






# Impact of the COVID-19 Pandemic in the Prevalence of Burnout among Residents in Orthopedics\*

## *Impacto da pandemia COVID-19 na prevalência de burnout entre residentes em ortopedia*

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### Abstract

**Objective** The primary objective of the present study is to assess the impact of the COVID-19 pandemic on the prevalence of burnout syndrome among residents in orthopedic surgery. As a secondary objective, characteristics associated with the risk of developing the severe form of the syndrome were assessed.

**Method** In the present cross-sectional study, graduating orthopedic residents were evaluated before and during the COVID-19 pandemic. Medical students formed a control group. The participants answered a sociodemographic questionnaire, the Maslach Burnout Inventory, and the Brazilian validated version of the 36-item short-form health survey questionnaire (SF-36). Fifty-two residents were appraised before the pandemic and 19 during the pandemic.

**Results** Forty-four (84.6%) residents fulfilled the criteria for burnout syndrome, and the severe form of the syndrome was present in 16 (30.7%). There was no significant change in the evaluated scores after the beginning of the COVID-19 pandemic. There was also no increase in the prevalence of burnout syndrome or of the severe form of the syndrome. A negative correlation was observed between SF-36 items and the development of the severe form of burnout syndrome.

**Conclusion** The prevalence of burnout syndrome and of the severe form of the disease was very high among residents in orthopedic surgery. The COVID-19 outbreak does not increase burnout in the residents.

### Keywords

- ▶ occupational health physicians
- ▶ burnout syndrome
- ▶ burnout professional
- ▶ medical field training
- ▶ orthopedics

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**Resumo**

**Objetivo** O objetivo principal do presente estudo é avaliar o impacto da pandemia de COVID-19 na prevalência da síndrome de burnout entre residentes em cirurgia ortopédica. Como objetivo secundário, foram avaliadas características associadas ao risco de desenvolver a forma grave da síndrome.

**Método** No presente estudo transversal, foram avaliados residentes antes e durante a pandemia de COVID-19. Estudantes de medicina formaram um grupo de controle. Os participantes responderam a um questionário sociodemográfico, ao Inventário Maslach Burnout, e à versão validada brasileira do Short Form Health Survey 36 (SF-36). Cinquenta e dois residentes foram avaliados antes da pandemia e 19 durante a pandemia.

**Palavras-chave**

- ▶ médicos do trabalho
- ▶ síndrome do esgotamento
- ▶ esgotamento profissional
- ▶ treinamento de campo médico
- ▶ ortopedia

**Resultados** Quarenta e quatro (84,6%) residentes tinham critérios para síndrome de burnout, e a forma grave da síndrome estava presente em 16 (30,7%). Não houve alteração significativa nos escores avaliados após o início da pandemia de COVID-19. Também não houve aumento na prevalência da síndrome de burnout ou da forma grave da síndrome. Observou-se correlação negativa entre os itens SF-36 e o desenvolvimento da forma grave da síndrome de burnout.

**Conclusão** A prevalência da síndrome de burnout e da forma grave da doença foi muito alta entre os residentes em cirurgia ortopédica. A pandemia de COVID-19 não aumentou o burnout nos residentes.

**Introduction**

Occupational burnout is a syndrome composed of emotional exhaustion, depersonalization, and a low sense of fulfillment secondary to chronic occupational stress.<sup>1</sup> The syndrome affects negatively personal life and professional performance, and is a growing concern among healthcare professionals.<sup>1</sup> Orthopedic surgeons frequently manage complex cases and need to master a wide range of surgical techniques. Their practice usually involves heavy workload, night shifts, and long surgeries.<sup>2</sup> As a result, the orthopedic training program is notoriously difficult.<sup>3,4</sup>

The emergence of a highly contagious virus in December 2019 has dramatically altered social interactions around the world.<sup>5</sup> As COVID-19 rapidly spread, it was declared a pandemic, and it caused profound changes in healthcare systems, dramatically altering medical training programs.<sup>6</sup> Healthcare professionals are the first line of defense against COVID-19, and they are under a high risk of infection. Initial reports showed infection rates that range from 1.5 to 20.7% between orthopedic surgeons at the early stage of the outbreak.<sup>5</sup> This new reality may result in increased anxiety among healthcare professionals not only as a result of work but also as a result of profound changes in lifestyle imposed by quarantine.<sup>7</sup>

The primary objective of the present study is to assess the impact of the COVID-19 pandemic on the prevalence of burnout syndrome among graduating orthopedic residents. As a secondary objective, the correlation between socio-demographic and health characteristics with the risk of

developing the severe form of burnout syndrome was assessed.

