

Review Article

A comparative study of the curriculum of a master's course in anesthesiology in Iran and the United States of America

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Abstract

Background & Objective: The field of anesthesiology is rapidly evolving in Iran, and there is a growing need to develop educational programs in this area. As such, the purpose of this research is to conduct a comparative analysis of the curriculum for master's courses in anesthesiology between Iran and the United States.

Material & Methods: This comparative descriptive study was conducted in 2023. To collect the necessary data, we extracted information from the websites of the Ministry of Health, Treatment, and Medical Education of Iran and Case Western Reserve University, respectively. Once the data was collected, we analyzed it using Bereday's model, which involves four key stages: description, interpretation, juxtaposition, and comparison.

Results: Based on the results of this study, it is recommended that both Iranian and American anesthesiology master's programs incorporate the principles of professional ethics in their curriculum. One major weakness of the anesthesiology master's curriculum in Iran is its focus on preparing students for careers in education and research rather than practical application in the field. However, Iran's anesthesiology major benefits from a strong foundation in both continuous and noncontinuous anesthesiology bachelor's courses. In terms of similarities, our comparative analysis of the two programs revealed that many courses offered in anesthesiology master's programs are similar, including courses on monitoring, pharmacology, and the principles of anesthesia.

Conclusion: The findings of this research have important implications for enhancing the anesthesiology master's curriculum in Iran, with a focus on improving education, research, and patient care. The results suggest that there is a need to revise the curriculum to better prepare graduates for practical application and to increase the role of graduates in the care of patients. Furthermore, the insights gained from this study can be used by educational planners to revise curriculum content and evaluation methods, with the goal of enhancing the quality of anesthesiology education and training in Iran.

Keywords: curriculum, anesthesiology, Iran, USA, master of science, comparative study

Introduction

Medical science education, as a part of the higher education system, is essential in addressing human life, and the overall health of society depends on the quality of training (1-2). With the widespread progress of various sciences and the advancement of software technology, significant strides have been made in all fields, particularly in the medical sciences. However, if appropriate and high-quality educational plans are not developed in the medical sciences, they could cause irreversible damage to society's health (1, 3).

Educational issues and goals are similar in almost all scientific societies, but the procedures and planning applied in teaching sciences and solving related problems are strongly influenced by the traditions and culture of each society (4). High-quality curricula are crucial for nurturing capable students for the future, and this goal can be achieved through the revision and amendment of educational planning (5).

One of the primary goals of medical science universities is to achieve a prominent scientific standing among the



countries in the region and to elevate their rank on a global scale (6-9). To achieve a significant place in the world, it is essential to consider the curricula of the world's leading universities (9).

Despite some recent improvements, Iran's educational system still has a moderate rank overall. Therefore, it is necessary to adopt the experiences of other countries and amend the system in certain aspects through an appropriate and successful educational approach to nurture qualified clinical staff (3).

In postgraduate medical education curricula, the production of knowledge for improved quality of care is an emphasized principle. In recent years, postgraduate education for nurse anesthetists has become a growing trend worldwide (10).

Nurse anesthetists have been playing a crucial role in providing anesthesia services in medical centers in the USA, Canada, and the UK for almost 150 years after completing a two-year course and obtaining a bachelor's degree in nursing (11). In response to the need for professional individuals to provide anesthesia services, new educational courses for non-physician staff, such as anesthesia assistants, have been developed since the 1960s. Anesthesiology educational courses are currently offered in many universities across the globe, including the USA, the UK, Australia, and India, through bachelor's, master's, and doctoral curricula (11).

The field of anesthesiology was first introduced as an associate's course in Iran in 1975 and continued until 2006. In 2006, a non-continuous bachelor's program in anesthesiology was developed, followed by student admission to continuous and non-continuous bachelor's courses nationwide. From the 2020–2021 academic year on, the master's course in anesthesiology resumed student admission, with the difference that its graduates have no clinical care role (12).

The master's course in anesthesiology in Iran considers this field a branch of medical sciences. In addition to enhancing their knowledge, attitudes, and skills in anesthesiology, students become familiar with taking care of patients under both general and local anesthesia using modern methods of medical science education during this program (11).

