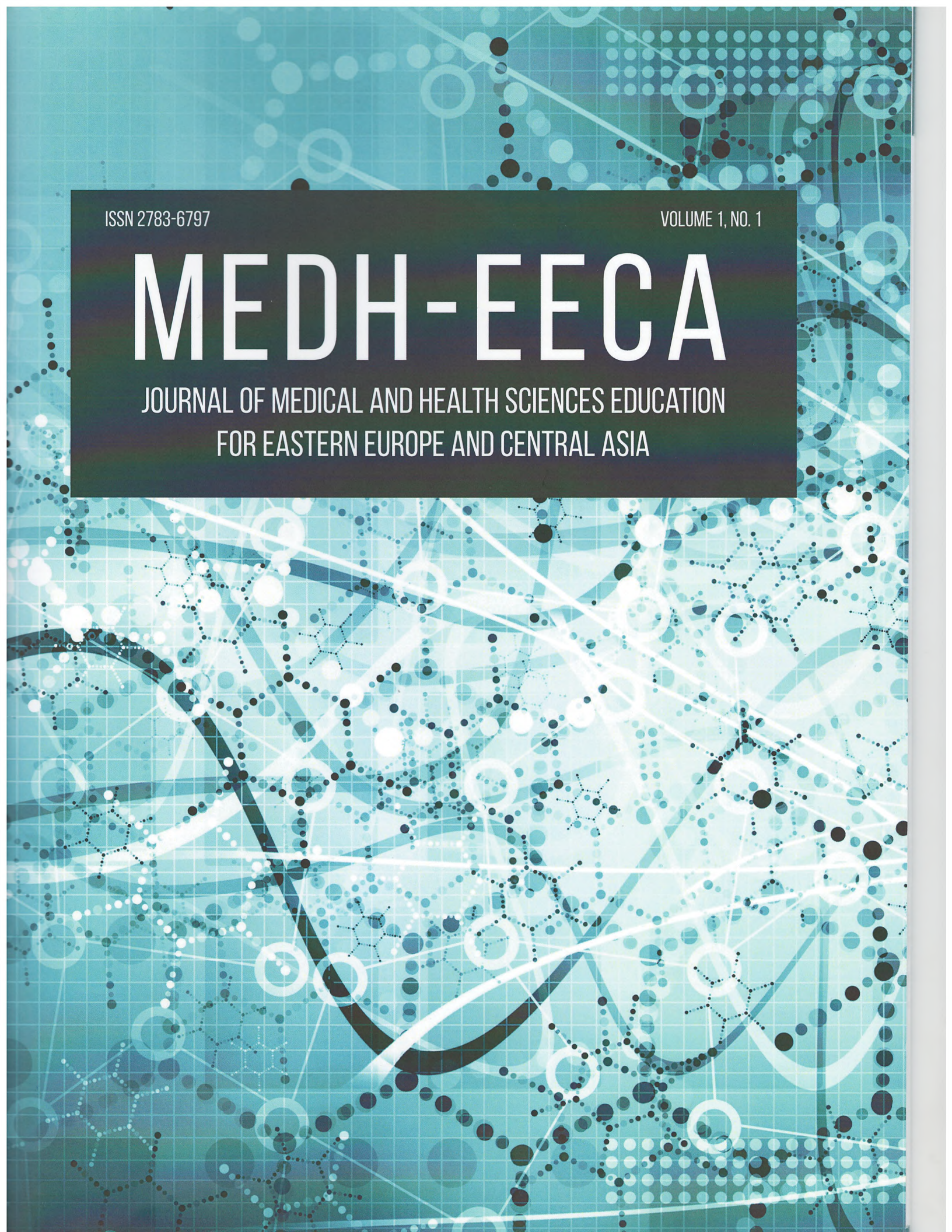


ISSN 2783-6797

VOLUME 1, NO. 1

MEDH-EECA

JOURNAL OF MEDICAL AND HEALTH SCIENCES EDUCATION
FOR EASTERN EUROPE AND CENTRAL ASIA



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IMPACT AND CONSEQUENCES OF COVID-19 ON TEACHING AND LEARNING IN *NICOLAE TESTEMIȚANU* STATE UNIVERSITY OF MEDICINE AND PHARMACY OF THE REPUBLIC OF MOLDOVA

