RESULTS OF EPIDEMIOLOGICAL SURVEILLANCE FOR COVID-19 AMONG STUDENTS AND TEACHING STAFF OF THE UNIVERSITY

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Organization of training in the context of COVID-19 pandemic demanded the development and implementation of active epidemiological surveillance for acute respiratory infections in students and teaching staff of the Medical University. The study was aimed to identify the features of the COVID-19 epidemic process among students and teaching staff in 2020–2022. The analysis of COVID-19 incidence among students and teaching staff in the academic years 2020–2021 and 2021–2022 was carried out. The study was conducted on 6293 students enrolled in the academic year 2020–2021, 6148 students enrolled in the academic year 2021–2022, and 772 teaching staff members. In the academic year 2020–2021, COVID-19 was detected in 681 students, among whom the cumulative incidence (CI) was 10.83 (95% CI: 10.08-11.61) per 100 students, and 79 teaching staff members, among whom the CI was 10.23 (95% CI: 8.09–12.37); in the academic year 2021–2022 infection was detected in 690 students, the CI was 11.44 (95% CI: 10.64–12.24) per 100 students, and 75 teaching staff members, the CI was 9.71 (95% CI: 7.62%–11.80%). In 26.3% affected individuals, COVID-19 was detected when contacting the University outpatient clinic. The incidence among students living in the dormitories did not exceed that among students living in private apartments ($p = 0.36$), and no outbreaks were reported. There was a strong positive correlation between the incidence among residents of St. Petersburg and the incidence among students ($r = 0.77$). Over the entire period, probable setting of transmission was determined in 39.9% of infected individuals, contact most often (15.2%) occurred when working in the health care facilities. The incidence of novel coronavirus infection (COVID-19) among students and teaching staff members in the academic years 2020–2021 and 2021–2022 is directly related to their involvement in the COVID-19 epidemic process in St. Petersburg.

Keywords: novel coronavirus infection, preventive measures, educational process, health care facility, epidemiological surveillance

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РЕЗУЛЬТАТЫ ЭПИДЕМИОЛОГИЧЕСКОГО НАДЗОРА ЗА COVID-19 СРЕДИ ОБУЧАЮЩИХСЯ И ПРОФЕССОРСКО-ПРЕПОДАВАТЕЛЬСКОГО СОСТАВА УНИВЕРСИТЕТА

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Организация обучения в условиях пандемии COVID-19 потребовала разработки и внедрения активного эпидемиологического надзора за острыми респираторными заболеваниями среди обучающихся и профессорско-преподавательского состава (ППС) медицинского университета. Целью работы было выявить особенности эпидемического процесса COVID-19 среди обучающихся и ППС университета в 2020–2022 гг. Проведен анализ заболеваемости COVID-19 среди обучающихся и ППС за 2020–2021 и 2021–2022 учебные годы. Под наблюдением находились 6293 обучающихся в 2020–2021 учебном году и 6148 в 2021–2022 учебном году, ППС — 772 человека. В 2020–2021 учебном году COVID-19 выявлен у 681 обучающегося, кумулятивная инцидентность (КИ) 10,83 (95% ДИ 10,08–11,61) на 100 обучающихся и 79 человек ППС — КИ 10,23 (95% ДИ 8,09–12,37), в 2021–2022 учебном году — у 690 обучающихся, КИ 11,44 (95% ДИ 10,64–12,24) на 100 обучающихся и 75 человек ППС — КИ 9,71 (95% ДИ 7,62%–11,80%). У 26,3% заболевших COVID-19 инфекция была выявлена при обращении в поликлинику Университета. Заболеваемость обучающихся, проживающих в общежитиях, не превышала заболеваемость среди тех, кто проживал на частных адресах ($p = 0,36$), также не было зарегистрировано вспышек. Найдена сильная положительная связь между заболеваемостью жителей Санкт-Петербурга и заболеваемостью обучающихся ($r = 0,77$). За весь период вероятное место заражения установлено у 39,9% заболевших, наиболее часто (15,2%) — в медицинской организации по месту работы. Заболеваемость новой коронавирусной инфекцией (COVID-19) среди обучающихся и профессорско-преподавательского состава за 2020–2021 и 2021–2022 учебные годы напрямую обусловлена их вовлечением в эпидемический процесс COVID-19 в Санкт-Петербурге.

Ключевые слова: новая коронавирусная инфекция, профилактические мероприятия, учебный процесс, медицинская организация, эпидемиологический надзор

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This paper is a continuation of a series of articles on prevention of the novel coronavirus infection spread among students and teaching staff of the Mechnikov North-Western State Medical University(hereinafter University) [1, 2].

During the COVID-19 pandemic many higher education institutions were forced to switch to distance learning. However, medical education cannot be effective without practical skills. That is why it was decided to conduct workshop-type classes and practical classes in the face-to-face format in the University's classrooms since September 2020 in case the classes involved developing practical skills. This resulted in the need to develop and implement a number of preventive and anti-epidemic measures taking into account the fact that medical students were engaged in providing care to COVID-19 patients in both outpatient and inpatient settings. Despite the fact that there are many publications discussing the COVID-19 rate among students, all these publications are based on the results of the questionnaire surveys of students, not on the objective morbidity data.