Since the master's degree in anesthesiology is a new field of study in Iran, there is a pressing need for educational development in this area. To date, no comparative study has been conducted to compare this field in Iran with other countries. However, an assessment of the evolutionary history of the world's educational systems shows that comparative studies are among the most

dynamic scientific methods that interest educational planners in leading countries. These studies have been recognized as prerequisites for designing modern educational systems (13).

Case Western Reserve University in the USA, established in 1826, offers over 100 fields of study. In 2008, the university expanded the educational planning of its master's course in anesthesiology to provide better services to the anesthesiology community (14). One of the reasons for selecting Case Western Reserve University in the USA for comparison with Iran is its reputation for training specialist medical staff. Given the university's superior standing and the need for the development of anesthesiology education, the researchers decided to conduct a comparative study, including values, beliefs, mission, history, credits, admission requirements, roles, and scientific capabilities, to determine the pros and cons of the master's course educational planning in this field in Iran and Case Western Reserve University in the USA.

Material & Methods

Design and setting(s)

This comparative descriptive research study was conducted to compare the master's course curricula in the field of anesthesiology between Iran and the USA in 2023.

Data collection methods

To collect and scrutinize the required data on the master's education curriculum in the field of anesthesiology in both countries, reliable Persian and English databases were searched, including Web of Science, Scopus, PubMed, SID, and Magiran, using the keywords "Master of Anesthesiology, Educational Planning, Curriculum, Iran, and the USA." Additionally, the details of the master's course curriculum in the field of anesthesiology in both countries were reviewed on related valid websites, such as the websites of the Ministry of Health, Treatment, and Medical Education of Iran (the Approved Program of the 72nd Session of the Supreme Council of Medical Sciences Planning, dated March 2018) (11) and Case Western Reserve University of the USA (14). To ensure accuracy and confirmability of the data collection, the process was independently performed by two investigators, and discussions were held to reach an agreement.

Data analysis

The famous method of George F. Bereday was used to conduct a comparative study. As per this method, two or more phenomena are placed next to each other, and their different and similar aspects are analyzed. The method comprises four stages, namely, description, interpretation, juxtaposition, and comparison.

In the description stage, the research phenomena are prepared based on evidence and information, note-taking, and providing adequate findings for investigation and criticism in the next stage. In the interpretation stage, the described data are checked and analyzed. In the juxtaposition stage, the data prepared in the previous two stages is categorized and combined to establish a framework for comparing similarities and differences. Finally, in the comparison step, the research problem is investigated and compared according to the details of similarities and differences and in response to the research questions (15, 16).

Results

The study results and the comparison of curricula in Iran and the USA regarding history, objectives, mission, student admission, curriculum content, and graduates' roles are presented in Tables 1-4.

In Iran, an anesthesiology educational course was established as an associate's course in 1975, and colleges continued to admit and train anesthesiology students until 2006. Due to advancements in anesthesiology science and the development of relevant equipment and technology to enhance the abilities of graduates in anesthesiology associates' degrees, educational planning for continuous and noncontinuous undergraduate courses in this field was formulated in 2006, and student admission was implemented in 2007, as per the request of the Ministry of Health, Treatment, and Medical

Education. The need for committed and professional staff to train students as residents in educational centers was felt more than ever to provide effective training and ensure the acquisition of graduates' essential capabilities. Consequently, the formulation and confirmation of the noncontinuous master's educational planning for anesthesiology were formulated, accepted, and approved by the authorities.

On the other hand, the field of anesthesiology at Case Western Reserve University was established in 1970. The university initially awarded bachelor's degrees, but in 1987, it turned into a professional master's course and began awarding master's degrees. In 2008, this university expanded its educational plans to provide the anesthesiology community with more services. The master's degree in anesthesiology lasts for two academic years at this university (Table 1).

The educational plans in Iran and the USA have a clear and transparent mission. In Iran, the mission of the plans is to train forces that are aware of current scientific issues, capable, responsible, and sensitive to the health of individuals and society, and who believe in the sanctity and importance of education. On the other hand, the mission of educational plans in the USA is to train the best anesthesiologists in the world (Table 2).

A comparative analysis of the curricula of the two countries revealed the similarity of many courses offered in master's courses in anesthesiology (Table 3).

Furthermore, graduates of the master's degree in anesthesiology in Iran can work in educational centers that hold bachelor's degree courses in educational planning in the field of anesthesiology, clinical research offices in hospitals, educational research centers, and research centers related to the field. On the other hand, graduates in the USA can work in educational, caring, and research centers. Additionally, they can work as hospital managers (Table 4).

