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# COVID-19 Impact on Infectious Disease Training and Residents' Satisfaction in the Republic of Croatia

## Utjecaj COVID-19 na specijalističko usavršavanje i zadovoljstvo specijalizanata infektologije u Hrvatskoj

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### Abstract

**Background:** The COVID-19 pandemic has caused significant changes in healthcare. Infectious disease (ID) physicians were among the most affected, yet comparisons are scarce on training implementation and the levels of residents' satisfaction between the pre-pandemic and the pandemic era.

**Methods:** We conducted a nationwide cross-sectional survey among Croatian ID residents between May and July 2021. The survey included 34 Likert-scale and multiple-choice questions pertaining to training rotation interruptions, educational opportunities, work hours, symptoms of burnout and overall satisfaction.

**Results:** The survey was completed by 52 (67.5%) ID trainees in Croatia. The curriculum-defined rotations were not met in real life before the pandemic (56.8%), and 63.5% of participants reported working exclusively with COVID-19 patients more than a year into the pandemic. The pre-pandemic educational opportunities included regular lectures for 61.4%, extra-curricular training for 59.1%, congress and symposia attendances for 52.3% and peer lectures for 27.3%. As many as 11.4% had never had a meeting with their mentor, while 59.1% only met in passing. Overtime work affected 90.9% of residents before and 96.1% during the pandemic. All burnout symptoms have increased from the pre-pandemic to the pandemic era. Overall satisfaction with specialty training has dropped from an average of 3.1 (SD 0.9) before the pandemic to 1.9 (SD 0.9) during the pandemic.

**Conclusions:** Our survey among Croatian ID residents indicated problems with educational opportunities and disruption of the planned training rotations before the pandemic. These problems were aggravated during the pandemic, thus causing a plunge in resident satisfaction levels. A closer monitoring of adherence to the training curriculum is mandated, as well as improvements in mentorship programs and burnout detection and reduction activities.

### Sažetak

**Uvod:** COVID-19 pandemija uzrokovala je značajne promjene u zdravstvu. Liječnici infektolozi bili su među najzahaćenijima ovim promjenama. Međutim, nedostaju usporedbe o provođenju specijalističkog usavršavanja te razini zadovoljstva specijalizanata, kako prije, tako i tijekom razdoblja pandemije.

**Metode:** Proveli smo presječnu anketu među specijalizantima infektologije u Republici Hrvatskoj u razdoblju između svibnja i srpnja 2021. godine. Anketa je sadržavala 34 pitanja s Likertovom ljestvicom ili pitanja s višestrukim ponuđenim odgovorima o prekidima planiranog programa specijalizacije, edukativnim prilikama, radnim satima, simptomima sindroma izgaranja te općem zadovoljstvu.

**Rezultati:** Anketu su ispunila 52 (67.5%) specijalizanta infektologije Republike Hrvatske. Prije pandemije, 56.8% specijalizanata nije ostvarivalo rotacije po odjelima kako su definirane kurikulumom, a nakon više od godinu dana trajanja pandemije 63.5% specijalizanata tvrdilo je da radi isključivo s COVID-19 bolesnicima. Prilike za edukaciju prije pandemije uključivale su redovita predavanja za 61.4%, edukaciju izvan obaveznog kurikuluma za 59.1%, pohađanje kongresa i simpozija za 52.3% te predavanja među kolegama iste razine stručnosti za 27.3% sudionika istraživanja. Čak 11.4% specijalizanata nikada se nije susrelo sa svojim mentorom, dok ih je 59.1% imalo tek usputni susret. Prije pandemije 90.9% specijalizanata radilo je prekovremeno, a tijekom pandemije njih 96.1%. Simptomi sindroma izgaranja porasli su od razdoblja prije pandemije do onoga tijekom pandemije. Opće zadovoljstvo specijalizacijom palo je s prosječnih 3.1 (SD 0.9) prije pandemije na 1.9 (SD 0.9) tijekom pandemije.

