Acta Scientific Otolaryngology (ISSN: 2582-5550)

Volume 5 Issue 11 November 2023

Research Article

The Impact of the COVID-19 Pandemic on Medical (And Other Specialties) Students and their Attitude Toward Prevention Measures

Gabriela Jimborean[1], Cristina Gârbovan[2], Delia-Liana Rachiş[1], Adriana Neagos[3]*, Tara Bigger[4], Edith Simona Ianosi[1], Mioara Szatmary[1], Mara Vultur[1], Cristian Mircea Neagos[5], Paraschiva Postolache[6] and Hedy Katalin Sarkosy[1]

[1]Department of Pulmonology, George Emil Palade University of Medicine Pharmacy Science and Technology, Romania, Romania

[2]Department of Infectious Diseases, "George Emil Palade" University of Medicine, Pharmacy, Science and Technology from Târgu Mureș, Romania

[3]Department of Otorhinolaryngology, "George Emil Palade" University of Medicine, Pharmacy, Science and Technology from Târgu Mureș, Romania

[4]Student of VI-th year in General Medicine, George Emil Palade University of Medicine, Pharmacy, Science and Technology from Târgu Mureș, Romania

[5]Department of Otorhinolaryngology, Emergency County Hospital of Targu Mures, Romania

[6]I[st] Medical Department, Respiratory Rehabilitation Clinic Rehabilitation Clinic University of Medicine and Pharmacy Grigore T Popa Iasi, Romania

***Corresponding Author:** Adriana Neagos, Department of Otorhinolaryngology, "George Emil Palade" University of Medicine, Pharmacy, Science and Technology from Târgu Mureș, Romania.

DOI: 10.31080/ASOL.2023.05.0612

Received: August 03, 2023

Published: October 31, 2023

Abstract

Background: A 2021-2022 retrospective study was conducted on 77 international students (Germany, Italy, Greece, New Zealand) and 76 Romanian (specialties: medicine, engineering, design, administration).

Methods: Our analysis considered the COVID-19 impact on students, knowledge, attitudes towards prevention, social life, and appreciation regarding online education.

Results: Medical students had a higher vaccination rate than non-medical students (73,6% Romanians, 100% international students). Romanian students respected mask-wearing in crowded places more than international (68,4% vs. 51,9%) and medical students more than non-medical students. 66,6% of all students approved the online lectures, and 14,3% of the hybrid model. All students were affected emotionally during the pandemic (anxiety, sleep disturbance, decreased concentration capacity). Students spent much time during isolation on the phone (36% 3-5h, 54% >6h) and internet (44% 3-5h, 39% >6h) for socializing or information. Although insufficient, medical student's knowledge of the pandemic was significantly more significant than those of non-medical students. The pandemic generated positive and profound thoughts: appreciation of life and being in good health, spending more time with the family, and appreciation of the benefices of social interactions.

Conclusions: The COVID-19 pandemic has significantly impacted students, frequently leading to anxiety, lifestyle changing, online learning (disliked by some students), and increased internet/phone use. The students do not respect the vaccination or compliance with the prophylaxis measures. However, compliance was increased among medical professionals and vaccinated people. Students' knowledge of the pandemic must be improved (higher among medical professionals). Knowledge about the pandemic was best acquired in academic courses for medical students. Compliance with preventive measures can be increased by intensifying information and medical education. The unique experience of the COVID pandemic also led to positive life lessons: valuing more life, health, family, and friends. The future needs a new strategy to improve university education under special conditions.

Keywords: COVID-19 Pandemic; Vaccination; Education

Introduction

The COVID-19 pandemic severely impacted people's health and the health system and had a particular social, economic, and emotional global impact [1-3]. WHO shows that in January 2023, 752,517,552 confirmed cases of COVID-19 and 6,804,491 death. 13,156,047,747 vaccine doses have been administered [2]. At the level of the entire society, there were multiple challenges, some very difficult for the continuation of social life, for combating isolation but respecting the preventive measures of the spread of the infection. Throughout the world, education systems have been seriously impacted, leading to a real crisis in the education of pupils and students [4]. For medical students, there were several challenges, in addition to the anxiety caused by the risk of infection and the change in daily life habits. One challenge has been the long-term decline in access to hands-on medicine and the need to adapt to online education. On the other hand, even after vaccination, students may spread the virus to ill patients when asymptomatic and may acquire the virus. In many educational units, there was also a lack of tests and protective equipment for education at the patient's bedside [5].