Table 1. The history of the master's degree in anesthesiology in Iran and the USA

Compared Items	Iran*	USA**
History	<ul style="list-style-type: none"> •The idea of establishing a master's course in anesthesiology was first proposed in 2006. •The Approved Program of Anesthesiology was indeed in the 72nd Session of the Supreme Council of Medical Sciences Planning and was dated March 12, 2018. •Admission of 15 students to the first master's course in anesthesiology in 2020 is being offered by Ahvaz University of Medical Sciences, Iran University of Medical Sciences, and Kashan University of Medical Sciences. •Currently, student admission to master's courses is being offered by three universities of medical sciences. 	<ul style="list-style-type: none"> •In 1987, Case Western Reserve University started offering a master's course in anesthesiology. •In 2008, Case Western Reserve University expanded the educational planning of its master's course in anesthesiology to offer more services to the anesthesiology community. •To date, over 1000 students have graduated from the master's course in anesthesiology at Case Western Reserve University.

Notes: *The information related to the master's course curriculum in anesthesiology has been extracted from various reliable sources, including the current Approved Program of Anesthesiology in the 72nd Session of the Supreme Council of Medical Sciences Planning of the country (dated March 2018) as well as other scientific sources (10-11 and 17-20). **The information regarding the master's course curriculum in anesthesiology in the USA has been obtained from the website of the faculty offering this course, along with articles published on this subject (13 and 24-25).

Table 2. The values and beliefs, mission, perspective, and objectives of the master's course in anesthesiology in Iran and the USA

Compared Items	Iran*	USA**
Values and beliefs	<ul style="list-style-type: none"> • Applying the principles of professional and Islamic ethics in all aspects. • Promoting education in medical sciences to enhance the health of society. • Valuing the dignity, position, and status of human beings in society. • Upholding equality and protecting the rights of patients. • Practicing social justice by ensuring everyone has equal access to opportunities in society. 	<ul style="list-style-type: none"> • Striving for excellence in teaching and research. • Encouraging creativity and innovation as a reflection of our dedication. • Practicing ethical behavior. • Valuing and appreciating the unique viewpoints and talents of each individual.
Perspective	<ul style="list-style-type: none"> • Enhancing and promoting the quality of education in the field of anesthesiology. • Becoming one of the leading fields of study in medical science education at the national and regional levels within the next ten years. 	<ul style="list-style-type: none"> • Acknowledging the master's course in anesthesiology as a field and program that will have a significant international impact in the future.
Mission	<ul style="list-style-type: none"> • Educating individuals who are knowledgeable about current scientific issues, competent, responsible, and attentive to the health of individuals and society, and who recognize the sanctity and value of education. • Utilizing their expertise in theoretical and practical training to instruct undergraduate anesthesiology students. • Playing a significant role in advancing and elevating the field of anesthesiology by delivering outstanding research services. 	<ul style="list-style-type: none"> • Preparing the finest anesthesiologists globally. • Producing skilled and compassionate anesthesiologist assistants upon graduation.
Objectives	<ul style="list-style-type: none"> • Offering full-time educational staff for continuous and non-continuous anesthesiology undergraduate courses • Appointing local educational staff in underprivileged regions of the country • Fostering academic drive among anesthesiology students • Enhancing the quality of education in anesthesiology educational centers, particularly in the internship setting. 	<ul style="list-style-type: none"> • Enhancing patient care skills (such as preoperative assessment, equipment preparation, and postoperative care), practice-based learning, interpersonal and communication skills, and professionalism.

Notes: *The information concerning the master's course curriculum in anesthesiology was extracted from the current Approved Program of Anesthesiology in the 72nd Session of the Supreme Council of Medical Sciences Planning of the country (dated March 2018) and other reliable scientific sources (10-11 and 17-20). **The information concerning the master's course curriculum in anesthesiology in the USA has been extracted from the website of the faculty holding this course, as well as the articles published in this regard (13 and 24-25).