Olga Cernetchi, Silvia Stratulat, Virginia Șalaru, Stela Aдаuji,
Angela Cazacu-Stratu, Evelina Gherghelegiu, Olga Iurco

Abstract. Background. The COVID-19 pandemic has impacted the world in many ways. From health issues at the individual level to sometimes catastrophic negative impact on the health-care systems around the world, the pandemic has affected the economic, social, and emotional well-being of societies. **Aim.** To evaluate the effects of the pandemic on teaching and learning domains at *Nicolae Testemitanu* State University of Medicine and Pharmacy, in order to get a broader picture of the effects of the pandemic on higher medical education in the Republic of Moldova. **Methods.** The observational study was conducted in the period of 2020–2021 in the *Nicolae Testemitanu* State University of Medicine and Pharmacy. Study instrument included an on-line questionnaire about the satisfaction of the employee and beneficiaries. Teachers and students answered questions about the methods of conducting classes initially on various platforms during the pandemic. **Results.** 64 008 questionnaires from students, residents, trainees, and other beneficiaries were collected, completed, and analysed. The average level of satisfaction increased from 93 % in 2019–2020 to 95 % in 2020–2021, which indicates an additional confidence and trust in the values and actions undertaken by the university community. The study revealed the challenges faced by higher medical education. These include the forced adaptation of students and teachers to online educational activities; declining quality of education; uncertainty in the applicability of the knowledge obtained and its use in practice, low level of skills of teachers and students in the use of digital tools, the gap in the digital culture of the younger and older generations of teachers.

Key words: teaching and learning, satisfaction, COVID-19 pandemic, methods of learning.

Introduction

Over the last two years, the COVID-19 pandemic has impacted the world in many ways. From health issues at the individual level to sometimes catastrophic negative impact on the health systems around the world, the pandemic has affected the economic, social, and emotional well-being of societies. The consequences of the pandemic will probably be felt in the long run. Medical education has been affected both by the restrictions applied to all educational institutions and by the impact of the pandemic on the health system at national level. The contexts in which medical universities operate are variable, but are characterised by innovation, performance,

and flexibility [1]. All aspects of medical training have been affected by COVID-19 [2]. The pandemic has accelerated change, including in higher education, and there is a need for thorough understanding and exchange about where we are today and how to prepare for the future.

The *Nicolae Testemitanu* State University of Medicine and Pharmacy of the Republic of Moldova (SUMPh) is the only university in the country that provides higher medical and pharmaceutical education, trains specialists for the healthcare system of the country, and carries out scientific and clinical activities. SUMPh is a competitive institution at the national and international levels in the field of

higher medical and pharmaceutical education, post university programmes (residency training and continuous medical education), research, medical and pharmaceutical service provision targeting quality, access, and collaboration.

In retrospect, the 2020–2021 period was atypical not only for the SUMPh, but also for all higher education institutions in the Republic of Moldova. The entire university activity was affected by the COVID-19 pandemic, a situation that forced the reorganisation of the educational process with a major shift to online education. The educational process continued in a mixed way with reduced student-teacher interaction. The ability to organise practical activities was also severely compromised. We lost the opportunity to teach and learn at the patient's bedside, to communicate with the patient. University leadership, students and staff have been ongoingly challenged. Yet new opportunities arise to be explored and properly understood.

The main objective of the study

To evaluate the effects of the pandemic on teaching and learning domains at *Nicolae Testemitanu* State University of Medicine and Pharmacy, in order to get a broader picture of the effects of the pandemic on higher medical education in the Republic of Moldova.

The methodology

The observational study was conducted in the period of 2020–2021 in the Nicolae Testemitanu State University of Medicine and Pharmacy. Study instrument included an online questionnaire about the satisfaction of the employee and beneficiaries.