The study was aimed to identify the features of the COVID-19 novel coronavirus infection epidemic process among students and teaching staff of the University in the academic years 2020–2021 and 2021–2022 based on the implemented epidemiological surveillance.

METHODS

Active epidemiological surveillance for acute respiratory infections in students and teaching staff was developed and implemented in the University in order to carry out and adjust anti-epidemic measures in the context of face-to-face training during the ongoing COVID-19 pandemic. The detailed scheme of epidemiological surveillance was reported earlier [1].

Analysis of morbidity was performed every week to ensure the timely adjustment of anti-epidemic measures.

The measures recommended by Rospotrebnadzor [3] and some additional measures were implemented to prevent the spread of novel coronavirus infection:

– outreach activities (movies, video lectures, posters, newsletters);

– active detection of individuals showing signs of acute respiratory infection (ARI);

– setting up an isolation ward for admission and assessment of students and employees with symptoms of ARI in the University outpatient clinic;

– switching individuals with symptoms of ARI and confirmed COVID-19 or exposed people to distance learning;

– withdrawing individuals with symptoms of ARI and confirmed COVID-19 or contact persons from the dormitory;

The incidence of COVID-19 for the mentioned above academic years (between September 1 and June 30) was assessed. All students and teachers were included in the study. During the studied period, a total of 4879 students were followed-up in the academic year 2020–2021 and 4703 were followed-up in 2021–2022; 1414 residents were followed-up in the academic year 2020–2021 and 1445 were followed-up in 2021–2022; a total of 772 teaching staff members were followed-up. The number of students of different fields by year is provided in Table.

The disease was detected when contacting local medical institution, ambulance or University outpatient clinic. Clinical diagnosis and laboratory confirmation were provided in accordance with the version of regulatory documents that was valid at the time of seeking medical care [4]. Cumulative incidence of COVID-19 (the ratio of the number of diagnosed cases in the studied group to the total number of individuals in the group within the studied period multiplied by 100) among students of various faculties and teaching staff and its monthly trends were calculated. The Pearson correlation coefficient for the relationship between the weekly trends in the number of cases diagnosed among residents of St. Petersburg and University students ® was calculated.

All the infected people were interviewed in order to reveal probable places of infection and contact persons. The place of infection was considered to be determined, when the student reported the contact with the confirmed case of COVID-19 within 14 days since the emergence of symptoms in the years 2020–2021 and within 7 days in the year 2022. Cumulative incidence of COVID-19 among students enrolled in different semesters was calculated based on the probable setting of transmission infection. The structure of junior and senior students of various faculties and residents (share of all disease cases) was also calculated based on the probable place of infection.

The 95% confidence intervals were calculated using the Wilson score. The differences were considered significant when *p*-value was below 0.05.

RESULTS

A total of 1371 students and 155 teaching staff members were diagnosed with COVID-19 during the studied period. Furthermore, in the academic year 2020–2021, COVID-19 was detected in 681 students, the cumulative incidence (CI) was 10.83 (95% CI: 10.08–11.61) per 100 students, and 79 teaching staff members, the CI was 10.23 (95% CI: 8.09–12.37); in the academic year 2021–2022, infection was detected in 690 students, the CI was 11.44 (95% CI: 10.64–12.24)

Table. Number of students of different fields by year

Year	Medical specialty (faculty)							
	Nursing care		General medicine		Preventive medicine		Dentistry	
	Academic year							
	2020–2021	2021–2022	2020–2021	2021–2022	2020–2021	2021–2022	2020–2021	2021–2022
1	19	13	695	786	156	156	95	70
2	10	11	718	586	160	125	90	66
3	8	7	581	607	142	140	72	56
4		8	556	505	127	114	66	61
5			581	535	116	123	72	58
6			480	563	135	113		
Total	37	39	3611	3582	836	771	395	311

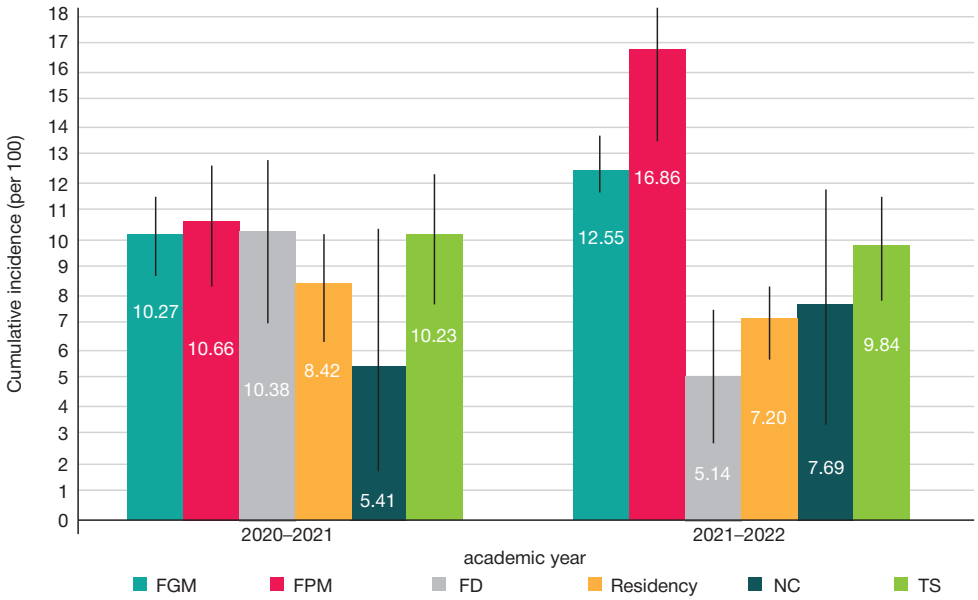

Fig. 1. Cumulative incidence of COVID-19 among students and teaching staff in 2020–2021 and 2021–2022. FGM — Faculty of General Medicine, FPM — Faculty of Preventive Medicine, FD — Faculty of Dentistry, NC — Nursing Care, TS — teaching staff

per 100 students, and 75 teaching staff members, the CI was 9.71 (95% CI: 7.62–11.80%).