There is even talk of economic losses for students who had deficiencies in education (by reducing their professional development with an impact on their future career) but also about the impossibility of working in different fields (to ensure the financial basis for studies [6].

In Romania, in the field of university education, significant efforts have been made at the governmental level but also at the University level to ensure the continuity of education and the integration of students in specific professional activities during the 2020-2022 pandemic period: the improvement of an online teaching system with platforms high-performance digital, hybrid education, new didactic materials, thematic specialization workshops, online presentations. In Romania, there are few studies on the effects of the changes imposed by the COVID-19 pandemic on student education, teaching methods, and students' social life. In this study, we want to analyze some aspects regarding the students' perception of the pandemic, its effect on their daily life, educational activity during this period, and the control measures introduced (including vaccination). At the same time, the psycho-emotional impact of the pandemic, the impact on the development of interpersonal relationships, and the professional development of students are analyzed.

Material and Methods

We conducted an observational study based on a questionnaire created electronically and distributed to students. Students completed the questionnaire between February 2021 and September 2022. We used a Google Forms survey (online) and questionnaire collection (anonymous) through direct student interaction. The digital survey was distributed online to students in Romania (Târgu Mureș - UMFST), Germany, Italy, Greece, and New Zealand. Different conclusions with theoretical and practical applicability were obtained.

Results

76 Romanian and 77 international students responded to the questionnaire. 76 - 49.6% are students in non-medical faculties - pedagogy, law, finance-banks, computer science, foreign languages) (Table 2). There is a female predominance among Romanian and international students who participated in the study, more precisely 61.4% of the students who answered the questionnaire (Table 1).

	Women	Men	Total number
Romanian students	59.7%	39.47%	76
International students	62.3%	37.6%	77
Total number	61.4%	38.56%	153

Table 1: Distribution of respondents by gender.

Women predominated among the responding students significantly, a fact explained by the increased number of female medical students. About 64.1% of students were female.

	Medical student	Non-medical students (engineering, design, administration, psychology, law, economics)
Romanian students 76	50%	50%
International students 77	49.3%	50.6%
Total Procentage	49,6%	50,3%

Table 2: The specialties of the students' origin.

The average age is 24 years among medical students and 25 years among non-medical students (18 - 34 years). The environment of origin is predominantly urban (58.2%). These data are comparable to those obtained for the international students analyzed. Among the Romanian students who responded to the questionnaire, only 63.15% are vaccinated (73.6% medical students and 52.6% non-medical students) under the conditions where the students represent a well-informed category, with higher education and under the conditions of free vaccination being very accessible in Romania. 15/48 - 31.25% of the vaccinated medical students had three doses, respectively 9/38 - 23.68% of the students of other specialties. In the group of international students, the vaccination rate was very high, with 93.5% of them, 100% being medical students. 36/38 - 94.7% of medical students were vaccinated with three doses, respectively 18/39 - 46.15% from other specialties (Table 3). The is a significant evidence, $p < 0.001$, that medical students were more aware and took more responsibilities in vaccination.

	Vaccinated		Unvaccinated	
	Medical students	Non-medical students	Medical students	Non-medical students
Romanian students	73.6%	52.6%	26.3 %	47.36%
	Total number of students vaccinated 48		Total number of students unvaccinated 28	
International students	100%	87,1%	0	5
	Total number of students vaccinated - 72		Total number of students unvaccinated - 5	
Total number of students	120 from 153 - 78,4%		33 from 153 - 21,56%	

Table 3: Vaccination of students.

Regarding the number of students who recommended vaccinating their relatives, 51/76 - 67.1% were Romanian students, respectively 65/77 - 84.4% international students. In both groups, medical students encouraged vaccination more.