The comparative analysis of the activity reports of the teaching subdivisions as well as the questionnaires to assess the satisfaction of employees and beneficiaries were performed. According to the requirements of the Quality Management System Evaluations the following questionnaires were applied:

- questionnaire on the evaluation of teaching quality for students, residents, and trainees;
- customer satisfaction survey for the beneficiaries of SUMPh subdivisions;

- teachers', administrative and support staff satisfaction surveys.

During the academic year 2020–2021, 64 008 questionnaires from students, residents, trainees, and other beneficiaries were collected, completed, and analysed. A mixed quantitative evaluation was applied by assessing the level of satisfaction of the beneficiaries, as well as the qualitative analysis of the data identifying the areas of impact of the COVID-19 pandemic on the teaching and learning process. The pandemic impact on the resilience and adaptation of students and teachers was also assessed and analysed.

Results

Between March 2020 and June 2021, the educational process in SUMPh was initially carried out exclusively online, in accordance with the epidemiological requirements at the country level. Thus, in a short period of time, a rapid transition was needed from the classical training with physical presence, both in the classes and in the practical settings, to the training in an exclusively online format. Teachers and students identified the methods of conducting classes initially on various platforms (*GoogleMeet*, *Zoom*, *Webex*, *Skype*, *Viber*, *WhatsApp*, etc.) with the adaptation of available technologies, in the context in which in the same home were several individuals (pupils, students, teachers, etc.) who had online lessons. Computerised networks at the University use modern technologies such as fiber optics, ADSL. All the chairs and subdivisions of SUMPh, including those located in medical institutions, are connected to the internal GMPU network and the Internet. In the university space (educational buildings and student campus) free access to Wi-Fi is constantly provided. In order to ensure access to online training and the necessary resources and to provide the opportunity for all students to connect to online teaching activities, the university has strengthened the endowment of student dormitories with modems.

In order to adapt the educational process to the restrictions imposed by the pandemic, the University carried out a series of actions. University Management Information System

(SIMU) was implemented at the university level which allowed the computerisation of administrative activities (human resources database, accounting, student and resident admission board, etc.) as well as the informatisation of the learning process (database of beneficiaries, monitoring of attendance, academic performance and quality of education; software for current and final assessment of acquired knowledge; electronic student assessment; electronic statements, reporting of the clinical activities, etc.).

In 2020, there was a significant increase in the exploitation of the Communication module of SIMU for students informing them on the organisation of the educational process, homework management and taking in of problems solved by students. Later in SIMU, for the development, recording and conducting of the lectures and practical work using the components of distance learning, a separate module "Live Courses" was created. The module was also used for the monitoring reports on the online teaching progress. The monitoring of the organisation and development of the online educational process was carried out by the heads of the didactic subdivisions, deans' offices, and the Didactic and Academic Management Department. In support of the online educational activity the following guidelines for teachers were developed:

- the guide "Creating and disseminating online lectures" on the Google classroom platform;
- the guide "Creating and Broadcasting Online Lectures" on the teachers' page in the SIMU;
- "Live Courses" module with Google Meet support.

The latter was synchronised with personal Google email accounts.

Another area of intervention was the adjustment of teaching materials for online training. For the good conduct of the on-line seminars, the practical works, and the training tools (communication, modelling/simulation, design, case studies, presentations of therapeutic procedures, video transmissions from the operating room, presentations of clinical cases, 3D animations, etc.) were devel-

oped and diversified. During the pandemic period, all departments placed in SIMU, MOODLE and on the WEB pages of the department their teaching materials, bibliographies, demonstrations, methodological recommendations, and course materials in all languages of instruction. Students were also granted access to links to national and international educational resources and began the process of distance learning through the use of various platforms. Both teachers and students at that time demonstrated receptivity, responsibility and understanding of context.