**Zaključci:** Naša anketa među specijalizantima infektologije Republike Hrvatske ukazuje na probleme u prilikama za edukaciju te prekidima planiranih rotacija po odjelima prije pandemije. Ovi su problemi pogoršani tijekom pandemije te su uzrokovali veliki pad zadovoljstva specijalizanata. Potrebno je pomnije praćenje pridržavanja kurikuluma specijalističkog usavršavanja, kao i poboljšanje sustava mentoriranja te detekcija i aktivnosti za smanjenje sindroma izgaranja.

### Introduction

The COVID-19 pandemic has caused various difficulties among healthcare workers worldwide, including increased workload, isolation, stress, unbalanced relationship between work and personal life, and poor mental health<sup>[1]</sup>. The pandemic has led to significant modifications within healthcare centres, such as mobilisation of staff to high-demand departments, interruption of the planned clinical rotations and decreased academic activities<sup>[2]</sup>.

The medical residents have been one of the most important forces to deal with the large inflow of patients with COVID-19. The maintenance of continued effective education and training has become one of the many challenges for residents, as well as for their leadership teams<sup>[3, 4]</sup>.

In March 2020, the Ministry of Health of the Republic of Croatia issued a resolution to mobilise all healthcare workers to high-demand departments, based on the current need<sup>[5]</sup>. This resolution was still in force in June 2022 and had a significant effect on the working conditions of healthcare staff. We were particularly interested in the impact of the pandemic on infectious disease (ID) residents.

In the Croatian healthcare system, ID residents and specialists work in secondary and tertiary healthcare institutions, both in ID wards and consulting in other wards. There is one specialised hospital, completely devoted to ID and only ID doctors attend to patients. The ID and the paediatric ID residency program in Croatia are based on a five-year national specialty curriculum approved by the Ministry of Health of the Republic of Croatia<sup>[6]</sup>. The ID residency consists of three years of

ID ward rotations and two years of rotations in internal medicine, microbiology and neurology. The paediatric ID specialty involves two-year rotations in the ID wards and three years of paediatric ward rotations. The end of the residency is marked by a formal oral examination. Residents are contractually bound to their parent hospital for the duration of the training, as well as for further five years as ID specialists; otherwise, a „pay-out” is an option. No formal changes have been made to the training curriculum during the COVID-19 pandemic up to the time of this publication.

This study aimed to examine the Croatian ID residents' working conditions and satisfaction before and during the COVID-19 pandemic.

### Methods

This study was conducted as a cross-sectional survey. The Ethics Committee of the University Hospital for Infectious Diseases „Dr. Fran Mihaljević”, Zagreb, Croatia (the central infectious disease training institution) approved this study. A voluntary online questionnaire was sent to all ID and paediatric ID residents in Croatia (at the time the survey was conducted, 77 persons in total), to be completed between May and July 2021. The study description, the invitation to participate and the link to the questionnaire were electronically distributed via e-mail. The questionnaire was created using Google Sheets and the response was taken as implied consent. The call to participate was sent two times at an interval of two weeks. Participation was optional and the identity of the respondents remained anonymous. The full questionnaire with a total of 34 questions is available as a supplement.

Question and possible answers Pitanja i ponudeni odgovori	Number of answers/Total answered Broj odgovora/Ukupno odgovoreno	Percentage/Postotak
1. Which age group do you belong to?		
<25 years	0/52	0.0%
25-30 years	26/52	50.0%
31-35 years	24/52	46.2%
>35 years	2/52	3.9%
2. What is your sex?		
Female	38/52	73.1%
Male	14/52	26.9%
3. What year of specialty training are you in?		
1	6/52	11.5%
2	12/52	23.1%
3	10/52	19.2%
4	9/52	17.3%