It should be noted that almost every fifth COVID-19 case (19%) was revealed in the University outpatient clinic, where the isolation ward for admission and assessment of students and employees with symptoms of ARI was set up. A total of 1058 contacted the clinic, of them the diagnosis of COVID-19 was confirmed in 278 individuals (26.3%). Among those who contacted the clinic, 487 students (46%) lived in the University dormitories, and COVID-19 was detected in 124 (25.4%) of them. The diagnosis was confirmed by PCR within 12 h after seeking medical care. Information was immediately sent to the coordinator of anti-epidemic measures, to head of the service for accommodation and socio-household arrangements, and the deputy deans of the faculties. This enabled earlier isolation of infected individuals and timely implementation of anti-epidemic measures. The incidence among students living in the dormitories reported over the entire research period did not exceed that among students living in private apartments, it was 19.1 and 18.9 per 100 students, respectively. No outbreaks among students living in the dormitories were reported.

In the year 2020–2021, the incidence among students of different faculties, residents, and teaching stuff was at the same level. In 2021–2022, the highest incidence was revealed in students of the Faculty of Preventive Medicine due to the greatest engagement in the outbreak caused by the SARS-CoV-2 Omicron strain (Fig. 1, 2).

The highest incidence was observed in senior students (years 4–6) in 2021–2022, it was 12.60 per 100 students (95% CI: 11.24–14.09). The incidence in junior students (years 1–3) was 11.52 per 100 students (95% CI: 10.33–12.76). In 2020–2021 these indicators were lower: 9.67 (95% CI: 8.61–10.84; p = 0.03) in junior students and 9.28 (95% CI: 8.12–10.59; p = 0.0006) in senior students.

The COVID-19 incidence peaks were revealed in autumn 2020 and winter 2022. In autumn 2020, a quarter of all disease cases detected among students resulted from exposure in health care facilities related to the students' and residents' work in the COVID centers. Furthermore, multiple cases of non-compliance with the self-isolation regime after the emergence of ARI symptoms were revealed. When the SARS-CoV-2 Delta strain prevailed, the highest incidence was observed in

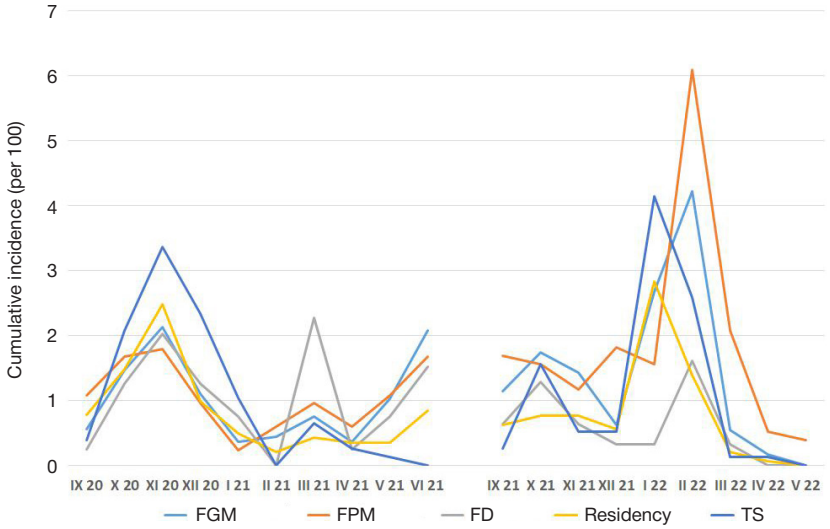

Fig. 2. Monthly trends in cumulative incidence of COVID-19 among students and teaching staff in 2020–2021 and 2021–2022. FGM — Faculty of General Medicine, FPM — Faculty of Preventive Medicine, FD — Faculty of Dentistry, TS — teaching staff