**Method**

In the present cross-sectional study, the prevalence of burnout syndrome in orthopedic residents who underwent residency at a reference hospital in orthopedics was evaluated. The present study was approved by the ethics in research committee and was performed from September 2019 to June 2020. The present study was designed to determine risk factors for the development of burnout syndrome. However, with the emergence of the COVID-19 outbreak during the study, it was possible to expand its scope. Information regarding the COVID period was collected between March and June 2020, a period in which the epidemic spread rapidly in Brazil.

Graduating orthopedic residents were included in the study. As the hospital is a reference unit for the local public health network, the institution also serves as a practice field for orthopedic residents from other programs. They are admitted as visiting residents and were also included in the study. Usually, visiting residents stay for periods that vary from 1 to 3 months per year and follow the same routine of the residents of the institution. A control group formed by medical students from the 4<sup>th</sup> to the 6<sup>th</sup> year of graduation who underwent a medical internship in orthopedics was also created. After the beginning of the COVID-19 pandemic, the hospital adopted social distance measures, which included a reduction in the number of residents and medical students.

Thus, most of the residents assessed during the pandemic period were residents of the institution residency program.

After signing the free informed consent form, the participants answered a sociodemographic questionnaire, the Maslach Burnout Inventory (MBI)<sup>8,9</sup> and the Brazilian validated version of the 36-Item Short-form health survey questionnaire (SF-36).<sup>10-13</sup> The forms were delivered together in the following order: sociodemographic questionnaire, MBI, and SF-36. The participants responded to the study in a reserved and quiet place. They were instructed not to identify themselves and, after filling the forms, they deposited them in a ballot box.

The data collected were: age, gender, birthplace, marital status, if they had children, characteristics related to habitation, years of medical practice, work hours per week, if they work at night, if they had another college degree, study hours per week, hours devoted to recreational activities per week, if they had already considered giving up medical residency, and if they had already considered giving up the medical profession.

The MBI is a widely used tool for the characterization of burnout syndrome, and it assesses the three components of the syndrome: emotional exhaustion (MBI\_EE), depersonalization (MBI\_DP), and personal accomplishment (MBI\_PA). Scores were used to characterize burnout syndrome when: MBI\_EE > 27 points, MBI\_DP > 10 points, and MBI\_PA < 40 points.<sup>9,14-16</sup> Participants with altered values in any of the components were considered to be affected by the syndrome. The combination of a high MBI\_EE, high MBI\_DP, and a low MBI\_PA was used to define the severe form of the burnout syndrome.<sup>15,17</sup>

The SF-36 is a generic instrument to evaluate general health and quality of life. It consists of a multidimensional questionnaire with eight domains: functional capacity, limitation due to physical aspects, pain, general health, vitality, social aspects, emotional aspects, and mental health. Each domain has a final score from 0 to 100, where 0 corresponds to the worst and 100 to the best state.<sup>10-13</sup>

### Statistical Analysis

The data were described as mean, standard deviation (SD), and interval for continuous variables. Normality was tested with the Shapiro-Wilk test. Comparison between groups or associations between variables was made with the *t*-test, the Wilcoxon-Mann-Whitney test, or the Fisher test. The MBI values, as well as its three components, were tested with the unpaired *t*-test. Considering the criteria for defining burnout, the MBI components were also analyzed as categorical variables. The SF-36 domains were analyzed as continuous variables. The internal consistency of responses to the MBI and the SF-36 was assessed using Cronbach's  $\alpha$  coefficient, and a value of 0.70 is considered sufficient. The correlation between the SF-36 and the severe form of the burnout syndrome was determined using the Spearman's rank correlation coefficient. Multivariate logistic regression was used to assess the effect of nonmodifiable variables (age and gender) on the MBI components. The data were analyzed in the Stata version 16 (Stata Corporation, College Station, TX, USA) software, and the level of significance was set at  $\alpha = 0.05$ .

## Results

Fifty-two residents participated in the study before the COVID-19 pandemic, and 19 during the pandemic period (**► Table 1**).

