anatomy, Histology and Cytology”

Author : Dr. Zlatizara Hristova Todorova

Form of study: Independent doctoral training

Department : Anatomy, Histology and Embryology

Dissertation title : “Anthropological Characteristics of the Facial Skull and Apertura Piriformis in the Bulgarian Population from Southern Bulgaria: Measurements Based on 3D Reconstructions of Computed Tomography Scans”

Scientific Supervisor : Assoc. Prof. Ferihan Ahmed-Popova, MD, PhD

1. General Presentation of the Procedure and the Candidate

The submitted documentation, provided in both printed and electronic formats, fully complies with the requirements of Article 70(1) of the Regulations for the Acquisition of the Educational and Scientific Degree “Doctor (PhD)” and the Scientific Degree “Doctor of Science” at the Medical University – Plovdiv (adopted on 28 January 2021).

The documentation set includes all required materials, namely:

- application to the Rector of MU-Plovdiv for disclosure of the procedure for defending a dissertation
- CV in European format with the signature of the doctoral student
- notarized copy of higher education diploma
- orders for enrollment in doctoral studies; for withdrawal with the right to defense
- order for conducting an exam from the individual plan and a corresponding protocol for passing the exam and doctoral minimum in the specialty
- protocol of the department council for preliminary discussion of the doctoral thesis and the decisions made to open a procedure and for the composition of the scientific jury
- dissertation
- abstract
- list of scientific publications on the topic of the dissertation
- copies of scientific publications

- list of participation in scientific forums
- declaration of originality and authenticity of the attached documents

The candidate has submitted four publications directly related to the dissertation topic. All materials are properly prepared and meet the formal requirements. No critical remarks are identified.

2. Biographical Data of the Candidate

Dr. Zlatizara Todorova was born in 1984 in Kazanlak, Bulgaria. She completed her secondary education in 2003 and graduated from the Medical University – Plovdiv in 2009. Since 2020, she has been affiliated with the Department of Anatomy, Histology and Embryology, initially as a part-time assistant and subsequently, since 2021, as a full-time assistant. She is currently specializing in “Anatomy, Histology and Cytology.” In parallel, she has been practicing as a dentist since 2009.

Dr. Todorova is actively engaged in teaching activities in both Bulgarian and English, conducts continuous assessment of students, and demonstrates commitment to academic excellence. She possesses excellent organizational, social, and technical skills. She is fluent in English and has basic proficiency in French. She is a member of several professional organizations, including the Bulgarian Anatomical Society, the Bulgarian Anthropological Society, the Union of Scientists in Bulgaria, and the Bulgarian Dental Association.

3. Relevance and Scientific Significance of the Research Topic

The dissertation topic is highly relevant and significant in both theoretical and applied scientific contexts. It is pertinent to disciplines such as anthropology and archaeology, as well as to clinical medical and dental specialties.

The study introduces an innovative methodological approach by evaluating the apertura piriformis as a reliable indicator for sex determination based on three-dimensional reconstructions derived from computed tomography. This contributes to the advancement of forensic anthropological and morphometric analyses.

Furthermore, the research provides a theoretically grounded framework for systematic measurement and comparative analysis of key morphometric parameters of the facial skull. The findings have potential applications in forensic medicine, plastic and reconstructive surgery, maxillofacial surgery, orthognathic surgery, neurosurgery, otorhinolaryngology, orthodontics, and prosthetic dentistry.

4. Knowledge of the Research Problem

The candidate demonstrates excellent knowledge of the research field and a high level of competence in critically analyzing scientific literature. The literature review is comprehensive, well-structured, and analytically sound. Based on the reviewed literature, the author convincingly substantiates the relevance of the study, identifies existing gaps, and formulates clearly defined research objectives, four specific tasks, and a working hypothesis.

5. Research Methodology

The applied methodology is appropriate and fully aligned with the objectives of the study. The research design is well-conceived and ensures the validity and reliability of the obtained results. The study includes 120 participants of Bulgarian origin (55 males and 65 females), aged between 20 and 60 years. Clear inclusion and exclusion criteria are defined. Contemporary statistical and analytical methods are employed, including descriptive, correlation, and discriminant analyses. The methodology is described in detail, including the applied imaging techniques, measurement protocols, craniofacial landmarks, and statistical procedures.

6. Evaluation of the Dissertation

The dissertation is structured in accordance with established academic standards and includes the following sections: introduction, literature review, aim and objectives, materials and methods, results, discussion, conclusions, and references. The manuscript comprises 146 pages and is supported by 27 tables and 57 figures.

The literature review is structured into 5 main sections and 14 subsections on 32 pages, constituting 21% of the dissertation work: historical overview, evolutionary development of the facial skull and nasal cavity, sexual dimorphism, significance of the apertura piriformis, research methods. The literature review shows that the doctoral student Dr. Zlatizara Todorova knows the main approaches for establishing and confirming gender by cranial characteristics, namely: non-metric (scopic) - by observation and description of prominent bone marks; metric - by placing craniometric points on the skull and measuring parameters (distances, angles, volume). As well as the measurement methods: classical - by direct measurement on skulls; modern - by measurement on two-dimensional or three-dimensional models.

The aim of the dissertation work to make an anthropological characterization of the facial skull and apertura piriformis in individuals from the Bulgarian population and to carry out an inter-

sex comparison to assess sexual dimorphism, both in the Bulgarian population and with individuals from other populations, is clearly formulated.