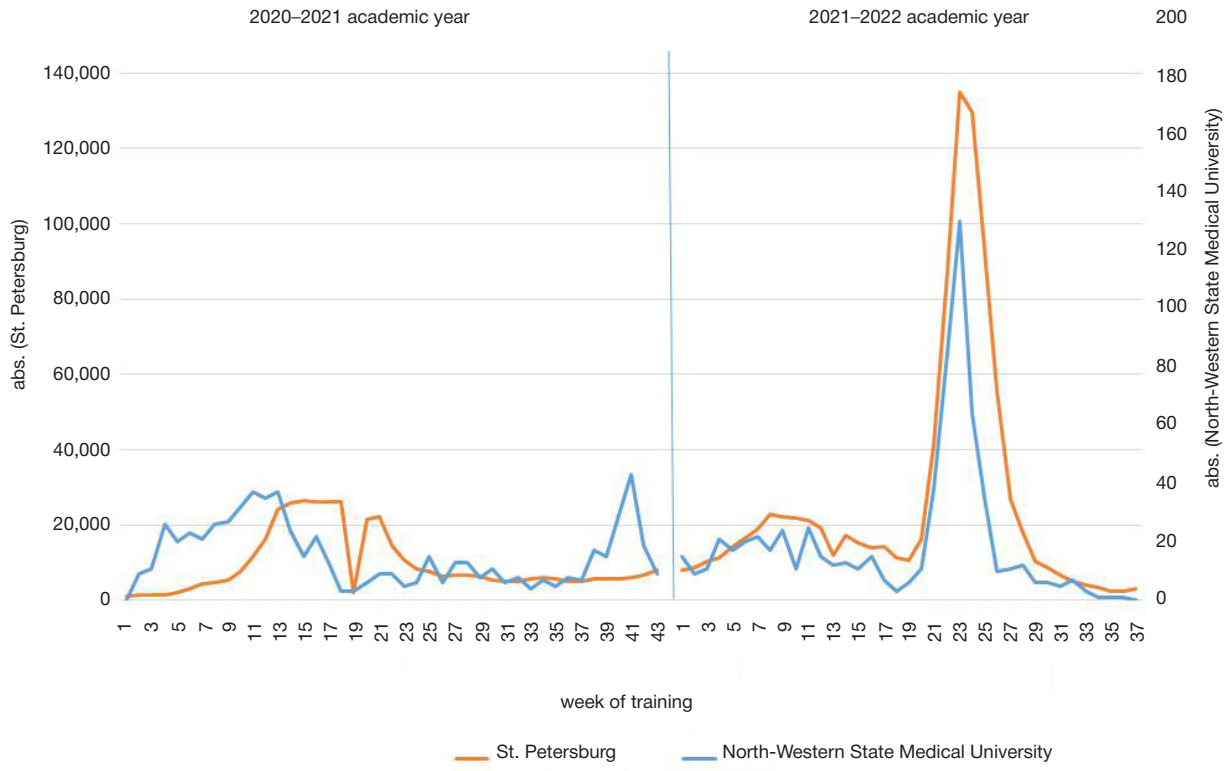

Fig. 3. Trends in the number of COVID-19 cases revealed among the University students and teaching staff and the residents of St. Petersburg

the teaching staff members, which was probably due to the age-related factor. The rise of incidence during weeks 40–41 (May 31–June 13, 2021) was caused by the students' non-compliance with the self-isolation regime in cases of infection during the end-of-semester examinations: 70% of infected students having symptoms of ARI continued attending the University. Furthermore, testing students for SARS-CoV-2 performed prior to summer internship revealed 30% of the total number of cases [1]. In winter 2022, when the SARS-CoV-2 Omicron strain prevailed, the teaching staff and residents were maximally involved as early as January 2022, while students were involved in February, which was due to student holidays.

The COVID-19 epidemic process among students and teaching staff members in the University depended on the epidemic process among residents of St. Petersburg: a strong positive correlation was revealed (correlation coefficient $r = 0.77$) (Fig. 3).

Re-infection was detected in 58 students (4.3% of the total number of infected individuals). The peak number of re-infection was revealed during the spread of SARS-CoV-2 Omicron strain in February 2022.

We managed to determine the probable setting of transmission infection in 39.9% of affected individuals over the entire period. The students most often reported contacting persons with confirmed COVID-19 at work or during their internship in the health care facilities (15.2% of affected individuals), 12.1% were contact in the group during face-to-face training, contact in the family at home was reported by 6.6%, contact in the dormitory was mentioned by 2.2%, 2.5% reported contact in other circumstances, and 1.3% noted they were contact to multiple sources of infection. The incidence among students who contacted persons with confirmed COVID-19 over the entire observation period was 8.8 per 100 students, while the incidence among students had contact to undefined sources of infection was 13.3 per 100 students. However, the incidence rates in individuals with various types of contact were different in the epidemic process intensity and were higher during the incidence peaks compared to periods with lower incidence (47.8 and 28.9%, respectively; $p << 0.01$) mostly due to infection resulting from exposure at work or during internship in the medical institution or University. Multiple contact, i.e. contact to multiple sources of infection during the incubation period, were reported in 2021–2022 (Fig. 4).

The infected senior students of the Faculties of General Medicine and Preventive Medicine and residents most often reported contacting persons with confirmed COVID-19 at work or during internship in the health care facilities ($p << 0.01$). This is not surprising, since it is senior students and residents who work and do internships in health care facilities. Infection due to contact in the University prevailed among junior students ($p = 0.0004$). The largest share of contacts with persons having confirmed COVID-19 under different circumstances outside the University was reported by students of the Faculty of Dentistry (Fig. 5).

