

## Effects of COVID-19 pandemic on stress level of residents and fellows during ophthalmology training

Itamara O Aragão<sup>1,‡</sup>, Tatiana G C Alencar<sup>1,‡</sup>, Ana Karine A Soares<sup>2</sup>, Camilla S da Rocha<sup>2</sup>, Camila V Ventura<sup>1,2</sup>

**Purpose:** To evaluate the impact of coronavirus disease 2019 (COVID-19) on the mental health of residents and fellows in ophthalmology. **Methods:** A questionnaire composed of 42 questions was applied to Brazilian residents and fellows in Ophthalmology. The questionnaire addressed the demographics of participants, their working conditions before and during the COVID-19 pandemic, and the Perceived Stress Scale (PSS-10). **Results:** The study had a total of 271 participants in Ophthalmology training, from which 100 were fellows and 171 were residents. Before the pandemic, Ophthalmology residents and fellows had a higher workload ( $P < 0.001$ ), and residents worked more hours than fellows ( $P = 0.001$ ). During the pandemic, the workload of both residents and fellows decreased and equalized ( $P = 0.195$ ). No correlation was found between the working hours during the pandemic and their stress level were observed ( $P = 0.760$ ). Higher stress scores were identified in women ophthalmologists ( $P = 0.001$ ) as well as in residents and fellows that had their surgical training interrupted during the pandemic ( $P < 0.001$ ). **Conclusion:** The stress level of residents and fellows during the COVID-19 pandemic was similar, however, those that had their surgical training interrupted during the pandemic presented higher level of stress. Female physicians also presented higher level of stress compared to male physicians.

**Key words:** COVID-19, mental health, ophthalmology, pandemic, stress

The coronavirus disease 2019 (COVID-19) is a disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that has been affecting thousands of individuals physically and psychologically around the globe.<sup>[1]</sup> The psychological impacts of this pandemic include stress, anxiety, depression, and fear.<sup>[2-5]</sup>

To curb the spread of this disease, governments around the world imposed “lockdowns” to varying degrees.<sup>[3,5]</sup> In Brazil, some state governors adopted similar policies including blockades.<sup>[6]</sup> As a result of these measures, medical centers and small private clinics performing elective services were closed during this period.<sup>[7,8]</sup>

In ophthalmology, many patients with eye diseases had their appointments, ancillary exams, clinical treatments, and elective surgeries postponed.<sup>[7]</sup> The number of elective cataract surgeries performed between January and May 2020 was 148 800–83 800 less than in the same time frame in the year before. Similarly, the number of ophthalmological consultations dropped 36% during that period compared to 2019.<sup>[7]</sup>

Healthcare providers, on the other hand, have been in the frontline of COVID-19 pandemic. Because of this global public health crisis, healthcare providers were more susceptible to SARS-CoV-2 infection. America is the region with the largest number of infected health professionals in the world.<sup>[9]</sup> Data show that almost 570 000 health professionals in the Americas

had COVID-19, and more than 2 500 of them died between December 2019 and August 2020.<sup>[9]</sup>

In most countries, thousands of healthcare professionals have been transferred to emergency rooms and intensive care units to help fight COVID-19. Some of whom acquired the infection and died.<sup>[10]</sup> In the midst of numerous uncertainties and lack of knowledge on this novel virus, medical doctors have been facing an overload of stress. It is well-known that in general, doctors and other health professionals face excessive pressure during their work hours.<sup>[11]</sup> However, in situations such as the COVID-19 pandemic an increase in the level of stress would be expected.

Ophthalmology is one of the medical specialties with high vulnerability to SARS-CoV-2 due to the proximity that physicians stand to patients’ face during examination, as well as keratoconjunctivitis being one of the possible initial symptoms.<sup>[12]</sup> Thus, the aim of this survey-based study was to evaluate the impact of COVID-19 on the mental health of residents and fellows in ophthalmology.