Table 3. The entrance requirements and methods of admission, course features and structure, and curriculum content of a master's course in anesthesiology in Iran and the USA

Compared Items	Iran*	USA**
Student admission requirements and ways	<ul style="list-style-type: none"> • Achieving a minimum grade point average of 12 out of 20 in the undergraduate course. • Taking the national exam. • Gaining admission without examination by being selected as a national top or elite student in the continuous/non-continuous undergraduate course and achieving the first rank with a total grade point average of at least 17 among students of the same field of study and the same admission year of the university in the place of education, graduating within a maximum period of eight semesters. • Possessing a bachelor's degree in anesthesiology. • Having excellent physical and mental health. • Believing in and being committed to adhering to professional principles and values in performing clinical, educational, and research services. 	<ul style="list-style-type: none"> • Possessing a bachelor's degree from one of the leading universities in the United States, Canada, or an equivalent institution. • Holding a certificate for prerequisite courses, such as physiology, from a top institution of higher education in the United States or Canada. • Taking the entrance exam • Meeting physical and technical requirements, such as physical health and communication skills. • Completing a one-year English language training course at a higher education institution in the United States or Canada.
Course structure and features	<ul style="list-style-type: none"> • Education is provided as a full-time course. • The master's course in anesthesiology has a duration of two years. • The education is based on the credit system, and the value of each lesson is evaluated by the number of credits it is worth. • Each lesson credit is determined by the amount or rate of the lesson, which comprises 17 theoretical hours, 34 practical hours, 51 internship hours, and 68 training hours, all of which are covered during one academic semester, according to the Approved Program of the Supreme Council of Medical Sciences Planning. 	<ul style="list-style-type: none"> • Education is provided as a full-time course. • The master's course in anesthesiology has a duration of two years. • The value of each lesson is evaluated by the number of hours of that lesson. • The curriculum has a higher ratio of clinical hours to theoretical hours.
Curriculum content	<ul style="list-style-type: none"> • The master's course in anesthesiology consists of 32 credits, which include: - 24 specialized obligatory credits (Core) with courses on Teaching-Learning Methods (2 credits), Lesson Planning (1 credit), Student Appraisal Methods (2 credits), Advanced and Safety Monitoring (2 credits), Application of Drugs in Anesthesia (2 credits), Principles and Techniques of Anesthesia (2 credits), Anesthesia 1 (2 credits), Anesthesia 2 (2 credits), Critical Care (2 credits), Patient Introduction (1 credit), Internship 1 (2 credits), Internship 2 (2 credits), and Bedside Training Internship (2 credits). - 2 specialized credits - optional (non-core) - Thesis (6 credits) 	<ul style="list-style-type: none"> • The master's course in anesthesiology involves 2070 teaching hours, which include: - 42 hours of basic and clinical science training in the first year with lessons on Electrocardiography 1 and 2 (2 hours), Patient Monitoring 1 and 2 (4 hours), Introduction to Anesthesia (2 hours), Tendency to Clinical Experience (3 hours), Introduction to Simulation Based on Physiological Model (1 hour), Applied Physiology 1 and 2 (6 hours), Anesthesia

Clinical Experience 1 and 2 (7 hours), Anesthesiology Clinical Correlation 1 and 2 (2 hours), Pharmacology for Anesthesia Assistants 1 and 2 (6 hours), Clinical Decision-Making in Anesthesiology 1 and 2 (6 hours), Anesthesiology Skills Laboratory (1 hour), and Simulation Based on Physiological Model 1 and 2 (2 hours). - 28 hours of clinical training in the second year with lessons on Anesthesia Clinical Experience 3, 4, and 5 (20 hours), Ethics and Law for Anesthesia Assistants (2 hours), Anesthesiology Clinical Correlation 4 and 5 (2 hours), Principles of Safe Anesthesia and Scientific Review 1 and 2 (2 hours), and Simulation Based on Physiological Model 3 and 4 (2 hours). - 500 hours of direct patient care in the first year. - 1500 hours of direct patient care in the second year.

Notes: *The information concerning the master's course curriculum in anesthesiology was extracted from the current Approved Program of Anesthesiology in the 72nd Session of the Supreme Council of Medical Sciences Planning of the country (dated March 2018) and other reliable scientific sources (10–11 and 17–20). **The information concerning the master's course curriculum in anesthesiology in the USA has been extracted from the website of the faculty holding this course, as well as the articles published in this regard (13 and 24–25).