DISCUSSION

The risk of infection increases during face-to-face training at universities. Thus, a dramatic increase in the COVID-19 incidence among students was observed in the USA in early 2020–2021. The survey performed by New York Times in more than 1600 colleges revealed more than 26,000 COVID-19 cases in more than 750 colleges across the country by August 26, more than 51,000 cases in more than 1020 US colleges by September 3, and more than 130,000 cases in 1300 colleges by September 25 [5]. In the other university 528 students (24.1%) out of 2187 were diagnosed with COVID-19 during the fall semester 2020, which was 8 times higher compared to the values obtained during our study [6]. The SARS-CoV-2 seroprevalence in 2905 students of five universities in the UK was 17.8% (95% CI: 16.5–19.3) in December 2020, it was within the range of 7.6–29.7% [7]. The incidence among students of one more university in 2020–2021 was 15.7 per 100 students [8].

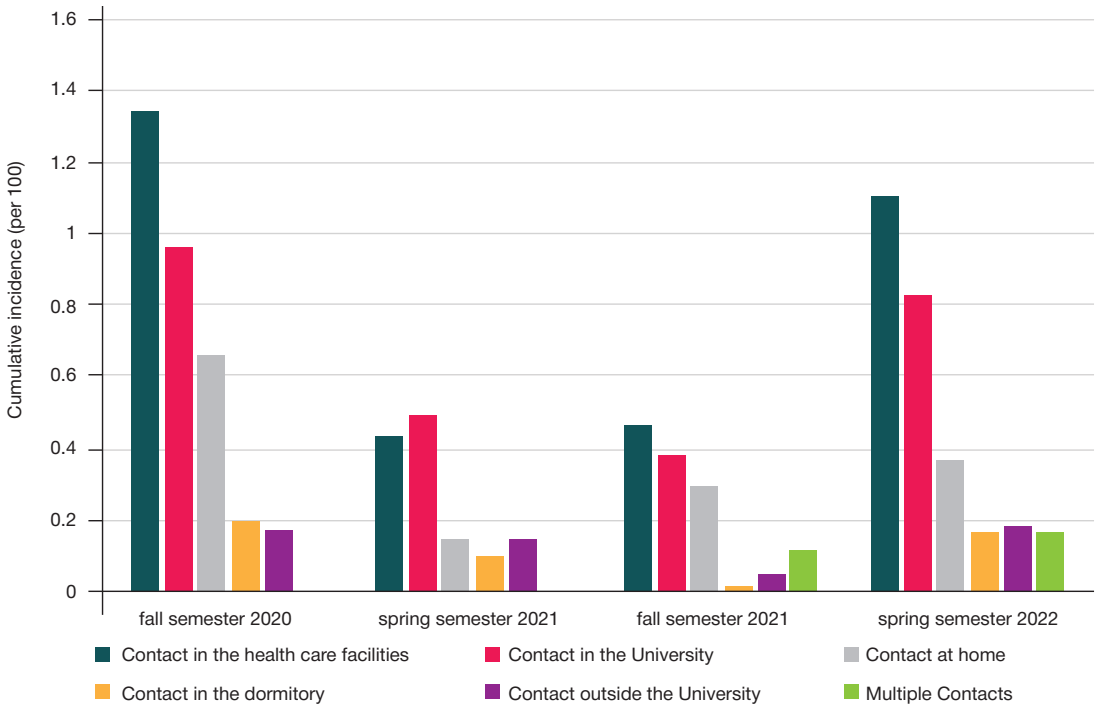

Fig. 4. Cumulative incidence of COVID-19 by probable setting of transmission infection among students enrolled in different semesters

In our study, the rapid growth of incidence in early 2020–2021 was also observed. The analysis of the causes of COVID-19 spread in September 2020 showed that students who attended the University while having ARI symptoms were the main cause. Thus, in September 2020, 25.4% of infected individuals came to the university on the day of symptom onset and 32.7% of individuals with COVID-19 continued attending face-to-face classes for more than one day after the disease onset. The studies conducted in other Russian universities have also shown that about a quarter of students having symptoms of COVID-19 do not seek medical care [9, 10]. This is usually due to the fear of making up missed classes. University administration decided to switch the infected individuals to distance learning, i.e. the classes were not marked as missed and the infected students did not have to make up any classes. Furthermore, a poster was created with a message not to attend classes after the emergence of ARI signs. Such posters were stationed at the entrance to each department. These measures reduced twice the attendance rate of individuals showing ARI symptoms, which made it possible to reduce the incidence rate when used along with implementation of other preventive and anti-epidemic measures. Rapid detection and isolation of infected people and exposed individuals along with strict compliance