	Recommendations	No recommendation
Romanian students	67.1%	32.89%
International students	84.4%	19%
Proportion of vaccination	74.8%	

Table 4: Percent of students that recommended vaccination to other people.

The proportion of vaccination in the group that recommended vaccination to other people was 74.8%. This observation attests to the student's confidence in the vaccine and the lack of adverse reactions. 116/120 - 96.6% of those who recommended vaccination were vaccinated with at least one dose. International students have higher percentages of recommendations than Romanian ones, $p < 0.05$ (p:0.0003) which attests to a better knowledge of the benefits of vaccination, discipline regarding compliance with official medical measures, and social and professional employment. As in table 5 most medical students received their information regarding COVID infection due to academic classes, with an important and positive correlation with their knowledge (r>0). Most of non-medical students used internet as primer source of information.

Total students	Medical students - 76	Non-medical students - 77
Pneumology class	92.1%	0
Infectiouse Disease class	86.8%	0
Other classes	32.89%	32.4%
Relatives who work on medical field	15.78%	10.38%
Podcast, radio, TV	7.89%	18.18%
Internet	100%	84.4%
Work at the Hospital	14.28%	1.29%

Table 5: Origin of medical information.

70/76 of the medical students, 92.1% correctly answered questions such as SARS-COV2 etiology, symptomatology, mode of transmission, and treatment of SARS-COV-2 infection. In the foreign and Romanian students group, non-medical students had to learn the etiology, symptomatology, mode of transmission, and treatment of the SARS-COV-2 infection (Table 6).

	Good theoretical Knowledges		Without sufficient theoretical Knowledges	
	Medical Field	Nonmedical Field	Medicine	Nonmedicine
Romanian students	92.1%	31.5%	7.89%	68.4%
International students	78.9%	31.5%	21%	71%

Table 6: Students' level of knowledge regarding the COVID-19 pandemic.

	Romanian students Vaccinated - 48	Romanian students Unvaccinated - 28	International students vaccinated - 72	International students unvaccinated - 5
Basic level of knowledge	6.25 %	92.8%	41.6%	100%
High level of knowledge	93.75%	7.1%	58.3%	-
Total number	48	28	72	5

Table 7: Proportion of knowledge about COVID in vaccinated and unvaccinated.

The primary sources of information on SARS-CoV-2 infection, the pandemic, and the need for vaccination were data from courses (for medical students), the media, and the Internet. Most Romanian students obtained the necessary information during university courses (pneumology 92%, infectious diseases 86.8%), significantly statistic according with their level of vaccination. All medical students confirmed the Internet as the primary source of information. The impact of the pandemic on students had a tremendous psychological and emotional resonance (Table 8).

	Anxiety	Sleeping disorders	Restless feeling	Decreased ability to concentrate	Total number
Romanian students	9	9	34	46	76
International students	12	18	45	56	77

Table 8: The psychological impact of the epidemic on students.

In the group of Romanian students, 56.5% there is an increase in the level of impairment (motivated by a generalized phobia of a possible infection, restlessness, and sleep disturbances), respectively a decrease in the ability to concentrate to approximately 60% from subjects. The level of anxiety and decreased ability to concentrate was higher in the group of international students than in Romanian students. Students improved their lifestyle and reduced the effects of isolation primarily by increasing physical activity (walking, running, gymnastics, cycling). The differences between Romanian and international students are significant - Romanian students have a much lower availability to compensate for isolation and sedentarism through physical activities than foreigners. We mention that in Romania, the provisions during the pandemic regarding the permission to carry out physical activities outdoors were very generous (freedom), even during the first three months of quarantine in the first wave when there was no vaccination yet.

	Romanian students		International students	
	Medical	Non-medical	Medical	Non-medical
Physical Activity	43.4%	50%	63%	81.8%
Events with large communities participation	13.1%	30%	18.1%	25.9%

Table 9: Physical and recreational activity of students during the pandemic.