The tasks and working hypothesis are precisely formulated to meet the objectives of the study: 1. To make an anthropological characterization of the dimensions of the facial skull and apertura piriformis and to calculate cranial indices in individuals from the Bulgarian population; 2. To determine the correlation between the dimensions of the facial skull and the dimensions of the apertura piriformis for the purposes of plastic and aesthetic surgery; 3. To make an inter-gender comparison of the data obtained from the anthropological measurements; 4. To evaluate the anthropological data on the facial skull and apertura piriformis in the Bulgarian population for their reliability in determining sex and their application in forensic medical practice, anthropology, plastic and aesthetic surgery.

The material and methodology section contains 18 pages, which is 12.33% of the dissertation work. The collected material is in sufficient volume to obtain reliable results. 120 patients of Bulgarian ethnic origin (55 men and 65 women), aged 20 to 60 years, were studied. The criteria for inclusion and exclusion from the study are described. The applied methodology is described in great detail: the equipment and software with which the study was conducted; craniometric points - name, designation and location; the measured linear dimensions; the calculated cranial indices; an anthropometric sheet was made to document the measurements and calculations made and the methods for statistical analysis of the data. The methodology is illustrated with 23 figures, which facilitates the understanding of the conducted study.

The largest in volume is the chapter on results of own research – 39 pages, 26.71%. For the statistical and mathematical analysis, modern methods have been applied – descriptive analysis, correlation analysis, discriminant analysis and division of faces into rubrics according to nasal, orbital, maxillary, facial, transverse craniofacial and zygomatic-maxillary index. The results have been processed, analyzed and interpreted correctly and thoroughly.

In the summary and discussion section, the doctoral student skillfully summarizes the most significant results, incorporates a creative approach into the discussion plan with elements of interpretation of complex scientific information with the necessary criticality and analytical skills.

The conclusions drawn are made logically, summarizing the most significant findings.

7. Contributions and significance of the dissertation for science and practice

The dissertation contains clearly formulated and well-founded scientific, theoretical-methodological and scientific-applied contributions of high significance for anthropology and related disciplines.

Among the original contributions, the detailed anthropological characterization of the apertura piriformis and the facial skull in a population from Southern Bulgaria, based on modern 3D reconstructions from computed tomography, stands out. This represents a significant expansion of the anthropometric database on a national scale. Also, for the first time in Bulgaria, an assessment of the apertura piriformis as an indicator of gender differentiation has been proposed and validated, which can be considered a significant contribution to forensic anthropology.

The theoretical and methodological contributions are related to the development of an anthropometric model for the analysis of the facial skull, as well as the validation of morphometric indicators as reliable criteria for sex determination. These results have the potential to be used as a methodological basis in future scientific research.

The scientific and applied contributions are expressed in the creation of a reliable database for the Bulgarian population, which has direct application in forensic medicine, anthropology and clinical practice. Real opportunities for implementing the results are outlined.

In conclusion, the dissertation demonstrates significant scientific and applied contributions with potential for future development.

8. Assessment of dissertation publications

The publication activity of Dr. Zlatizara Todorova is in accordance with the requirements for obtaining the educational and scientific degree "doctor". A total of 6 full-text publications are presented, 4 of which are directly related to the topic of the dissertation, as well as 4 participations in scientific forums, which indicates active scientific communication.

The publications reflecting the results of the dissertation include 2 articles in refereed and indexed publications (Scopus and Web of Science) and 2 articles in scientifically reviewed, but not indexed journals. This distribution shows a desire to publish in internationally recognized sources, as well as to popularize the results in the scientific community.

In terms of content, the publications adequately reflect the main results of the dissertation research – the morphometric analysis of the facial skull and its application in anthropology and forensic medicine. There is consistency between the dissertation work and the published materials.

In general, it can be assumed that the doctoral student has a significant personal contribution to the development of the publications, which correctly present the results of the dissertation work.

9. Personal participation of the doctoral student

I highly appreciate the personal participation of the doctoral student in the realization of the dissertation work. The presented research shows that she actively participated in all stages of the scientific development – from the formulation of the goals and objectives, through the collection and analysis of empirical data, to the interpretation of the results and their presentation. It can be assumed that the main scientific and applied scientific contributions, as well as the obtained results, are to a significant extent her personal merit.

10. Abstract

The abstract reflects the content of the dissertation in 55 pages. It is well structured and illustrated according to the requirements for the development and defense of a dissertation for the award of the educational and scientific degree "Doctor". In terms of content and quality, it reflects in the best possible way the main results achieved in the dissertation.

11. Critical remarks and recommendations

All critical remarks suggested during the preliminary reviews have been discussed and reflected in the final version of the dissertation. No significant additional recommendations are required.

12. Personal impressions

From my personal impressions, the doctoral student is characterized by responsibility, consistency and a good level of scientific preparation.

13. Recommendations for future use of the dissertation contributions and results

The results of the dissertation work have significant potential for future development and application. It is recommended that they be implemented in practice, as well as expanding the research through a multidisciplinary approach and international cooperation.

CONCLUSION

The dissertation submitted by dr. Zlatizara Hristova Todorova represents an original and valuable scientific contribution and fully complies with the requirements of the law on the development of the academic staff in the Republic of Bulgaria, its implementing regulations, and the internal regulations of the Medical University – Plovdiv.

The overall assessment of the dissertation is highly positive. The work demonstrates that the candidate possesses in-depth theoretical knowledge and advanced research skills in the field of “Anatomy, Histology and Cytology,” as well as the ability to conduct independent scientific research.

In conclusion, I confidently express my “POSITIVE” evaluation and recommend that the esteemed members of the scientific jury award the educational and scientific degree “DOCTOR (PHD)” to dr. Zlatizara Hristova Todorova.

26.03. 2026 г.

Reviewer:



Заличено на основание
Чл.5 §1, б.“В” Регламент (ЕС)2016/679

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