Question and possible answers Pitanja i ponudeni odgovori	Number of answers/Total answered Broj odgovora/Ukupno odgovoreno	Percentage/Postotak
5	8/52	15.4%
>5 years, having had to postpone specialty exam	7/52	13.5%
4. Have you been in the specialty training since before the beginning of the pandemic?		
Yes	44/52	84.6%
No	8/52	15.4%
5. Which specialty training rotation are you on currently?		
Infectious disease rotations as planned	15/52	25.9%
Currently mobilised back to infectious disease wards, although due for non-infectious disease rotations	23/52	44.2%
Non-infectious disease rotations as planned	7/52	13.5%
6. For most of the pandemic you have been working:		
With COVID-19 patients only	33/52	63.5%
With both COVID-19 and other infectious disease patients	11/52	26.9%
With non-infectious disease patients (rotations)	5/52	9.6%
7. Did your specialty training rotations follow the formal curriculum prior to the pandemic?		
All my rotations happened according to plan	5/44	11.4%
My rotations mostly followed the specialty training plan	14/44	31.8%
I have mostly worked in wards that lacked doctors, mostly not according to specialty training plan	25/44	56.8%
8. Which educational opportunities were available to you before the pandemic? (multiple choice)		
Regular lectures for residents	27/44	61.4%
Regular courses and extra-curricular training opportunities	26/44	59.1%
Regular congress and symposia attendances	23/44	52.3%
Regular opportunities to hold lectures supervised by my seniors	12/44	27.3%
9. The educational opportunities during the pandemic:		
Improved	3/44	6.8%
Worsened	36/44	81.8%
Are similar to the pre-pandemic opportunities	5/44	11.4%
10. How involved were you in scientific activities before the pandemic?		
I published one or more papers	16/44	36.4%
I participated in scientific work, but have not been published	17/44	38.6%
I am not interested in science	11/44	25%
11. Did your scientific activities change during the pandemic?		
I was more active	7/44	15.9%
I was less active	18/44	40.9%
My scientific activity stayed the same	19/44	43.2%
12. How often did you meet with your mentor before the pandemic?		
Regularly, on a monthly basis	5/44	11.4%
Regularly, on a yearly basis	8/44	18.2%
We cross paths during work, with no formal mentor-mentee meeting	26/44	59.1%
We have never met	5/44	11.4%

Question and possible answers Pitanja i ponudeni odgovori	Number of answers/Total answered Broj odgovora/Ukupno odgovoreno	Percentage/Postotak
13. Did your relationship with your mentor during the pandemic		
Improve	1/44	2.3%
Worsen	17/44	38.6%
Stayed the same	26/44	59.1%
14. Most of my knowledge and skills during specialty training has been acquired from (multiple choice)		
My colleagues residents	39/52	75%
Junior specialists	38/52	73.1%
Senior specialists	18/52	34.6%
My mentor	6/52	11.5%
Nurses	19/52	36.5%
Self-education through books, videos, online materials	28/52	53.9%
15. How many average overtime hours did you work per month before the pandemic?		
No overtime	4/44	9.1%
1-20 hours	4/44	9.1%
21-40 hours	13/44	29.6%
41-60 hours	10/44	22.7%
61-80 hours	8/44	18.2%
> 80 hours	5/44	11.4%
16. How many average overtime hours did you work per month during the pandemic?		
No overtime	2/52	3.9%
1-20	0/52	0
21-40	9/52	17.3%
41-60	16/52	30.8%
61-80	5/52	9.6%
>80	20/52	38.5%
17. Did you have regular 48-hour time off periods at least once in a fortnight before the pandemic?		
Yes	26/44	59.1%
No	18/44	40.9%
18. Did you have regular 48-hour time off periods at least once in a fortnight during the pandemic?		
Yes	19/52	36.5%
No	33/52	63.5%
19. Before the pandemic, did you experience any of the following symptoms (multiple choice)?		
Insomnia	10/52	19.2%
Headache	13/52	25%
Gastritis	19/52	36.5%
Anxiety	12/52	23.1%
Depression	1/52	1.9%
Other symptoms	3/52	5.8%
No symptoms at all	17/52	32.7%
20. Did you experience any of the following symptoms during the pandemic (multiple choice)?		
Insomnia	28/52	53.9%