Students noted an increase in the time spent on the phone, the average duration of phone use showing an increase from 4h to 7h in the group of Romanian students and an increase from 3h to 8h in the case of international students. Students spent much time during isolation on the phone (36% 3-5h, 54% >6h) and internet (44% 3-5h, 39% >6h) for socializing/information, especially non-medical students. The impact of the pandemic was also reflected in how teaching activities were carried out. Both the courses and the practical activity in the hospital were transferred online, except for students who voluntarily wanted to work in the emergency services of SMURD. Also, several clinics reduced their medical activities for the chronically ill. They admitted patients with COVID and diseases from their specialty (with separate circuits for COVID patients and the rest of the patients) and regular staff. With the start of the vaccination, the students had different opinions regarding the optimal place for teaching activities. Among Romanian students, 67.8% want to conduct their academic activity online, 28.9% agree with the hybrid system, and only 4.6% want the courses to be held on-site. International students online 71% and on-site 29% (Table 10).

	Online	Onsite	Hybride
Roumanian students	47/76 - 67,8%	7/76 - 9,2%	22/76 - 28,9%
International students	55/77 - 71%	22/77 - 29%	-

Table 10: The manner of carrying out the didactic activity.

Most of the Romanian students agree to continue their academic development with online classes, 67.8% or in a hybride manner, 28.9% but none of the international student are wiling a hybride convention.

	Online	Onsite	Hybride
Vaccinated	58.3%	24.1%	18.3%%
Unvaccinated	97%	-	3%

Table 11: Willingness to participate in online/onsite or hybrid courses depending on vaccination.

Most of those who prefer the online environment are unvaccinated. About 24.1% of vaccinated students prefer onsite carrying out of their academic activity.

	Too strict measures	Resonable measures	Insufficient measures
Romanian medical students	5/38 - 13.1%	25/38 - 65.7%	8/38 - 21%
Romanian non-medical students	12/38 - 31.5%	26/38 - 68.4%	0
International medical students	8/38 -21%	24/38 - 63.1%	6/38 - 15,7%
International non-medical students	8/39 - 20.5%	29/39 - 74%	2/39 - 5.1%
Total number of students	33/153 - 21.5%	104/153 - 67.9%	16/153 - 10,4%

Table 12: Perception of preventive measures.

Different measures to prevent the spread of infection have been encountered at different pandemic stages. About 67.9% of the students asked considered that the measures were reasonable. Preventive measures include wearing confinement, face masks, social distancing, avoiding crowds, closure of restaurants/bars, restrictions of social life, and frequent hand washing.

	Medical students	Nonmedical students
Romanian students	73.6%	68.4%
International students	52.6%	51.2%

Table 13: Observance of measures to prevent the spread of infection by wearing a protective mask constantly in crowded places.

The Romanian students were more compliant when wearing masks in crowded places than the international students and the medical students from other specialties. Romanian medical students respected the mask-wearing recommendation more than non-medical students.

Regarding volunteering in the medical field, 26.9% of the participants of the student group carried out their volunteer activity in the vaccination center (medical students 16.6%, students in other specialties 2.7%), in the family doctor's office (medical students -10%, students in other specialties - 0%) respectively in the hospital (medical students 23.3%, students in other specialties 5.4%).

127/153 - 83% of all students reported that their lives had changed radically in recent years. Many students gave exciting, severe, and profound views on the challenges of the pandemic and some lessons learned during the pandemic. We mention some of them:

- Life is unpredictable; things can change very quickly!
- Do not take health, the social life, or freedom for granted;
- Enjoy every single moment, especially those spent with loved ones;
- How to spend time with yourself without getting bored or depressed;
- Wrong information spreads quickly, and many people are not well informed;
- People are selfish and tend to extreme behaviors (pro/contra vaccination);
- The importance of digitization and technology;
- Much effort and research is needed for better knowledge of viral infections, their prevention, and treatment.