### Prevalence of burnout before the COVID-19 pandemic

The comparison between residents and medical students showed significant differences in terms of sociodemographic characteristics (age, gender, birthplace, marital status, housing conditions, hours of work per week, night shifts, hours of study per week, and hours of recreation per week (**► Supplementary Material 1, Table**). Despite these contrasts, the values of the MBI categories showed a statistical difference only for the MBI\_DE ( $p = 0.00$ ). There was a difference only in the SF-36 functional capacity domain between medical students and residents ( $p = 0.02$ ) (Supplementary Material 2, Graph).

Thirty-six (69.2%) residents presented values for MBI\_EE > 27. Twenty-four (46.1%) had values for MBI\_DE > 10, and 34 (65.4%) had values for MBI\_PA < 40. Again, these values were significant concerning academics only for MBI\_DE ( $p = 0.02$ ). Thus, 44 (84.6%) residents had definite criteria for burnout syndrome against 18 (78.2%) of the students, and

**Table 1** Study participants by year of medical residency or graduation

	n (%)	Training year	n (%)
<b>Before the pandemic</b>	75 (80%)		
Medical student			23 (31%)
		4 <sup>th</sup>	21
		6 <sup>th</sup>	2
Residents from the hospital training program			33 (44%)
		1 <sup>st</sup>	15
		2 <sup>nd</sup>	7
		3 <sup>rd</sup>	11
Visiting residents			19 (25%)
		1 <sup>st</sup>	10
		2 <sup>nd</sup>	8
		3 <sup>rd</sup>	1
<b>During the pandemic</b>	19 (20%)		
Residents from the hospital training program			17 (89%)
		1 <sup>st</sup>	7
		2 <sup>nd</sup>	5
		3 <sup>rd</sup>	5
Visiting residents			2 (11%)
		2 <sup>nd</sup>	1
		3 <sup>rd</sup>	1

this difference was not statistically significant. The severe form of burnout syndrome was present in 16 (30.7%) residents and in none of the students ( $p = 0.00$ ).

The analysis of risk factors showed that being a resident ( $p = 0.00$ ), working night shifts ( $p = 0.05$ ), and having already considered changing career ( $p = 0.05$ ) were risk factors for developing severe burnout. The logistic regression showed no relationship between age and gender with high values on the MBI\_EE scale ( $r = 0.04$ ;  $p = 0.23$ ), but these characteristics were correlated with an increase in MBI\_DE ( $r = 0.12$ ;  $p = 0.00$ ).

### Impact of COVID-19 on the Prevalence of Resident's Burnout

Comparing only residents in the prepandemic period with residents during the pandemic, a reduction in the proportion of men ( $p = 0.00$ ), a significant increase in working hours ( $p = 0.00$ ), and a decrease in study time were observed ( $p = 0.05$ ). The sociodemographic characteristics of the residents are described in ►Table 2 and did not vary after the beginning of the COVID-19 pandemic. There was also no significant change in the MBI or SF-36 categories after the beginning of the COVID-19 pandemic, and the values are shown in ►Figures 1 and 2. Besides, there was also no increase in the prevalence of burnout syndrome or of the severe form of the syndrome, as demonstrated by the values shown in ►Table 3.

An analysis excluding visiting residents did not change the findings, except for reductions in hours of study that were no longer significant ( $p = 0.07$ ). The analysis of risk factors for severe burnout showed that residents with a stable union

had a higher risk of presenting the severe form of the syndrome during the COVID-19 pandemic ( $p = 0.04$ ).

Considering that there was a minimal variation in the prevalence of burnout before and during the COVID-19 pandemic, risk factors for the severe form of burnout syndrome were assessed among all residents. Only the fact of having already considered changing careers was associated with the development of severe burnout among residents ( $p = 0.04$ ). A negative correlation was observed between SF-36 items and the development of the severe form of burnout syndrome (►Fig. 3), as well as lower values in almost all SF-36 items (►Table 4). The logistic regression showed no relationship between age, gender, and high values on the MBI\_EE and MBI\_DE scales among residents.