Question and possible answers Pitanja i ponudeni odgovori	Number of answers/Total answered Broj odgovora/Ukupno odgovoreno	Percentage/Postotak
Headache	22/52	42.3%
Gastritis	26/52	50%
Anxiety	26/52	50%
Depression	19/52	36.5%
Other symptoms	9/52	17.3%
No symptoms at all	9/52	17.3%
21. Which of the following causes you stress at work (multiple choice)?		
Too many patients, not enough staff to attend to them	45/52	86.5%
My relationship with superiors	23/52	44.2%
Too much responsibility for my level of knowledge and skill	28/52	53.9%
Inadequate infrastructure and equipment for work	36/52	69.2%
The amount of overtime hours	33/52	63.5%
Other	6/52	11.5%
22. Did you have enough personal protective equipment available to you at any time during the entire pandemic?		
Yes	47/52	90.4%
No	5/52	9.6%
23. Are you satisfied with psychological support provided in your workplace?		
Yes	2/52	3.9%
No	1/52	1.9%
I know it is available, but I have not sought it	18/52	34.6%
I am not aware my work offers psychological support	31/52	59.6%
24. Have you sought professional psychological support outside your workplace before the pandemic?		
Yes, regularly	1/52	1.9%
Yes, irregularly	9/52	17.3%
No	42/52	80.8%
25. Do you seek professional psychological support outside your workplace during the pandemic		
More than before	8/52	15.4%
Less than before	6/52	11.5%
The same as before	38/52	73.1%
26. How would you rate your general satisfaction with your specialty training programme before the pandemic? (1 = extremely dissatisfied; 5= extremely satisfied)		
1	3/44	6.8%
2	4/44	9.1%
3	27/44	61.4%
4	6/44	13.6%
5	4/44	9.1%
27. How would you rate your general satisfaction with your specialty training programme during the pandemic? (1 = extremely dissatisfied; 5= extremely satisfied)		
1	17/52	32.7%
2	23/52	44.2%
3	8/52	15.4%

Question and possible answers Pitanja i ponudeni odgovori	Number of answers/Total answered Broj odgovora/Ukupno odgovoreno	Percentage/Postotak
4	3/52	5.8%
5	1/52	1.9%
28. How would you rate your enthusiasm for your specialty training before starting? (1 = extremely disinterested; 5= extremely interested)		
1	0/52	0
2	0/52	0
3	6/52	11.5%
4	14/52	26.9%
5	32/52	61.5%
29. How would you rate your enthusiasm for your specialty training before the pandemic? (1 = extremely disinterested; 5= extremely interested)		
1	2/44	4.6%
2	2/44	4.6%
3	10/44	22.7%
4	19/44	43.2%
5	11/44	25%
30. How would you rate your enthusiasm for your specialty training during the pandemic? (1 = extremely disinterested; 5= extremely interested)		
1	10/52	19.2%
2	19/52	36.5%
3	13/52	25%
4	5/52	9.6%
5	5/52	9.6%
31. What is the reason for change in your enthusiasm during your training? (multiple choice)		
My enthusiasm did not change	3/52	5.8%
My work collective is motivating	3/52	5.8%
My work collective is disappointing	27/52	51.9%
My knowledge and skills have deteriorated during the pandemic	37/52	71.2%
I feel exhausted since the pandemic started	40/52	76.9%
Other	3/52	5.8%
32. Did you consider leaving your specialty training before the pandemic?		
Yes	24/44	54.6%
No	20/44	45.5%
33. Did you consider leaving your specialty training during the pandemic?		
Yes	34/52	65.4%
No	18/52	34.6%
34. If you considered leaving your specialty training, why have you not done it?		
I never considered it	19/52	36.5%
The money fees I would need to return if I left training	16/52	60.8%
I plan to quit after becoming a specialist	5/52	9.6%
I believe every workplace has similar problems	5/52	9.6%
I hope the conditions will get better	7/52	13.5%

Topics such as interruptions at the place of work and in the training rotation, educational opportunities, work hours and time off, symptoms of burnout and overall satisfaction were covered in questions posed either as a 5-point Likert scale (grading from 1: extremely dissatisfied/disinterested, to 5: extremely satisfied/interested) or closed multiple-choice questions. The age of the participants was defined in 5-year spans rather than as an absolute number in order to preserve the anonymity of the participants. Questions pertaining to pandemic conditions were mandatory for all participants, while pre-pandemic questions only applied to those in training prior to March 2020.

The data was analysed using Microsoft Office 365 Excel.