Discussions

In our study (both Romanians and foreigners), female students predominated, a fact due, on the one hand, to the increased frequency of women in medicine and attendance during classes (when the questionnaires were collected) but also because it is known that females fill in surveys [7]. It was a difference between the actual percentage of female and male students but not statistically significant ($p = .948$, $p > 0.05$). Vaccination campaigns

across Europe have led to significant progress in the fight against COVID-19. The latest estimates on COVID-19 pointed out a range of 60-75% immune individuals that would be necessary to halt the onward transmission of the virus and community spread of the virus [8,9]. The overall vaccination level of students in the entire study group with at least one dose of vaccine was 78.4%, which is high compared to the general population in Romania (approximately 41.8% in June 2022). However, the international vaccination situation with at least one dose is very different in the USA: 80%, 84.6% in Italy, 92.5% in Singapore, 60.8% in Russia, 78% in Germany, France, 81.7% [10]. 10.6% of people in low-income countries have received one dose, and just 5.5% have had two doses [11]. Among social and demographic determinants, our findings indicate that booster hesitancy is higher at younger ages [12]. Both Romanian and international students could observe a higher level of vaccination of medical students compared to non-medical students ($p < .001$), a fact explained by their superior knowledge of the role of vaccination and an increased degree of discipline towards medical recommendations. However, the difference between foreign medical students and vaccinated Romanians is significant even statistically ($p = .0054$, $p < .05$). It can be explained by the high level of responsibility and the fact that these students have a large area of travel and contact with various communities and crowds, which increases the risk of contagion. If we talk about the unvaccinated in Romania, a very high percentage was found, 26.3% for medical students and 47.36% for non-medical students. Reasons could be a lower level of knowledge about the disease or how the vaccines work and, therefore, a higher skepticism. People who are less educated about a topic tend to believe false information found online without questioning it. Other studies also present religious and cultural beliefs or previous health conditions as reasons to refuse the vaccine [13]. On the other hand, medical students witness severe COVID-19 infections of patients at the hospital and, therefore, might be more cautious and would like to prevent getting severely ill themselves [14,15]. Unfortunately, in addition to the critical degree of hesitation among the population, there is also a decrease in confidence in the vaccine's benefits over time (for example, the level of hesitation to the booster is 1% in the UK, at 21.1% in South Africa). On the other hand, the introduction of vaccination in children met significant resistance. In a large study on 23 countries, Lazarus and Wyka found that 12.1% of the respondents were already vaccinated for the booster, and 38.6% of the respondents only paid the same attention to general information data on the evolution of the pandemic and the general degree of support for vaccination is progressively decreasing. 24% declare they would instead take medication than get vaccinated [16]. Unfortunately, even at the high decision-making level in some countries, there are influences on vaccination related to politics, ethnicity, or vaccine safety [17,18]. A few studies reported COVID-19 acceptance rates below 60%, which would pose a severe problem for efforts to control the current COVID-19 pandemic. Low COVID-19 vaccine acceptance rates were pronounced in the Middle East, Eastern Europe, and Russia [15]. Of course, the high variability of the virus with the possibility of lack of vaccine coverage for some variants also contributes to distrust in vaccines [19]. Currently, 2x/year vaccination is recommended in some countries, and vaccination is according to variants (after the development of new strains). In our study, a large part of the students, 75%, advised someone else to get vaccinated, and all 96.6% of the students who recommended the vaccine were vaccinated themselves 67.1% of these were Romanian students, respectively 84.4% international students. This observation attests to the student's confidence in the vaccine and the lack of adverse reactions. International students have higher percentages of recommendations than Romanian ones, which attests to a better knowledge of the benefits of vaccination, discipline regarding compliance with official medical measures, and social and professional employment. In both groups, medical students encouraged vaccination more. Even statistically it was proven that international students recommended often vaccination to their relatives in compare Romanian student ($p = .0001$). The knowledge about COVID-19 varies among medical and non-medical students were very different. Most people from both groups in our study got their knowledge from the internet, which could be explained by the increased time spent online due to the online classes and the advantage of quickly looking up specific information. However, non-medical students cannot use lecture material as a source of information, nor do they work at a hospital. None of them mention these sources. In international students, the differences in knowledge between medical and non-medical students were significant for the categories clinical evolution, complications and treatment ($p < 0.05$), and transmission ($p < 0.0001$). The complete suspension of schools and universities is not supported by 18.9% of students. The resulting worse quality of education could explain this. Most students from both groups

voted for the pulmonology lectures to be online but the practical classes to be on-site or hybrid (28.9%). A possible explanation is the importance of practical experience for medical students, which can only be gained during classes at the hospital [20]. During the practical activities, the groups are smaller than at the lectures, and therefore students might see a lower risk of getting infected. For the lectures, the learning discrepancies between online and on-site are less significant since the material presented is only theoretical. At the same time, there is a higher risk of getting infected when sitting in one room with many other students for hours.