Important support was provided by the Scientific Medical Library of SUMPPh, which provided access to a wide range of information resources, including electronic scientific editions, educational publications, and periodicals. The Library also provides *online* access to medical and pharmaceutical electronic resources of 23 databases and training programmes. The Library created its own information resources such as educational electronic library (317 books) and university repository which included staff publications (5 146 documents).

In order to effectively manage patients, gain experience in working with medical care systems and optimise student access to medical care system data, the University's site provides *online* access to Internet links of the Ministry of Health of Republic of Moldova, National Public Health Agency, World Health Organization, Agency for Medicines and Medical Products of the Republic of Moldova, National Health Insurance Company, National Agency for Quality Assurance in Education and Research, etc.

Effective communication with the beneficiaries in accordance with the Public Health Strategy, the epidemiological situation in the country and abroad, current legislation and regulations, national and international clinical guidelines, standardised clinical protocols, diagnostic and treatment algorithms, etc. were heavily supported and promoted. The knowledge gained facilitated faster involvement of students in medical practice and represents a practical way to standardise and improve the quality of medical services.

With the lifting of the pandemic restrictions, from 01.09.2020, the training at SUMPh was carried out in mixed method. In order to avoid the accumulation of a large number of people in an enclosed space, the theoretical courses in all compulsory subjects were conducted online. As for the seminars, practical and laboratory works, the educational process was carried out with the physical presence. An important achievement was the development of internships in country medical institutions. The internships were carried out in the public medical institutions, including the ones with COVID-19 profile departments, exclusively at the request of the students.

In partnership with MOH, NAPH and the Soros Foundation online training for students was developed for the correct application of individual protection measures and the reduction of the risk of COVID-19 infection.

The university provided the necessary conditions for obtaining relevant clinical experience, including a certain number and categories of patients. The university has a sufficient number and clinical bases of different categories, which include clinics, outpatient services, primary medical institutions, health centres, as well as clinical skills centres and laboratories that allow it to conduct clinical training using the possibilities of clinical bases and providing rotations in basic clinical disciplines.

The final/semester assessment process was performed in a mixed regime with the use of the computer-assisted examination forms in SIMU in the Academic Assessment Centre. Practical skills were developed in CUSIM, using standardised patients and high-fidelity simulators and mannequins. It should be noted that the semester evaluation was carried out according to the terms established by the Academic Calendar, with the mandatory observance of the "Instruction on protection measures to be applied to organise the activity of public and private educational institutions in the epidemiological context of COVID-19".

It is to be noted that in the pandemic context since 2020 the admission process was performed in online format, using the plat-

form "Admitere USMF". The platform allows the collection of exact and exhaustive data about the candidates, the objective development of the admission contest and serves as a platform for the database of the Teaching Module in SIMU. In pandemic SUMPh registered an increased enrolment rate in domestic students. However, SUMPh experienced a decrease in the number of international students' admission. It is possible that the decrease in enrolment of international students is a temporary phenomenon, and that international mobility will resume once any COVID-19 related restrictions are lifted.

The quality ensuring mechanisms for the online studies and assessments included monitoring of the student's attendance, teaching materials provisions, procedures for conducting online assessments. Thus, the process of monitoring students' attendance in classes was carried out using SIMU, which allowed determining the access to activities, the actual duration of their stay in teaching activities, homework, and individual work. The heads of teaching subdivisions, deans' offices and the Didactic and Academic Management Department were able to monitor the organisation and development of teaching activities, through direct access to courses and seminars conducted online, but also through reports generated by the system.

The Department of Information and Communication Technology ensured the proper functioning of the University Management Information System and provided consultations and support for the creation and management of online lessons using various platforms.

Thus, questionnaires were applied to assess the satisfaction of the beneficiaries with reference to the educational process carried out during the pandemic period. In the academic year 2020–2021, 64 008 questionnaires were completed by students, residents, trainees, and other beneficiaries (clients). Due to the lack and/or decrease of the number of beneficiaries registered in the Medical Scientific Library, Sports Complex, Food, etc. during the pandemic period, the number of questionnaires decreased insignificantly from 65 548

in 2019–2020 to 64 008 in 2020–2021. However, the average level of satisfaction increased from 93 % in 2019–2020 to 95 % in 2020–2021, which indicates an additional confidence and trust in the values and actions undertaken by the university community.