## Results

Out of 77 residents (79.2% women) enrolled into the ID (n 68) and paediatric ID (n 9) residency programs in Croatia at the time this questionnaire was conducted, 52 (67.5%) participated in our study. Eight of the residents taking the survey started their training only after the pandemic had already started, and were exempt from questions comparing the pre-pandemic and the pandemic work environment. The most common age group was 25–30 years old (50%) and 96.1% of participants were younger than 35 years. Women made up 73.1% of the participants. Residents across all years of training participated in the study, with a notable 13.5% of participants reporting being a resident for longer than 5 years, having had to postpone their end-of-residency exam for various reasons, including professional (postponed rotations due to lack of physicians in certain wards) and personal (sick leaves, maternity leaves, etc).

### Specialty training rotations

At the time of taking the questionnaire, most of the participants reported being mobilised back to infectious diseases wards, although they were due to be in non-infectious disease rotations (44.2%).

More than half of the participants (56.8%) reported that their training did not follow the formal curriculum even before the pandemic and they were often assigned to wards lacking personnel. Since the beginning of the pandemic, most of the participants (63.5%) reported working only with COVID-19 patients.

### Education

Before the pandemic, 61.4% of the participants declared having regular opportunities to attend lectures for residents, 59.1% had regular opportunities for

extra-curricular training, 52.3% had regular opportunities to attend congresses and symposia, and 27.3% had regular opportunities to give peer lectures. Since the pandemic started 81.8% of participants claim that their educational opportunities have declined.

Before the pandemic, 75% of the participants reported interest in scientific activity, with 48.5% authoring at least one publication. During the pandemic, scientific activity decreased for 40.9% of the participants, while 15.9% reported higher scientific activity compared to the pre-pandemic period.

The majority of the residents' relationships with their mentors involved crossing paths during work, with no planned formal meetings (59.1%). As many as 11.4% reported never having met their mentor during their training. Only one resident reported that their relationship with their mentor improved during the pandemic, while 38.6% experienced a worsening of this relationship.

Seventy-five percent reported that, during their residency, they acquired most of their knowledge and skills from colleague residents, 73% from junior ID specialists, 36.5% from nurses and 34.6% from senior ID specialists. Only 11.5% reported acquiring skills and knowledge from their designated mentor, and 53.8% felt that the majority of their knowledge and skills came from self-educating through books, videos and online learning materials.

### Work hours

Most of the residents reported regular overtime work (90.9% before, and 96.1% during the pandemic), with 80 hours of overtime per month reported in 11.4% of residents before and 38.5% during the pandemic. Before the pandemic, 59.1% of trainees regularly had 48-hour periods of time off work every fortnight; during the pandemic, this number dropped to 36.5%.