### Discussion

Stress causes low quality of life, a drop in productivity, absenteeism, considerable expenses with medical care, and personal dissatisfaction. Burnout is the response to a prolonged state of stress, occurring by its chronification when coping methods have failed or were insufficient.<sup>18–21</sup> The syndrome is usually accompanied by a series of symptoms such as feelings of helplessness and hopelessness, lack of enthusiasm at work and in life in general, disillusionment, negative self-concept, negative attitudes toward work and partners, among others.<sup>18–21</sup>

The most used instrument to assess job burnout is the MBI, and the scale has been validated in multiple physician and nonphysician populations.<sup>15,22</sup> The three dimensions of the MBI generate scores, and there is a considerable

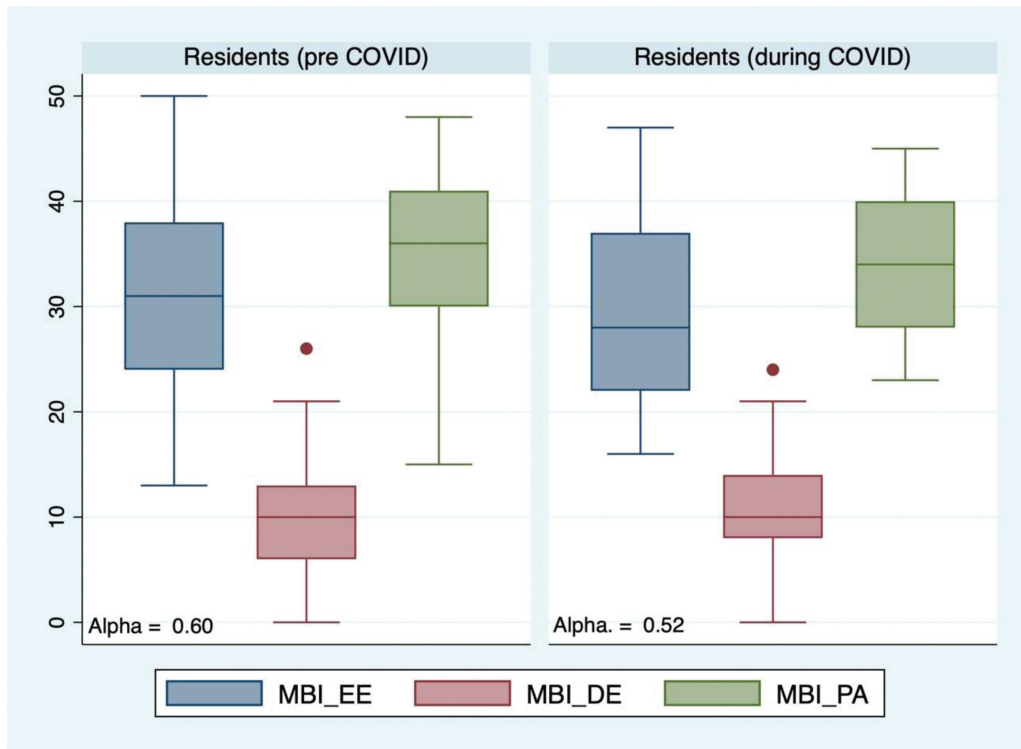
**Table 2** Sociodemographic characteristics of the residents before and during the COVID-19 outbreak

Study group	Residents Pre Mean ± SD (range) n (%)	Residents during Mean ± SD (range) n (%)	p-value
Participants	52 (73.2%)	19 (26.7%)	
Age (years old)	29.8 ± 3.5 (24–38)	31 ± 4.6 (26–46)	0.36 <sup>a</sup>
Gender (male)	49 (94.2%)	13 (68.4%)	0.00 <sup>b</sup>
Birthplace (local)	34 (65.3%)	12 (63.1%)	1.00 <sup>b</sup>
Marital status (single)	37 (71.1%)	11 (57.8%)	0.39 <sup>b</sup>
Children (no)	44 (84.6%)	15 (78.9%)	0.72 <sup>b</sup>
Training year (1 <sup>st</sup> )	25 (48%)	7 (36.8%)	0.69 <sup>b</sup>
Work hours (> 120h/week)	43 (82.6%)	9 (50%)	0.00 <sup>b</sup>
Night shift (yes)	34 (65.3%)	14 (73.6%)	0.57 <sup>b</sup>
Other graduation (no)	43 (82.6%)	14 (73.8%)	0.50 <sup>b</sup>
Habitation (with parents)	21 (40.3%)	7 (38.8%)	0.06 <sup>b</sup>
Give up (no)	31 (59.6%)	11 (57.8%)	1.00 <sup>b</sup>
Study hours (> 6h/week)	28 (53.8%)	5 (26.3%)	0.05 <sup>b</sup>
Recreation hours (> 6h/week)	16 (30.7%)	3 (15.7%)	0.24 <sup>b</sup>
Change career (no)	42 (80.7%)	16 (88.8%)	0.71 <sup>b</sup>

Abbreviation: SD, standard deviation.