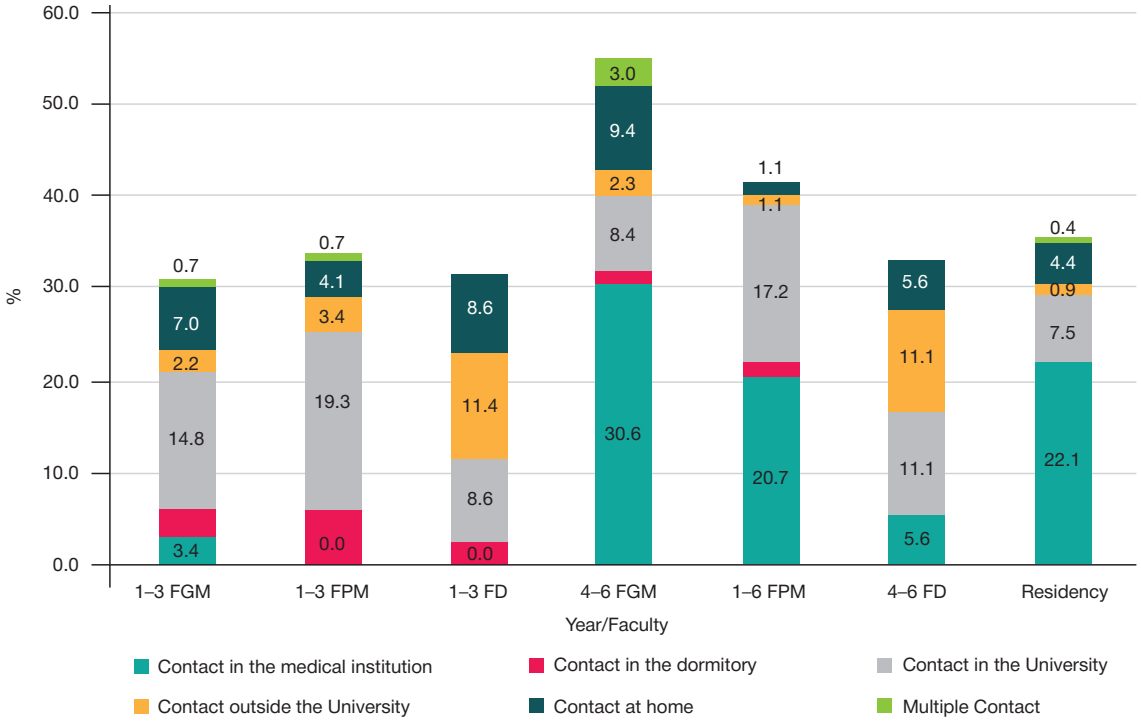

Fig. 5. Probable setting of transmission infection (share of all disease cases) of junior and senior students of various faculties and residents

with the face mask requirements are the key measures to control the spread of coronavirus infection.

During the pandemic (September–June 2020–2021 and 2021–2022), the incidence among the University students and teaching staff generally resulted from their involvement in the COVID-19 epidemic process in St. Petersburg, however, it was lower compared to that observed in the aggregate population of St. Petersburg. More than 1,350,000 COVID-19 cases were reported in St. Petersburg over the studied period, and the incidence that constituted 25 per 100 residents was higher than the incidence reported in the University. The highest incidence values were reported during the period of peak incidence in St. Petersburg. The relationships between the incidence rates of students and residents of settlements were described by some other researchers [11]. For example, the lower number of COVID-19 cases was registered among residents of Pennsylvania, who were not students, than among students [12].

Working in health care facilities was the main risk factor of morbidity in students. Active questioning of infected individuals made it possible to define the probable setting of transmission infection in more than a third of cases. Almost a half of them were contact when working in the health care facilities , which to a great extent determined the incidence among senior students and residents. Thus, the incidence among students working in health care facilities of Barnaul exceeded the regional average by 4.7 times. The share of infected 4–6-year students was 75.3% [13]. The students of Smolensk medical university also noted that health care facilities were among the major probable setting of transmission infection [14]. This is due to the clear COVID-19 status of patients in health care facilities and, probably, to the higher risk of infection in the context of medical care. Predominance of infection cases among junior University students is probably due to less knowledge and low adherence to preventive measures [15, 16].

The implemented measures made it possible to prevent high incidence among the University teaching staff members, which was extremely important, since many of them had some risk factors of severe COVID-19. The cumulative incidence of COVID-19 among teaching staff and students was 19.9 and 22.3 per 100, respectively.

The mass media of the Russian Federation repeatedly reported the COVID-19 outbreaks in the student dormitories. Thus, information about at least 15 outbreaks with the total number of affected individuals of at least 324 (4–79) was published on the open online resources. One of the studies showed that students living in the room together had a twice as much chance to become infected with COVID-19 than those who lived alone [5]. Active detection and isolation of infected and exposed individuals made it possible to avoid outbreaks among students living in the dormitories. The low percentage of re-infection cases that were observed only during the spread of the SARS-CoV-2 Omicron strain should be noted.

CONCLUSIONS

The incidence of novel coronavirus infection (COVID-19) among students and teaching staff members in the academic years 2020–2021 and 2021–2022 is directly related to their involvement in the COVID-19 epidemic process in St. Petersburg. The measures developed and implemented in the University in order to control the spread of novel coronavirus infection made it possible to prevent outbreaks among students and teaching staff and achieve the lower levels compared to overall population of St. Petersburg despite the face-to-face learning format. The incidence among students living in the dormitories over the entire period did not exceed that among individuals living in private apartments due to the development and implementation of active epidemiological surveillance for acute respiratory infections. No outbreaks among students living in the dormitories were detected, while mass media repeatedly reported COVID-19 outbreaks in the dormitories of other universities. Infection most often occurred upon exposure to the source of infection when working in the health care facilities. The experience of the University can be used in the future in case of new challenges related to the spread of infections.