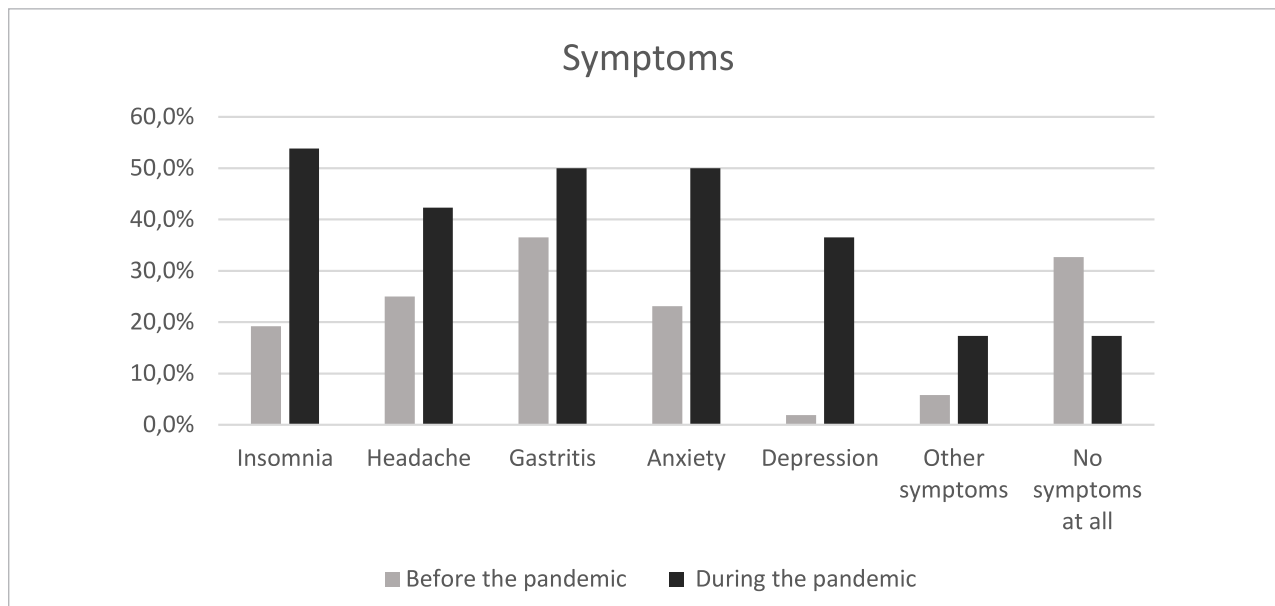
### Symptoms of burnout

There was an increase in reported cases of insomnia (19.2% vs 53.8%), headache (25% vs 42.3%), gastritis (36.5% vs 50%), anxiety (23.1% vs 50%) and depression (1.9% vs 36.5%) before and during the pandemic, respectively (Figure 1).

Most participants found the disparity between the number of patients and medical staff (86.5%), inadequate infrastructure and equipment (69.2%), the number of overtime hours (63.5%) and too much responsibility (53.8%) as the main causes of stress in their work environment. As many as 9.6% of the par-

FIGURE 1: SYMPTOMS OF BURNOUT IN CROATIAN ID RESIDENTS BEFORE AND DURING THE PANDEMIC

SLIKA 1. SIMPTOMI SINDROMA IZGARANJA MEĐU SPECIJALIZANTIMA INFJEKTologIJE U REPUBLICI HRVATSKOJ PRIJE I TIJEKOM PANDEMIJE



Participants reported not having enough personal protective equipment available to them at any time during the pandemic.

As many as 59.6% of participants are not aware if their workplace offers professional psychological support, and 34.6% are aware of its existence, but have not sought it. Most of the trainees did not seek psychological support outside their workplace (80.7% before, and 73.1% during the pandemic).

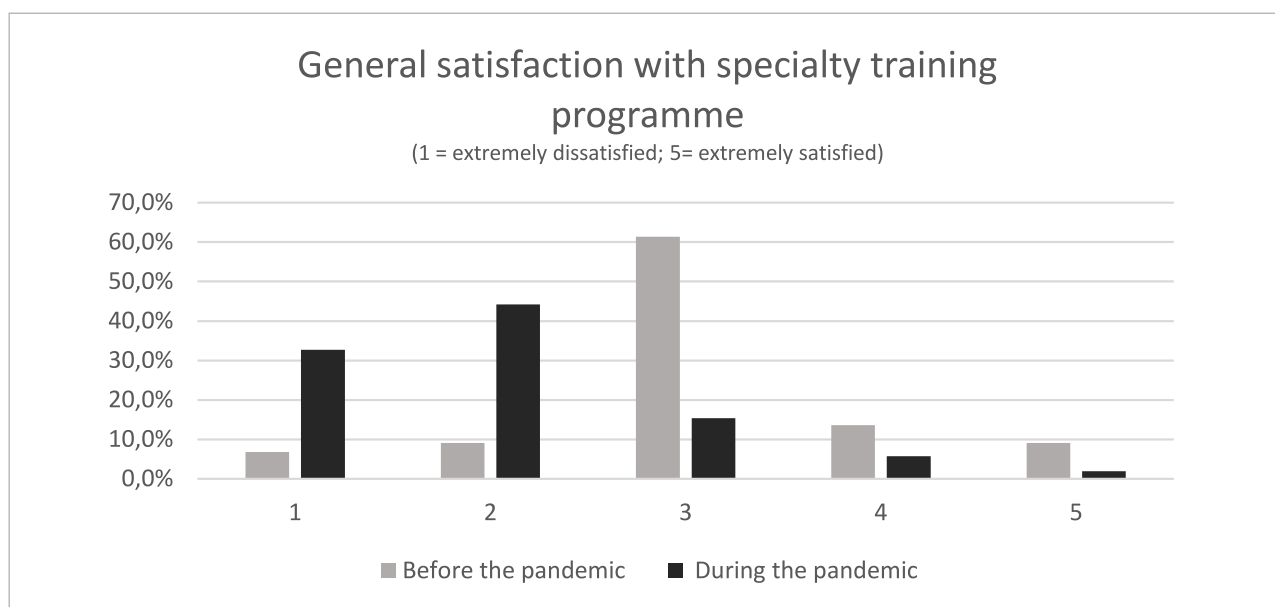
### Overall satisfaction

Residents graded their satisfaction with specialty training with an average of 3.1 (SD 0.9) before the pandemic and 1.92 (SD 0.85) during the pandemic (Figure 2).