More non-vaccinated students voted for online practical classes, 97%, statistical more than vaccinated student ($p = .0002$, $p < 0.05$). It could be because they do not want additional exposure to a higher risk of infection, or they might not want to put the patients at risk since unvaccinated people have an increased virus transmission [21]. An advantage of online lectures and practical classes is the opportunity for students to stay with their parents instead of renting apartments close to the university, which reduces the financial burden on the families. A disadvantage is the lower quality of online teaching due to problems with the internet connection and the audio or video quality. The student's attention to online classes is reduced, often caused by a lack of interaction. It is demonstrated by multiple other studies, which confirm the lower quality of online teaching [22]. The government has established different preventive measures to avoid the transmission of SARS-CoV-2. Not everyone agrees with those measures because they immensely influence and restrict our daily lives. Overall, 67.9% of the students who filled out the survey considered the measures reasonable, 10.4% think they are not strict enough, and 21.5% believe they are too strict. Even if there was a slight difference between the applicability of prophylactic measures against SARS-CoV-2 infection between international and Romanian students, there hasn't a statistical significance among our two groups of study ($p = .08$). Since these answers only apply to the present restrictions, less intense than those at the beginning of the pandemic, it would be interesting to know the student's opinions on the preventive measures applied in the early phases. A study by Murphy et al. showed that people get less compliant with restrictive measures after a more extended period [23]. The Romanian students were more compliant when wearing masks in crowded places than international students, medical students, and those from other specialties. Romanian medical students respected the mask-wearing recommendation more than non-medical students. The degree of social interactions and presence in crowded spaces decreased in more than half of the students from both groups. One reason is the closure of schools, universities, restaurants, bars, and clubs and, therefore, fewer opportunities to meet up with other people. Another cause is the limitation of the number of contacts set by the government which restricted social life. People who fear an infection avoid social contact as much as possible to minimize the risk of getting infected and infecting others [24]. It shows that even though most of the students in our study claimed they missed socializing, most still wanted to avoid going to significant events without any precautions.

Our study showed no difference between males and females regarding the overall adherence to preventive measures. In a cross-sectional study from Germany, women adhered more to preventive measures since they are more cautious about putting their health at risk [25]. The study claimed that states that fear is positively correlated with adherence to preventive measures.

The pandemic and the ongoing restrictions forced people worldwide to modify their daily routines and lifestyles to combine work (often home office), physical exercise, and mental well-being while adapting to social isolation. In our study, students carried out different activities besides school and worked in their free time during isolation. Most commonly, physical activities such as home workouts or walking and running were mentioned. One explanation could be the urge to move after spending hours of sitting and listening to online classes. Another possible cause is the positive impact of physical activity on mental health [26,27]. Since social isolation can have adverse psychological effects, sports can be reasonable compensation.

Our study showed a difference in the regularity of physical exercise between medical and non-medical students (63% vs. 82% for international students, 43 - 50% for Romanian students), which could be caused by the fact that many medical students, instead of attending online classes, they worked at COVID wards or vaccination centers and therefore had less free time for exercising. Medical students, on average, spend more time attending classes and studying than other students, which reduces the time available for doing sports. Our study supported this, as a larger number of medical than non-medical students spent their free time studying.

During the lockdown, increased the time spent on the phone. Comparing the total time students spent on their phones during the lockdown and after, there is a statistically significant difference looking at medical students and an extremely significant difference looking at other students. The number of students spending 3-5 hours/day on the phone was approximately the same during and after the lockdown. The number of students who only spent 1-2 hours daily on their phones doubled after the lockdown.

Less than half as many students spent 6 hours or more on their phones after the lockdown compared to during the. It can be explained by the additional time available while not attending university or the possibility of using phones for online classes. In addition, many people scroll through social media, read articles, and follow the news when bored.