<sup>a</sup>Wilcoxon Mann-Whitney test.

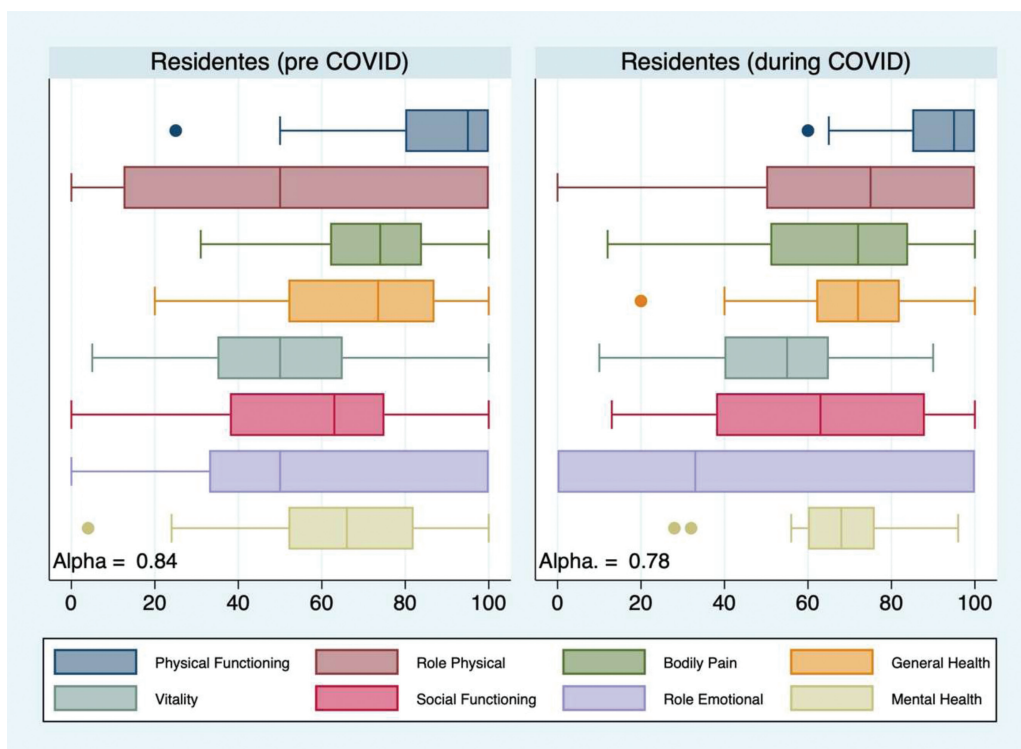
<sup>b</sup>Fisher's exact.



**Fig. 1** Maslach Burnout Inventory components before and during the COVID-19 outbreak. MBI\_EE, Maslach Burnout Inventory emotional exhaustion component; MBI\_DP, Maslach Burnout Inventory depersonalization component; MBI\_PA, Maslach Burnout Inventory personal fulfillment component; Alpha, Cronbach's  $\alpha$ ,

variability in how researchers define burnout.<sup>15</sup> According to Maslach et al.,<sup>9</sup> a high degree of burnout is reflected in high scores in the MBI\_EE and MBI\_DP subscales and low scores in the MBI\_PA subscale. Doulougeri et al. identified that the

combination of high MBI\_EE, high MBI\_DP, and low MBI\_PA or high MBI\_EE and/or high MBI\_DP is the most used in published papers. However, in some studies, the cutoff scores differed from the ones defined by Maslach et al.;<sup>9</sup>



**Fig. 2** SF-36 domains before and during the COVID-19 outbreak. Alpha, Cronbach's  $\alpha$ ,



**Table 3** Burnout prevalence of the residents before and during the COVID-19 outbreak

Study group	Residents Pre n (%)	Residents post n (%)	p-value
MBI_EE > 27	36 (69.2%)	10 (52.6%)	0.26 <sup>a</sup>
MBI_DE > 10	24 (46.1%)	9 (47.3%)	1.00 <sup>a</sup>
MBI_PA < 40	34 (65.3%)	14 (73.6%)	0.57 <sup>a</sup>
Prevalence burnout	44 (84.6%)	17 (89.4%)	0.71 <sup>a</sup>
Severe burnout	16 (30.7%)	6 (31.5%)	1.00 <sup>a</sup>

Abbreviations: BI\_DP, Maslach Burnout Inventory depersonalization component; MBI\_EE, Maslach Burnout Inventory emotional exhaustion component; MMBI\_PA, Maslach Burnout Inventory personal fulfillment component.