References

1. Sayganov SA, Lyubimova AV, Meltser AV, Lopatin ZV, Kuznetsova OYu, Kovaleva OV, i dr. Ehpidemiologicheskie osobennosti rasprostraneniya novoj koronavirusnoj infekcii COVID-19 sredi obuchayushhixsya universiteta v 2020–2021 uchebnom godu. Profilakticheskaya i klinicheskaya medicina. 2021; 81 (4): 10–19. Russian.
2. Sayganov SA, Meltser AV, Lyubimova AV, Kuznetsova OYu., Zuyeva LP, Aslanov BI, i dr. Opyt organizacii mer po predotvrashheniyu rasprostraneniya novoj koronavirusnoj infekcii sredi obuchayushhixsya obrazovatel'noj organizacii, prozhivayushhix v obshhezhitiyax. Profilakticheskaya i klinicheskaya medicina. 2020; 76 (3): 4–11. Russian.
3. MR 3.1/2.1.0205-20. 3.1. Profilaktika infekcionnyx boleznej. 2.1. Kommunal'naya gigiena. Rekomendacii po profilaktike novoj koronavirusnoj infekcii (COVID-19) v obrazovatel'nyx organizaciyax vysshego obrazovaniya. Metodicheskie rekomendacii (utv. Glavnym gosudarstvennym sanitarnym vrachom RF 29.07.2020) (red. ot 11.02.2021). MR 3.1./2.1.02.05.20. Metodicheskie rekomendacii. Russian.
4. Vremennye metodicheskie rekomendacii ministerstva zdravooxraneniya Rossijskoj Federacii «Profilaktika, diagnostika i lechenie novoj koronavirusnoj infekcii (COVID 19)» versii 8.1-15 [Internet] Citirovano 21 yanvarya 2022 [okolo 248 str.] Dostupno po ssylke: https://xn--80aesfpebagmfblc0a.xn--p1ai/info/ofdoc/who/. Russian.
5. Watson S, Hubler S, Ivory D, Gebeloff R. A new front in America's pandemic: college towns.New York Times. [Internet] September 6, 2020. Updated September 25, 2020. Accessed January 21, 2022. [about 3 p.]. Available from: https://www.nytimes.com/interactive/2020/us/covid-college-cases-tracker.html.
6. Bigouette JP, Ford L, Segaloff HE, Langolf K, Kahrs J, Zochert T, et al. Association of Shared Living Spaces and COVID-19 in University Students, Wisconsin, USA, 2020. Emerg Infect Dis. 2021; 27 (11): 2882–6.
7. Vusirikala A, Whitaker H, Jones S, Tessier E, Borrow R, Linley E, et al. Seroprevalence of SARS-CoV-2 antibodies in university students: Cross-sectional study. England. J Infect. 2021; 83 (1); 104–11.
8. Cass AL, Slining MM, Carson C, Cassidy J, Epright MC, Gilchrist AE, et. al. Risk Management of COVID-19 in the Residential Educational Setting: Lessons Learned and Implications for Moving Forward. Int J Environ Res Public Health. 2021; 18 (18): 9743.
9. Lelenkova LYu, Nozhkina NV. Ocenka informirovannosti i otnosheniya studentov-medikov k ehpidemicheskoj situacii i vakcinacii protiv COVID-19. V sbornike: VI Mezhdunarodnaya (76 Vserossijskaya) nauchno-prakticheskaya konferenciya «Aktual'nye voprosy sovremennoj medicinskoj nauki i zdravooxraneniya». 2021; 783–8. Russian.
10. Nemchaninova DA, Marchenko DD. Osobennosti zabolevaemosti

COVID-19 sredi studentov medicinskogo vuza. FORCIPE. 2022; 5 (53): 568. Russian.
11. Pollock BH, Kilpatrick AM, Eisenman DP, Elton KL, Rutherford GW, Boden-Albala BM, et al. Safe reopening of college campuses during COVID-19: The University of California experience in Fall 2020. PLoS One. 2021; 16 (11): 0258738. PubMed PMID: 34735480.
12. Bharti N, Lambert B, Exten C, Faust C, Ferrari M, Robinson A. Large university with high COVID-19 incidence is not associated with excess cases in non-student population. Sci Rep. 2022; 12 (1): 3313.
13. Suvorova SM, Shirokostup SV, Lukyanenko NV. Analiz zabolevaemosti novoj koronavirusnoj infekciej COVID-19 sredi studentov medicinskogo vuza. V sbornike: V. G. Akimkin, redaktor. Molekulyarnaya diagnostika i biobezopasnost'-2021. COVID-19: ehpidemiologiya, diagnostika, profilaktika: sbornik tezisov Onlajn-kongressa s mezhdunarodnym uchastiem (28–29 aprelya 2021 g., Moskva). M.: FBUN CNII Ehpidemiologii Rospotrebnadzora, 2021; 48 s. Russian.
14. Chubanov VA, Zakharov YeA, Zaboyenkova YeA. Koronavirusnaya infekciya u studentov Smolenskogo gosudarstvennogo medicinskogo universiteta. Smolenskij medicinskij al'manax. 2022; (3): 153–57. Russian.
15. Delova LA. Soblyudenie mer profilaktiki COVID-19 studentami medicinskix special'nostej: po materialam sociologicheskogo oprosa. V sbornike: Innovacionnye issledovaniya: teoreticheskie osnovy i prakticheskoe primenenie: sbornik statej Nacional'noj (Vserossijskoj) nauchno-prakticheskoj konferencii, Saratov, 22 iyulya 2021 goda. Ufa: «OMEGA SAJNS», 2021; 296–301. Russian.
16. Wassif GO, El Din DAG. Relationship between knowledge, attitude, and practice of COVID-19 precautionary measures and the frequency of infection among medical students at an Egyptian University. PLoS One. 2022; 17 (9): 0274473. PubMed PMID: 36121862.