Both group students spent significantly more time on the internet during isolation than after. A significant drop in screen time was noticed in both groups of students after isolation, especially in those who spent more than 8 hours per day on the computer during the lockdown. It can be explained by less time spent on online classes, activities outside the house, and socializing again.

The pandemic has impacted many students emotionally and psychologically. The disturbed daily rhythm and reduced social interactions can hurt the students' mental health. The fear of getting infected or losing loved ones through the virus, the isolation from family and friends, and the constant input of information about the virus and the suffering it causes contributed to that. Additionally, the socioeconomic problems caused by the pandemic have a significant psychological impact [29]. Our study shows that most of the students were emotionally affected to some extent. International students were more emotionally affected than Romanian students ($p = 0.0003$, $p < 0.05$).

According to a study about the mental health impact of the pandemic on students in Romania [30], prolonged periods spent on the internet are positively correlated with a higher amount of stress and anxiety. One reason is the tendency to follow alarming news about the pandemic; the other could be a lack of physical activity and life in the open air and sun. Both groups of students mentioned having no social life as the most significant sacrifice, followed by no traveling, no team sports, and no university.

Overall, 83% of the students who participated in our study stated that the past two years, with periods of lockdown and social isolation, have changed their lives.

In addition to the changes mentioned, some positive changes were the excellent thoughts and lessons learned during the pandemic: appreciation of life, spending more time with the family, appreciation of the benefits of social interactions, good health status, and the opportunity to study on-site has increased. A study from Spain about the psychological impact the quarantine had on the population showed similar results and therefore supported our study [31].

Conclusions

- The COVID-19 pandemic has had a significant impact on students, with lifestyle changes frequently leading to online learning (disliked by a large proportion of students), increased internet/phone use;
- The pandemic has brought significant challenges with increased levels of stress and anxiety, levels of concentration, decreased socialization and direct interaction;
- The primary source of information for all students was the Internet, but for medical students, relevant information came from courses dedicated to pneumology and infectious diseases;
- Increased physical activity (although it is known to have a positive impact on reducing anxiety and concentration levels) was not embraced by all students. International students included recreational activities of physical activities more often than Romanian ones.
- The preferred way of carrying out the didactic activity during the pandemic was the online environment or the hybrid system (for practical activities). In order to reduce the degree of exposure, most unvaccinated students preferred to carry out the didactic activity in the online environment.
- Volunteering was an activity present in the program of medical students but also of those from other specialties. The main areas of volunteering were local hospitals, vaccination centers, respectively the offices of family doctors in the home.

- Vaccination of students was insufficient (especially at the level of Romanian medical students). This observation must remain in the attention of the decision-makers in the medical and educational systems and the health policy strategies for a better responsibility of the population given vaccinations in order to reduce the risk of perpetuating the endemic of some severe forms of the disease and to reduce some future risks.
- The exceptional experience of going through the COVID pandemic also led to positive life lessons - appreciation of life, spending more time with the family, appreciation of the benefits of social interactions, appreciation for having a good health status, and the opportunity to study on-site.
- Despite the development of measures to continue education processes during the pandemic, strategies are needed to deal with future emergencies. The flexibility of distance learning systems and the recovery of activities strictly related to professional practice are means of improving university education for special situations.

Acknowledgement

This article is written within the Project No 511/6/17.01.2022.