The Figure 1 illustrates the level of satisfaction according to educational programmes within SUMPh.

Thus, the highest results were determined in the Pharmacy programme, due to the fact that the practical training is carried out in laboratories, production areas and communication pharmacies, whose activity was not stopped during the pandemic. The online organisation of the theoretical courses was appreciated as positive by the majority of students. Good results were also obtained for the beneficiaries of the dental programme, whose training was mainly performed in the simulation centres. This allowed the students to develop practical skills, but also to feel safe, in the context of airborne transmission of the infection – Sars-CoV-2.

The 97% satisfaction of the beneficiaries of the postgraduate residency education programme is possibly determined by the active involvement of resident doctors in providing medical care to patients in various medical institutions, volunteering later in 2021 in the vaccination campaigns. The lowest level of satisfaction was for the international students who, being away from home, endured intense emo-

tional stress caused by uncertainties about their own safety and that of their families.

The Figure 2 represents the analysis of the data regarding the training during the pandemic highlighted the students' opinions on the following areas: the quality of online training, the volume and relevance of information provided in online courses, the efficiency of performing and presenting tasks for individual work and the assessment of final assessment methods.

The analysis of the presented data identified a rather high level of positive appreciation of the educational process during the pandemic. At the same time, it was interesting to analyse the qualitative data, namely the opinion and attitude of both teachers and students with reference to the educational process during this period.

The dynamics of the average level of satisfaction for the employees of the teaching subdivisions are as follows: year 2018 – 91 %; year 2019 – 94 %; year 2020 – 93 %; year 2021 – 93 %. Although the level of satisfaction is similar to previous years with an insignificant decrease. The focus though was to identify and understand the qualitative aspects that are beyond the numbers.

Thus, the analysis of the qualitative data from the questionnaires completed by the teachers highlighted the following problems that they have faced since the establishment of the COVID-19 pandemic:

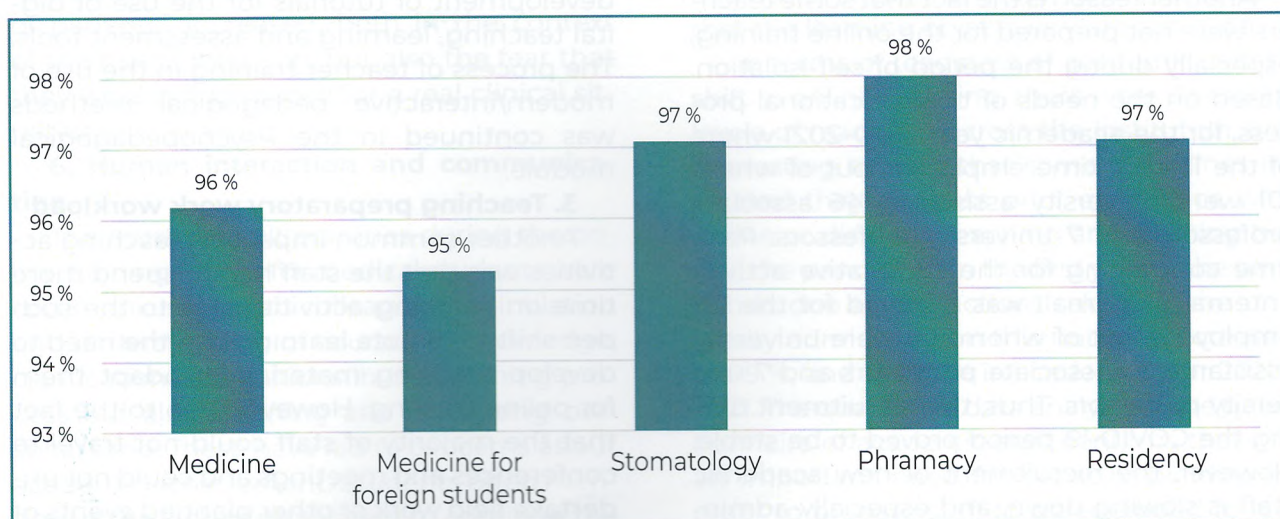


Figure 1. The level of satisfaction according to educational programmes

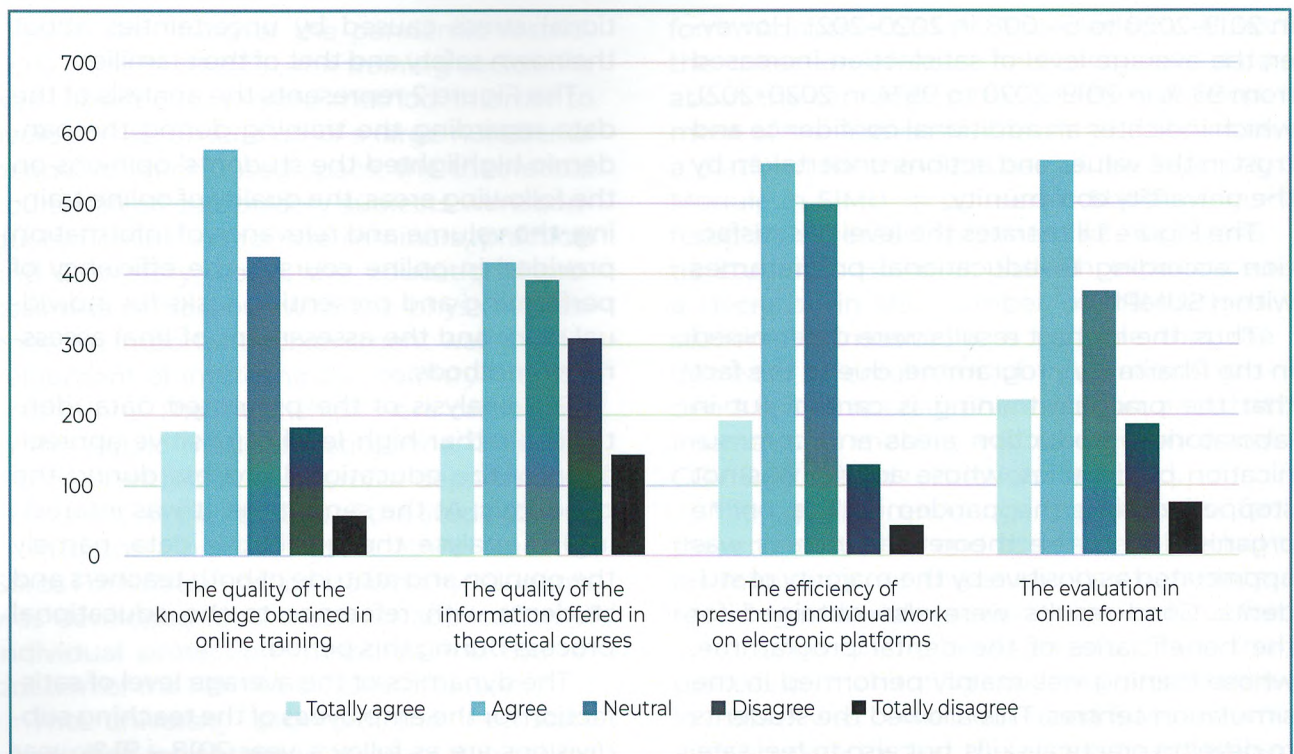


Figure 2. The evaluation of the study process during the self-isolation period

1. Insufficient teachers

On the one hand, the pandemic seriously affected the health of teachers. Many of them were infected, followed by long periods of convalescence, many cases regrettably resulting in death. On the other hand, teachers had to focus on clinical activity. COVID-19 depleted the healthcare system and required the mobilisation of all reserves.