Table 4. The role, evaluation, and tuition of the master's course in Anesthesiology in Iran and the USA

Compared Items	Iran*	USA**
Graduate's roles	<ul style="list-style-type: none"> • Educational • Research 	<ul style="list-style-type: none"> • Educational • Caring • Research • Management
Evaluation	<ul style="list-style-type: none"> • Written • Oral • Portfolio • Logbook • Objective Structured Practical Examination (OSCE) • Direct observation of practical skills 	<ul style="list-style-type: none"> • Midterm and final written exams • Use of simulated clinical rooms • Observing student performance in the way of treating and communicating
Tuition	<ul style="list-style-type: none"> • The tuition for the master's course at medical sciences universities of the Ministry of Health is free in the daily course but must be paid by the student in the international course. 	<ul style="list-style-type: none"> • The tuition for the master's course must be paid by the student and is paid at the beginning of the summer, fall, and spring seasons of each year.

Notes: *The information concerning the master's course curriculum in anesthesiology was extracted from the current Approved Program of Anesthesiology in the 72nd Session of the Supreme Council of Medical Sciences Planning of the country (dated March 2018) and other reliable scientific sources (10–11 and 17–20).

**The information concerning the master's course curriculum in anesthesiology in the USA has been extracted from the website of the faculty holding this course, as well as the articles published in this regard (13 and 24–25).

Discussion

The aim of the present research was to compare master's educational planning in anesthesiology between Iran and the USA. Based on the comparisons made in each of the components of educational planning at the universities of Iran and Western Reserve University in the USA, the following cases can be discussed:

The important items in Iran's educational planning for master's courses in anesthesiology include education and research, the training of proficient and experienced forces to work in educational centers for the influential training of anesthesiology undergraduate students in educational centers, attendance in clinical research offices in hospitals and educational and research centers, and work in research centers in the field of anesthesiology, such as anesthesia research centers, pain management, and special care, as committed and specialized forces (5). On the other hand, American educational planning emphasizes training graduates who

are sufficiently proficient in all three domains of education, research, and clinical work (14). Likewise, in Australia, a country with an advanced healthcare system, master's degree graduates in anesthesiology possess comprehensive clinical expertise, and the development of assessment, planning, implementation, and evaluation skills to provide proper anesthesia patient care is of special importance (22).

Based on the study results, it can be concluded that the master's degree in anesthesiology in the USA has a longer history than that in Iran. This field of study is relatively new in Iran, and student admission has been implemented in only four courses in the master's course in anesthesiology thus far (12, 14). Therefore, it can be acknowledged that postgraduate education in the field of anesthesiology in the USA has had more opportunities to be introduced to the world community than that in Iran. The values and beliefs of both educational plans are based on the beliefs and values of society. It is suggested

that the fundamentals of professional ethics should be applied and ethical behaviors should be exhibited at the time of providing services in both educational plans. The educational plans in Iran and the USA have clear and transparent missions. The anticipation of a ten-year perspective is for the master's degree in anesthesiology to be one of the prominent fields of study in medical science education at the national and regional levels in Iran. On the other hand, the effectiveness of the master's course in anesthesiology at the international level in the future is the mission of Case Western Reserve University (11, 14). However, in Iran, this mission has been defined within geographical boundaries and the region. Given the role of Iran among other countries, attention to international education seems to have been neglected in formulating the goals and mission of this field. The results of Raholm et al.'s study indicate that the establishment and development of education in postgraduate courses play an essential role in learners' professionalization (17). Similarly, Barzouee et al.'s study underlines the necessity of expanding postgraduate education in the global community (2). At the same time, there is no field of study with the same name as anesthesiology in the PhD course in Iran (23). Therefore, it is crucial to establish and expand postgraduate education in PhD courses for a master's degree course in anesthesiology in the field with the same name or considering the high similarity of the curriculum of this field with some master's fields of study in nursing, such as critical care nursing (8, 24, 25).