### Methods

The present study was approved by Ethics Committee for Human Research and comprised a 42-questions survey

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Departments of <sup>1</sup>Ophthalmology, <sup>2</sup>Research, Altino Ventura Foundation, Recife, Brazil

<sup>‡</sup>Co-first authorship.

**Correspondence to:** Prof. Camila V Ventura, Fundação Altino Ventura (FAV), Rua da Soledade, 170, Recife - 50070-040, PE, Brazil. E-mail: camilaventuramd@gmail.com

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elaborated by the authors and addressed the impact of COVID-19 on the mental health of residents and fellows in ophthalmology. The questionnaire was divided into two sections: The first section contained demographic characteristics of the participants (8 questions) and their working conditions before and during the COVID-19 pandemic (24 questions), and the second part of the questionnaire consisted of Perceived Stress Scale (PSS-10), a 10-question and validated survey.<sup>[13,14]</sup>

The PSS-10 was developed with the objective of estimate the stress level of each participant with questions about negatives and positives feelings and ability or inability of dealing with stressful situations.<sup>[15]</sup> Half of the items reflect positively and the other half negatively and five options of answer, each of them with a punctuation that varies from 0 to 4, being: 0 = never, 1 = almost never, 2 = sometimes, 3 = almost always, and 4 = always. Positive questions are calculated inverted (0 = 4, 1 = 3, 2 = 2, 3 = 1, 4 = 0) and higher the sum, greater the stress. The score value obtained from the PSS-10 can range from 0 to 40 points. The higher the level of stress, the higher the score.<sup>[13,14]</sup>

The participants of the survey were Brazilian residents and fellows in ophthalmology identified by the professional network of the authors including members of their national ophthalmological societies. The online survey was sent by email and WhatsApp (WhatsApp LLC, Menlo Park, California, USA) with a link to access the survey on Google Forms (Google LLC, Mountain View, California, USA). Complete questionnaires were received between June 22 and July 9 of 2020. Responders could answer only once to the survey and the participation was voluntary, anonymous, and offered no financial support.

Categorical variables were recorded as absolute and relative frequencies. Comparisons between “before” and “during” the pandemic periods were performed, using the McNemar test for categorical data. Qui-square tests (mainly the Pearson Qui-square test) were applied to categorical data to assess how likely it is that any observed differences could happen at random. Comparison between sex was performed using the Mann-Whitney Test. The Spearman Correlation Test was used to evaluate the association between stress and workload in the emergency room working. The comparison between level of professional training and stress was analyzed using the Kruskal Wallis Test. A *P* value <0.05 was considered statistically significant. Statistical analysis was performed using the Statistical Package for Social Sciences software version 25.0 (IBM, Armonk, NY).

## Results

A total of 271 physicians responded to the survey: 100 (36.9%) fellows in ophthalmology and 171 (63.1%) residents in Ophthalmology. The study sample had representation of all years of residency and fellowship training. The mean age of the participants was  $28.9 \pm 2.7$  (23.0–40.0) years and the study included a higher number of women (73.1%). Most participants were single (67.9%) or married (21.0%). Of the participants, 243 (89.7%) did not have children. According to the geographical distribution of participants, 33 (12.2%) professionals were doing their training in the Midwest, 119 (43.9%) in the north/northeast, and 119 (43.9%) in the south/southeast of Brazil [Table 1].

There was no significant difference in the level of stress detected in our work using the PSS-10 between

**Table 1: Demographic data of residents and fellows in Ophthalmology**

	<i>n</i> (%)
Age	$28.9 \pm 2.7$ (23.0–40.0)
Sex	
Female	198 (73.1%)
Male	73 (26.9%)
Marital status	
Married	57 (21.0%)
Divorced	3 (1.1%)
Single	184 (67.9%)
Stable union	27 (10.0%)
Children	
No	243 (89.7%)
Yes	28 (10.3%)
Country region	
North/northeast	119 (43.9%)
Midwest	33 (12.2%)
South/southeast	119 (43.9%)
Professional training	
First year resident	50 (18.5%)
Second year resident	56 (20.7%)
Third year resident	65 (24.0%)
First year fellow	67 (24.7%)
Second year fellow	29 (10.7%)
Third year fellow	4 (1.5%)