Another reason is the fact that some teachers were not prepared for the online training, especially during the period of self-isolation. Based on the needs of the educational process, for the academic year 2020–2021 where of the 154 full-time employees out of whom 101 were university assistants, 46 associate professors and 7 university professors. Part-time contracting for the cumulative activity (internal / external) was reserved for the 132 employees, out of whom 100 were university assistants, 25 associate professors and 7 university professors. Thus, the recruitment during the COVID-19 period proved to be stable. However, the recruitment of new academic staff is slowing down, and especially administrative staff.

2. Digital skills

Such obstacles as unstable internet connection, unavailability of the computer devices but also insufficient skills in using modern technologies are only a few to be mentioned. In order to strengthen digital skills, the continuous professional training of academic staff was carried out through short-term training modules in online format and the development of tutorials for the use of digital teaching, learning and assessment tools. The process of teacher training in the use of modern/interactive pedagogical methods was continued in the Psychopedagogical module.

3. Teaching preparatory work workload

Another common impact on teaching activities was that the staff had to spend more time on teaching activities due to the sudden shift to remote learning and the need to develop teaching materials or adapt them for online training. However, due to the fact that the majority of staff could not travel to conferences and meetings and could not undertake field work or other planned events of physical presence which could not be simu-

lated remotely, they spent more time on the elaboration of teaching materials or publications.

Some authors wrote articles on research outcomes rather than starting new lab-work or starting new field-based data collection, others were involved in COVID-19 management, and they were able to provide the results of observational or case studies. The majority of academics reported an increase in workload.

4. Mental health

The analysis of students' perceptions and attitudes regarding online instruction identified a number of issues they faced. For the students, the pandemic period was a challenge, they mentioned negative psycho-emotional states (stress, demotivation, frustration, depression, and anxiety). These conditions had a negative impact on the study process. Students expressed concerns such as: *"I will not meet the challenges and deadlines"*, *"fear that I will fail the assessments"* or *"if I have connection problems and I will not be able to present the paper"*.

5. Knowledge and skills applicability

One area of concern was the applicability of the knowledge gained and the possibility of using it in practice. Due to the pandemic, the students could not actually perform the manoeuvres on patients at the patient's bedside, as they were previously accustomed to. The students reported that the level of "fear of patients" increased, both in the context of the risk of infection, but also the fear that they were not prepared for a real clinical situation.

6. Human interaction and communication

The most difficult activities during the online training period for medical students were communication with colleagues, assimilation and understanding of courses or knowledge, clarification of questions in the learning process but also planning and organising personal time. These have led to concerns about academic achievement. Students often mentioned the lack of motivation to continue the educational process.

Discussion

During the pandemic, certain activities had been stopped. The teaching and learning were one of the areas most impacted by the pandemic, first because SUMPPh had to shift in March 2020 the education process from face-to-face to online without the necessary preparation as it was not planned for.

In terms of disrupted activities, the most cited categories were:

- a) international activities, particularly mobility;
- b) social events and extracurricular activities, including business trips, internships, field trips, job fairs, open days, sports or arts events and other practical performances;
- c) the disruption of practical and face-to-face education.

Offering remote teaching and learning is one thing, but another important issue is student access to the remote offer. The University had taken different measures in order to support students who did not have access to remote teaching and learning. It was given priority to assure Wi-Fi access to students' campus, increase the number and provide material support to students by SIMU, web page and online university library. The SUMPPh increased the use of various digital tools. The results of the annual evaluation clearly demonstrated that some disciplines lend themselves more easily to remote teaching and learning. Particularly for clinical disciplines the situation was more complex, and additional measures were taken, to ensure that the learning objectives were achieved.