The participants marked their enthusiasm for their specialty before starting training at an average of 4.5 (SD 0.7), 3.8 (SD 1.0) after starting training, but before the pandemic started, and 2.5 (SD 1.2) during the pandemic.

FIGURE 2: GENERAL SATISFACTION WITH ID SPECIALTY TRAINING PROGRAMME IN CROATIA BEFORE AND DURING THE PANDEMIC

SLIKA 2. OPĆE ZADOVOLJSTVO PROGRAMOM SPECIJALISTIČKOG USAVRŠAVANJA IZ INFJEKTologIJE U REPUBLICI HRVATSKOJ PRIJE I TIJEKOM PANDEMIJE





demic. About half of the participants are disappointed with their work collective (51.9%), 71.1% feel their knowledge and skills deteriorated during the pandemic and 76.9% have been feeling exhausted since the start of the pandemic.

The number of participants considering leaving their specialty training grew from 54.5% before the pandemic, to 65.4% during the pandemic. The most common reason for not leaving the specialty training (48.5% of those considering it) were the fees that would need to be settled in case of leaving the training unfinished.

### Discussion

Previous surveys have been conducted on training adequacy and satisfaction in ID and clinical microbiology residents in Europe<sup>[7]</sup>, as well as on the impact of COVID-19 on ID and non-ID residents<sup>[4, 8-18]</sup>. However, to our knowledge, this is the first survey on the conditions and satisfaction of Croatian ID residents.

A survey at the end of 2020, showed that 95% of European clinical microbiology and ID residents were involved in COVID-19 related activities, and despite the majority reporting increased overtime, disrupted training and research opportunities, 82% felt useful in managing the crisis<sup>[8]</sup>. However, this study noted that residents from south and eastern European countries were less likely to feel useful in the same circumstances, which correlates to our results. The time at which this and our survey were conducted could also have influenced the results, as our participants filled in the survey during and slightly after the 3<sup>rd</sup> wave of COVID-19 in Croatia, during which the highest mortality was noted<sup>[19]</sup>.

Although a high involvement rate of ID residents in the treatment of COVID-19 patients may be expected during a pandemic, ID residents across Europe previously complained of low-level implementation of the training curriculum in real life<sup>[7]</sup>. Our survey brings the residents' competency training into question, as 63.5% of our participants reported working exclusively with COVID-19 patients more than a year into the pandemic. Furthermore, the compliance of the residency with the curriculum seems to have been unacceptably low even before the pandemic, when more than half of the participants reported working in high-demand wards, instead of their curriculum-defined rotations. Other studies already reported trainees' concern with the pandemic affecting their preparedness for independent practice<sup>[4]</sup>, as the loss of time spent in planned rotations disrupts skill acquisition and is detrimental to residents' skill development<sup>[17]</sup>.

Regular opportunities for resident-directed lectures and congress and symposia attendance were not readily available to all the participants of our study; giving peer lectures or authoring a publication were even more uncommon. During the pandemic, all educational and scientific opportunities decreased; as was noted in some other previously published works, mostly including surgical residents<sup>[11, 13, 15]</sup>. As reported in the European-wide ID resident survey four years earlier<sup>[7]</sup>, infrequent, or even a complete absence of communication with the designated mentor was also observed in our survey even before the pandemic. Only one participant reported an improvement in their relationship with their mentor during the pandemic, while others reported stagnation or worsening of the relationship. Although maintaining effective education during the pandemic is not an easy task, trainee satisfaction feedback, as well as effective mentorship programs are vital to the improvement of training curricula and trainee satisfaction<sup>[7, 17]</sup>. The pandemic certainly brought to light some educational opportunities that can be implemented in the post-pandemic era as well, including virtual learning tools, telemedicine, and augmenting classical mentoring with peer mentoring<sup>[14, 20]</sup>.