Bibliography

1. Rose S. "Medical Student Education in the Time of COVID-19". *JAMA* 323.21 (2020): 2131-2132.
2. Bradley Steve and Colin Green (eds.). "The Economics of Education: A Comprehensive Overview". 2nd edition, Academic Press, London (2020).
3. Mulder Joris and Marika de Bruijne. "Willingness of Online Respondents to Participate in Alternative Modes of Data Collection". *Survey Practice* 12.1 (2019).
4. Anderson RM., *et al*. "Challenges in creating herd immunity to SARS-CoV-2 infection by mass vaccination". *Lancet* 396 (2020): 1614-1616.
5. Britton T., *et al*. "A mathematical model reveals the influence of population heterogeneity on herd immunity to SARS-CoV-2". *Science* 369 (2020): 846-849.
6. Lazarus JV., *et al*. "A survey of COVID-19 vaccine acceptance across 23 countries in 2022". *Nature Medicine* (2023).
7. Coronavirus (COVID-19) Vaccinations. Our World in Data (2020).
8. Batra K., *et al*. "COVID-19 booster vaccination hesitancy in the United States: a multi-theory-model (MTM)-based national assessment". *Vaccines (Basel)* 10 (2022): 758.
9. Dhama Dhawan., *et al*. "COVID-19 intranasal vaccines: current progress, advantages, prospects, and challenges". *Human Vaccines and Immunotherapeutics* 1 (2022): 1-11.
10. N Puri., *et al*. "Social media and vaccine hesitancy: new updates for the era of COVID-19 and globalized infectious diseases". *Human Vaccines and Immunotherapeutics* 16.1 (2022): 2586-2593.
11. Sallam M. "COVID-19 Vaccine Hesitancy Worldwide: A Concise Systematic Review of Vaccine Acceptance Rates". *Vaccines* 9 (2021): 160.
12. Lazarus JV., *et al*. "A survey of COVID-19 vaccine acceptance across 23 countries in 2022". *Nature Medicine* (2023).
13. Lazarus JV., *et al*. "A global survey of potential acceptance of a COVID-19 vaccine". *Nature Medicine* 27 (2020): 225-228.
14. Shakeel CS., *et al*. "Global COVID-19 vaccine acceptance: a systematic review of associated social and behavioral factors". *Vaccines (Basel)* 10 (2022): 110.
15. Zhang Y., *et al*. "Immune evasive effects of SARS-CoV-2 variants to COVID-19 emergency used vaccines". *Frontiers in Immunology* 12 (2021): 4842.
16. Hoefer Sterz., *et al*. "Conveying practical clinical skills with the help of teaching associates—a randomised trial with focus on the long term learning retention". *BMC Medical Education* 17.1 (2021): 65.
17. Wienkes Vilen., *et al*. "Transmission of and Infection With COVID-19 Among Vaccinated and Unvaccinated Attendees of an Indoor Wedding Reception in Minnesota". *JAMA Network Open* 5.2 (2022): e220536.
18. S Dhawan. "Online Learning: A Panacea in the Time of COVID-19 Crisis". *Journal of Educational* T*echnology Systems* 49.1 (2022): 5-22.
19. K Murphy., *et al*. "Why people comply with COVID-19 social distancing restrictions: Self-interest or duty?". *Australian and New Zealand Journal of Criminology* 53.4 (2022): 477-496.
20. Woskie Hennessy., *et al*. "Early social distancing policies in Europe, changes in mobility & COVID-19 case trajectories: Insights from Spring 2020". *PLOS ONE* 16.6 (2021): e0253071.

21. S Dohle., *et al*. "Acceptance and adoption of protective measures during the COVID-19 pandemic: The role of trust in politics and trust in science". *Social Psychological Bulletin* 15.4 (2020).

22. S Saxena., *et al*. "Mental health benefits of physical activity". *Journal of Mental Health* 14.k5 (2015): 445-451.

23. P Nagu., *et al*. "CNS implications of COVID19: a comprehensive review". *Reviews in the Neurosciences* 32 (2021): 219-234.

24. BK Al-Dabal., *et al*. "A Comparative Study of Perceived Stress among Female Medical and Non-Medical University Students in Dammam, Saudi Arabia". *Sultan Qaboos University Medical Journal* 10.2 (2010): 231-240.

25. Mokhtari Dehghan., *et al*. "Epidemiology of mental health problems in female students: A questionnaire survey". *Journal of Epidemiology and Global Health* 3.2 (2013): 83.

26. Dumitrache Stanculescu., *et al*. "Post-Lockdown Effects on Students' Mental Health in Romania: Perceived Stress, Missing Daily Social Interactions, and Boredom Proneness". *International Journal of Environmental Research and Public Health* 18.16 (2021): 8599.

27. B Sandín., *et al*. "Psychological impact of the COVID-19 pandemic: Negative and positive effects in Spanish population during the mandatory national quarantine". *Revista de Psicopatología y Psicología Clínica* 25.1 (2020): 1.