**Table 2: Residents and fellows in Ophthalmology weekly workload before and during the pandemic**

Hours per week	Residents ( <i>n</i> =171) (%)	Fellows ( <i>n</i> =100) (%)	<i>P</i> *
Before pandemic			0.001
10 max	3 (1.8%)	0 (0.0%)	
11-20	2 (1.2%)	2 (2.0%)	
21-30	6 (3.5%)	5 (5.0%)	
31-40	17 (9.9%)	31 (31.0%)	
41-50	39 (22.8%)	19 (19.0%)	
51-60	63 (36.8%)	26 (26.0%)	
>60	41 (24.0%)	17 (17.0%)	
During pandemic			0.195
10 max	36 (21.1%)	27 (27.0%)	
11-20	37 (21.6%)	29 (29.0%)	
21-30	35 (20.5%)	19 (19.0%)	
31-40	28 (16.4%)	6 (6.0%)	
41-50	17 (9.9%)	8 (8.0%)	
51-60	9 (5.3%)	7 (7.0%)	
>60	9 (5.3%)	4 (4.0%)	

\*Pearson Qui-Square test

the groups of fellows (average score 22.5) and residents (average score 22.1).

Residents had a higher workload then fellows before the pandemic (*P* > 0.001) [Table 2]. During the pandemic,

**Table 3: The stress level of residents and fellows in Ophthalmology based on sex and professional training**

	Stress level	P*
Sex		0.001*
Female	23.2±5.6 (6.0-39.0)	
Male	19.8±6.0 (8.0-33.0)	
Professional training		0.376**
First year resident	23.3±5.4 (9.0-35.0)	
Second year resident	21.8±6.3 (11.0-33.0)	
Third year resident	21.6±5.8 (8.00-36.0)	
First year fellow	22.5±5.9 (10.0-39.0)	
Second year fellow	22.3±6.2 (6.0-30.0)	

\*Mann-Whitney test. \*\*Kruskal Wallis test

**Table 4: The stress level of residents and fellows in Ophthalmology based on surgical training**

	Stress level	P*
Residents and Fellows that performed surgical training before the pandemic		0.287
Yes	22.0±6.0 (6.0-39.0)	
No	23.3±5.0 (12.0-35.0)	
Residents and Fellows that were performing surgical training during the pandemic		<0.001
Yes	20.0±6.2 (6.0-31.0)	
No	23.5±5.3 (9.0-39.0)	

\*Mann-Whitney test

a reduction and equalization of the workload of residents and fellows was noted ( $P = 0.195$ ) [Table 2]. No correlation was identified between the workload and stress level of professionals during the pandemic ( $P = 0.760$ ).

The year of professional training did not influence the level of stress ( $P = 0.376$ ) [Table 3], nor the age of fellows and residents ( $P = 0.857$  and  $P = 0.643$ , respectively) [Table 3]. Higher levels of stress were identified in female participants ( $P = 0.001$ ) [Table 3].

Before the pandemic, 131 residents (76.6%) and 91 fellows (91.0%) were performing the surgical training. During the pandemic, 54 residents (31.6%) and 44 fellows (44.0%) were still on surgical training ( $P < 0.001$ ). The stress level of residents and fellows during the COVID-19 pandemic that had their surgical training interrupted was significantly higher ( $P < 0.001$ ) [Table 4].