In terms of readiness of academic staff to shift to online teaching, there were divergent levels of readiness across the institution. It is interesting to note that some disciplines indicated they had less prior experience with online or distance teaching and learning before the pandemic. In the first year of the pandemic due to the actions taken by the university administration this number increased to 95 %, and to 100 % in academic year 2020–2021. The qualitative data analysis of the questionnaire of academic staff confirms that it is an important need for capacity building in order to prepare staff to be equipped to leverage the opportunities of online or remote

learning as a complement to more traditional face-to-face learning.

International activities were among the most negatively affected by the pandemic, with reduced international student enrolment, as well as reduced staff and student mobility. At the same time, the number of virtual exchanges increased as well as collaborative online learning or attendance of students and staff at international scientific events.

During the pandemic some staff or students have been affected directly by contracting the disease, and it was necessary to postpone some evaluation activities or switch from onsite to remote learning process. The change in working environment was enjoyable for some members of staff, for others it meant isolation. For others, it meant having to juggle several tasks – looking after children at home or taking care of elderly family members. For this reason, the University increased the institutional support for both physical health as well as mental health of staff and students and has conducted multiple vaccination campaigns.

The SUMP is generally satisfied with their crisis management and communications during the pandemic, thus in the auto-evaluation by the subdivisions and beneficiaries are for the great majority positive. On the positive side, the University was able to carry out exams despite the pandemic, however the exams had to be conducted under new conditions, for example online or mixed formats. SUMP was able to graduate last year's cohort of students in 2020 and 2021. It is positive to note that in the majority of cases, the pandemic did not disrupt learning paths of students and that many were able to continue and complete their studies although it may have been different than anticipated.

The great challenge and need of all teaching subdivisions registered both in 2020 and 2021, remains. Thus, the conduct of online classes, which led to the revision of teaching materials, their accessibility in electronic format, presentation of course notes in the online environment, the implementation of various applications and platforms for the smooth running of lectures, courses and practical hours shall be continued.

These challenges are commonly faced by many universities that conducted classical training before the pandemic. However, the conservatism of medical schools prevented the adoption of more radical pedagogical approaches. The COVID-19 pandemic has forced medical schools to break through barriers overnight and make the fastest change in the history of medical education [3].

The analysis of the qualitative data showed clearly that the students feel intensely the disadvantages of distance learning in the medical field, and their most frequent comments were: "*medicine is NOT done online*"; "*Medicine is for people and with people*" [4]. Students would have preferred to study the "real" cases at the patient's bedside, as well as some implementations such as telemedicine which has a significant potential to be retained as a teaching method, even after the end of the pandemic [5].

The online teaching process allowed for the continuation of medical education during the pandemic. Overcoming this crisis requires learning certain lessons and maximising the benefits of both face-to-face and online teaching and to improve the effectiveness of medical education in the future.

Combining online components into a medical curriculum will allow us to take advantage of the strengths of this environment, such as efficiency and the ability to support asynchronous and autonomous learning, which involves and promotes intrinsic learning in medical students [6].

Conclusion

In the pandemic the traditional method of teaching has been replaced by online teaching. Online teaching offers students the opportunity to learn another side of solving various problems by applying new teaching methodologies and techniques. The university has looked for new ways to teach online and has solved the problems caused by the pandemic in the distance education system, emphasising the satisfaction of employees and beneficiaries without diminishing the quality of training.

However, the study revealed the challenges faced by higher medical education in the

Republic of Moldova in the conditions of the pandemic. These include the forced adaptation of students and teachers to online educational activity; declining quality of education; uncertainty in the applicability of the knowledge obtained and its use in practice, low level of skills of teachers and students in the use of digital tools, the gap in the digital culture of the younger and older generations of teachers. Also, the study revealed a number of contradictions in the subsequent implementation of distance learning in higher medical education such as:

- the reduction of economic costs by universities for its organisation but quality deterioration of education received by students;
- decrease in the workload of teachers in the classroom but an increase in key tasks associated with checking tasks, setting them on educational portals, development of electronic courses, employment in scientific activities, tenacity, etc.;
- increasing leisure time by partially replacing their courses with electronic courses and modules taught by other professors at other universities;
- tendency to reduce the number of faculty members.

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