The conditions and methods of student admission to the master's degree course in anesthesiology differ between Iran and the USA. In the USA, there are no continuous or noncontinuous bachelor's courses in anesthesiology, and a bachelor's degree from one of the top universities in the USA, Canada, or its equivalent suffices to be admitted to a master's course in anesthesiology (14). In addition to the mentioned requirements, it is also necessary to hold a certificate related to prerequisite lessons from a top superior institution and to complete a one-year English language course (14). On the other hand, in Iran, student admission depends on holding a bachelor's degree in the field of anesthesiology, obtaining the minimum GPA of the undergraduate course, and taking a national exam. Another criterion for being admitted to the course in Iran is passing the university entrance exam for the master's degree (11). However, evidence has demonstrated that entrance exams in Iran cannot properly specify students' competence, and the selection of students from among

clinically experienced applicants is necessary to ensure students' competence in patient care (26, 27). Including the requirement of clinical work experience in the admission of this group of students can help reduce the theoretical and practical gap in care (28). Therefore, attention should be given to the assessment of the participants' work experience in the entrance exam for the master's course in anesthesiology.

The results of the current research indicate that the methods used to evaluate the educational planning of Case Western Reserve University in the USA are more diverse and comprehensive than those used at medical sciences universities in Iran. These methods assess student performance through treatment and communication and are used in clinical evaluations of simulated clinical rooms (14). This issue highlights the importance of using new equipment and technologies, such as simulators, in clinical evaluation.

In terms of the features and structure of the master's course in anesthesiology, studies at the universities of medical sciences in Iran and the USA are full-time, and the duration of study in this course is two years. However, unlike Case Western Reserve University, the education system in Iran is in the form of credit years (11, 14). In line with our study, other comparative studies have shown that the use of course credit is more common in Iran's educational planning than in some universities outside Iran's educational planning, which offers lessons based on hours (24-28).

A comparative study of the curricula of the two countries indicated the similarity of a large number of lessons offered in the master's course in anesthesiology, such as advanced safety and monitoring lessons, use of drugs in anesthesia, principles and techniques of anesthesia, and internship credits. However, the curriculum content of this course in the USA is generally more flexible and diverse than that in Iran. In other words, the curriculum of Iran does not contain some credits, such as clinical decision-making in anesthesiology and simulation based on physiological models, compared to the USA curriculum (11, 14). Therefore, it seems that including a greater number of optional credits in accordance with society's clinical needs is necessary for this course.

The tuition for the master's course at medical sciences universities of the Ministry of Health in Iran is free in the daily course but must be paid by the student in the international course. However, the tuition for the master's course in the USA must be paid by the student and is paid at the beginning of each semester. Therefore,

studying in an anesthesiology master's course in Iran is easier in terms of cost.

It is worth noting that no study has been conducted based on comparing Iran's educational planning for master's courses in anesthesiology with that of other universities in the world. Hence, this comparison can be considered a strength of the current study.

One of the limitations of this study was the lack of articles about master's educational planning in anesthesiology at Case Western Reserve University. Therefore, for data collection, researchers had to refer to the website of this university.

In future studies, it is suggested to conduct more research in other countries that offer master's courses in anesthesiology, such as Australia, to become familiar with the probable strengths of their curricula. This will enable researchers to review and optimally benefit from these strengths to formulate the country's curriculum.

Conclusion

Comparing the educational systems of Iran with those of the USA highlights the differences in the educational planning of the two countries. In Iran, the main objective of the course is to train human resources in an educational and research role. The results of this research can provide an opportunity to modify and revise the master's course in anesthesiology planning in Iran, with a care-oriented view and considering the needs and necessities of society, similar to the role of the operating room master's graduates. This will lead to developing the role, achieving the ideals of the anesthesiology field of study, and responding to the health system of our country. Moreover, Iran's education planning needs minor revision in terms of curriculum content and evaluation methods. The results of this study can help educational planners improve the quality of master's training curricula in the field of anesthesiology.

Future research to survey new medical education methods and advanced technology for promoting clinical training and curricula is recommended. Additionally, the organization of a curriculum committee to revise the anesthesiology master's curriculum based on the results of this study is suggested.

Ethical considerations

This study was approved by the Ethics Committee of Semnan University of Medical Sciences, located in Semnan, Iran (Ethics No. IR.SEMUMS.REC.1402.137).

Artificial intelligence utilization for article writing

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Conflict of interest statement

The authors declare that they have no conflicts of interest.

Author contributions

All authors participated in the process of writing the manuscript, including its initial draft and revisions, as well as the presentation of the idea, initial design, and collection and analysis of data. Furthermore, all authors take responsibility for the accuracy and correctness of the contents of this manuscript and have approved the final version.

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Data availability statement

The datasets are available from the corresponding author.

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