## Discussion

The pandemic has had a negative impact on the mental health of individuals from the most diverse sectors of society, but health workers have the aggravating factor of dealing directly with the infected and are at a greater risk of contracting COVID-19.<sup>[1]</sup> Data from the World Health Organization (WHO) and the Ministry of Health indicate that 570,000 health workers have been infected with COVID-19 in the Americas, and as of September 2020, the WHO has reported 2,500 health worker

deaths on the continent.<sup>[9]</sup> As of December 26, 2020, 435,872 cases of COVID-19 were confirmed in healthcare professionals in Brazil and 2,736 of these cases were reported as Severe Acute Respiratory Syndrome (SARS), of which they were hospitalized and 441 died. COVID-19 was the cause in 86.6% of these deaths.<sup>[16]</sup>

Although conjunctivitis is an uncommon presentation of COVID-19, infected or suspected patients may be admitted or referred to ophthalmology clinics, which increases the possibility of exposure of ophthalmologists to COVID-19.<sup>[12]</sup> Routine eye exams, such as slit lamp examination, and treatment procedures that are within the range of aerosol transmission, are performed by close contact. In addition, the short distance between ophthalmologist and patient during direct ophthalmoscopy increases their risk of contracting COVID-19 given their exposure to contaminated ocular secretions.<sup>[17]</sup> Thus, when trying to cope with this stressful global event, ophthalmologists may also develop psychiatric disorders.<sup>[2]</sup>

Katsurayama *et al.*<sup>[18]</sup> showed that medical residency training alone can promote psychological suffering to residents due to an interaction between sleep deprivation, social deprivation, and individual vulnerability. It was also observed that residents of university hospitals were more stressed and depressed than residents of non-university hospitals, which suggests that services with a predominantly academic profile require more and, consequently, doctors have a higher level of stress. Firth-Cozens<sup>[19]</sup> reported in their work that first-year residents were considered more vulnerable to stress due to less ability in the adaptive process, thus composing a risk group. In addition, Khanna *et al.*<sup>[1]</sup> assessed depression in ophthalmologists from India during confinement by COVID-19 using the Patient Health Questionnaire-9 (PHQ-9), a self-report measure used to assess the severity of depression over the previous 2 weeks and found that depression was significantly greater in younger ophthalmologists. However, our results show no significant differences between residents and fellows with respect to year of study or age.

The high level of stress observed in female residents and fellows in the present study corroborates with Frank *et al.*<sup>[20]</sup> that reported sex-related issues such as stress related to multiple functions, including managing domestic activities and professional life. Additionally, Grover *et al.*<sup>[21]</sup> showed that female ophthalmologists present higher levels of stress, depression, and anxiety compared to male ophthalmologists.

As expected, the present study showed that residents had an increased workload before the pandemic compared to fellows but during the pandemic the working hours for both residents and fellows dropped, and the workload became equivalent. However, it is noteworthy that the interruption of surgical training has impacted the stress level of residents and fellows. Our finding corroborates with Gondim *et al.*<sup>[22]</sup> that showed a workload reduction of 45.6% in Brazilian ophthalmology residency programs and concluded that all medical residency services were affected by the pandemic. Moreover, our findings draw attention to the impact that COVID-19 may have on the quality of training of future ophthalmologists given the possible gaps in knowledge and training that this pandemic may lead to and that are challenging to be remedied.

It is undeniable that the COVID-19 pandemic had a negative effect on ophthalmology training.<sup>[22,23]</sup> The real challenge is to quantify this impact considering the complexity of training and the multiple factors involved. Thus, our study aimed to evaluate the impact of the pandemic based on the physiological status of residents and fellows. Our study revealed that the pandemic resulted in an increased level of stress among female ophthalmology residents and fellows, as well as among those physicians that had their surgical training suspended during the pandemic. The present study highlights the stress level of these professionals that may be caused by the insecurity and uncertainties raised by the interruption of proper practical activities and surgical training.

The results also alert the medical community to the need for specific psychological support<sup>[21]</sup> for these professionals facing a life-threatening scenario and highlights the need for measures to mitigate the loss of in-person clinical and surgical training.

## Conclusion

As a consequence of the COVID-19 pandemic, the workload of residents and fellows decreased. Residents and fellows experienced similar levels of stress during this period. However, higher levels of stress were observed among female trainees and those that had their surgical training interrupted during the pandemic.

### Ethics committee approval

Altino Ventura Foundation (Protocol number: 3.784.484).

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### Conflicts of interest

There are no conflicts of interest.

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