Symptoms of burnout were prominent among specialists and residents in Croatia even in the pre-pandemic years<sup>[21]</sup>. Our survey also reported the presence of symptoms of burnout before the pandemic. All the surveyed symptoms (insomnia, headache, gastritis, anxiety and depression) increased in frequency during the pandemic, as did the number of overtime hours our participants worked. Other published work also found a clear increase in burnout, both work-related and pandemic-related, especially in younger persons and those of female sex<sup>[9-11, 16]</sup>. Perhaps unsurprisingly, the number of residents considering leaving their specialty training, already high at 54.5% before the pandemic, continued growing during the pandemic. In the period from 2013 to 2020, about 1000 medical doctors left Croatia to work abroad<sup>[22]</sup>. In our survey, the most common reason for not following through with the wish to leave their training was the financial debt connected to leaving the residency program early. Croatian doctors received less financial compensation for their overtime work than doctors in some other European countries, including neighbouring Slovenia<sup>[8]</sup>.

It is worrying that a large number of residents in our survey do not know whether they can receive psychological support in their workplace. Even when aware of the possibility, our participants were hesitant to seek help, whether in their workplace, or out of it, both before and during the pandemic. Burnout can

have profound effects on both mental and physical personal well-being, career prospects and personal relationships. It can also negatively affect patient care due to a larger proportion of medical errors<sup>[23-27]</sup>. Trainees and early-career physicians seem to be more prone to burnout; yet, at the same time, more reluctant to seek professional help<sup>[20, 25]</sup>. This highlights the potential of institutional support, which has been shown to have a greater role than mindfulness practices in improving resident well-being<sup>[10]</sup>.

In our survey, the overall level of satisfaction with the training was 3.1 on a 5-point Likert scale, almost identical to the level of satisfaction reported by ID and clinical microbiology residents in Croatia (3.1) and across Europe (3.2) in a survey published 4 years earlier<sup>[7]</sup>. The level of satisfaction dropped significantly during the pandemic, to 1.9. A smaller decline in the residents' enthusiasm for their chosen ID specialty, from 4.5 before starting training to 3.8 during training, but before the pandemic, is followed by a steeper decline during the pandemic (2.5). This could be due to the fact that ID residents are involved in treating COVID-19 patients the most<sup>[20]</sup>, and frontline doctors are most susceptible to burnout symptoms<sup>[16, 21]</sup>. Satisfaction may be increased by implementing good leadership strategies, which can help improve the work environment, and contribute to a sense of self-esteem and security at work<sup>[7, 9, 17, 20]</sup>.

The main limitation of our study is a relatively low percentage of resident participation in the survey (67.5%), which prevents generalization of our results. Another limitation is the cross-sectional design, with residents reflecting on the conditions during the pandemic and remembering those before the pandemic, with possible subjective negativism. Despite these limitations, our results are in concordance with other similar surveys<sup>[8-18]</sup>.

In conclusion, the ID residents' training has experienced major setbacks during the COVID-19 pandemic, including decreased educational opportunities, skill deterioration during mobilisation to high-demand wards and disruptions of curriculum-defined rotations, increased workload and symptoms of burnout, as well as a plunge in the levels of resident satisfaction and motivation. As our survey of the training conditions and satisfaction of Croatian ID residents before and during the pandemic shows, most of these problems were already present and were only accentuated by the pandemic conditions. The infectious disease and paediatric infectious disease training programme should aim to protect the curriculum-defined rotations, improve educational opportunities and the mentorship programme, while decreasing the residents'

workload, detecting symptoms of burnout and providing and promoting healthcare support. Improving the quality of the residency program can lead to increased happiness among trainees, which may improve their professional performance and create a better life-work balance.

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### Conflict of interest

The authors have no relevant financial or non-financial interests to disclose.

### Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Participation in the study was voluntary and anonymous. The study was approved by the Ethics Committee of the University Hospital for Infectious Diseases „Dr. Fran Mihaljević“, Zagreb (Ethics Committee approval number 01-912-4-2021).

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