Литература

1. Сайганов С. А., Любимова А. В., Мельцер А. В., Лопатин З. В., Кузнецова О. Ю., Ковалева О. В. и др. Эпидемиологические особенности распространения новой коронавирусной инфекции COVID-19 среди обучающихся университета в 2020–2021 учебном году. Профилактическая и клиническая медицина. 2021; 81 (4): 10–19.
2. Сайганов С. А., Мельцер А. В., Любимова А. В., Кузнецова О. Ю., Зуева Л. П., Асланов Б. И. и др. Опыт организации мер по предотвращению распространения новой коронавирусной инфекции среди обучающихся образовательной организации, проживающих в общежитиях. Профилактическая и клиническая медицина. 2020; 76 (3): 4–11.
3. МР 3.1/2.1.0205-20. 3.1. Профилактика инфекционных болезней. 2.1. Коммунальная гигиена. Рекомендации по профилактике новой коронавирусной инфекции (COVID-19) в образовательных организациях высшего образования. Методические рекомендации (утв. Главным государственным санитарным врачом РФ 29.07.2020) (ред. от 11.02.2021). МР 3.1./2.1.02.05.20. Методические рекомендации.
4. Временные методические рекомендации Министерства здравоохранения Российской Федерации «Профилактика, диагностика и лечение новой коронавирусной инфекции (COVID 19)» версии 8.1-15. Цитировано 21 января 2022. Доступно по ссылке: https://xn--80aesfpebagmfblc0a.xn--p1ai/info/ofdoc/who/.
5. Watson S, Hubler S, Ivory D, Gebeloff R. A new front in America's pandemic: college towns.New York Times. [Internet] September 6, 2020. Updated September 25, 2020. Accessed January 21, 2022. [about 3 p.]. Available from: https://www.nytimes.com/interactive/2020/us/covid-college-cases-tracker.html.
6. Bigouette JP, Ford L, Segaloff HE, Langolf K, Kahrs J, Zochert T, et al. Association of Shared Living Spaces and COVID-19 in University Students, Wisconsin, USA, 2020. Emerg Infect Dis. 2021; 27 (11): 2882–6.
7. Vusirikala A, Whitaker H, Jones S, Tessier E, Borrow R, Linley E, et al. Seroprevalence of SARS-CoV-2 antibodies in university students: Cross-sectional study. England. J Infect. 2021; 83 (1); 104–11.
8. Cass AL, Slining MM, Carson C, Cassidy J, Epright MC, Gilchrist AE, et. al. Risk Management of COVID-19 in the Residential Educational Setting: Lessons Learned and Implications for Moving Forward. Int J Environ Res Public Health. 2021; 18 (18): 9743.
9. Леленкова Л. Ю., Ножкина Н. В. Оценка информированности и отношения студентов-медиков к эпидемической ситуации и вакцинации против COVID-19. В сборнике: VI Международная (76 Всероссийская) научно-практическая конференция «Актуальные вопросы современной медицинской науки и здравоохранения». 2021; 783–8.
10. Немчанинова Д. А., Марченко Д. Д. Особенности заболеваемости COVID-19 среди студентов медицинского вуза. FORCIPE. 2022; 5 (53): 568.
11. Pollock BH, Kilpatrick AM, Eisenman DP, Elton KL, Rutherford GW, Boden-Albala BM, et al. Safe reopening of college campuses during COVID-19: The University of California experience in Fall 2020. PLoS One. 2021; 16 (11): 0258738. PubMed PMID: 34735480.
12. Bharti N, Lambert B, Exten C, Faust C, Ferrari M, Robinson A. Large university with high COVID-19 incidence is not associated with excess cases in non-student population. Sci Rep. 2022; 12 (1): 3313.
13. Суворова С. М., Широкоступ С. В., Лукьяненко Н. В. Анализ заболеваемости новой коронавирусной инфекцией COVID-19 среди студентов медицинского вуза. В сборнике: В. Г. Акимкин, редактор. Молекулярная диагностика и биобезопасность-2021. COVID-19: эпидемиология, диагностика, профилактика: сборник тезисов Онлайн-конгресса с международным участием (28–29 апреля 2021 г., Москва). М.: ФБУН ЦНИИ Эпидемиологии Роспотребнадзора, 2021; 48 с.
14. Чубанов В. А., Захаров Е. А., Забоенкова Е. А. Коронавирусная инфекция у студентов Смоленского государственного медицинского университета. Смоленский медицинский альманах. 2022; (3): 153–57.
15. Делова Л. А. Соблюдение мер профилактики COVID-19 студентами медицинских специальностей: по материалам социологического опроса. В сборнике: Инновационные исследования: теоретические основы и практическое применение: сборник статей Национальной (Всероссийской) научно-практической конференции, Саратов, 22 июля 2021 года. Уфа: «ОМЕГА САЙНС», 2021; 296–301.
16. Wassif GO, El Din DAG. Relationship between knowledge, attitude, and practice of COVID-19 precautionary measures and the frequency of infection among medical students at an Egyptian University. PLoS One. 2022; 17 (9): 0274473. PubMed PMID: 36121862.