<sup>a</sup>Fischer's exact test.

in > 79% of the studies, a high MBI\_EE was defined as  $\geq 27$ . Regarding data management, the MBI can be analyzed as continuous data. Alternatively, each area can be classified according to the cutoff scores and, finally, a dichotomy of burnout/no burnout is also possible.<sup>15</sup> In the present study, the values of the MBI categories were analyzed as continuous variables and as categorical variables, with no difference in results regardless of the method of analysis used. Also, to

**Table 4** Mean values in the SF-36 domains according to the presence of severe burnout

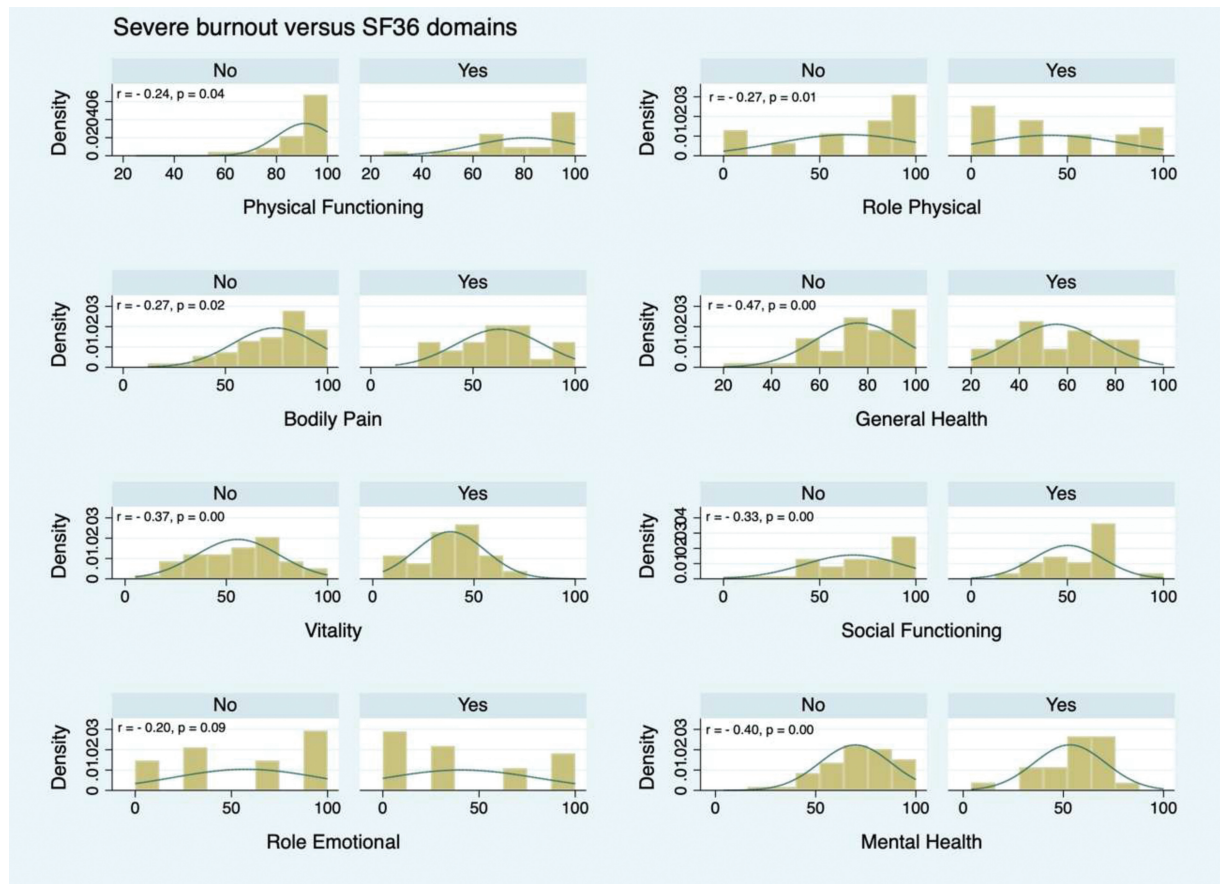
SF-36 domains	No severe burnout Mean $\pm$ SD	Severe burnout Mean $\pm$ SD	p-value
Physical functioning	91.2 $\pm$ 11.1	81.1 $\pm$ 20.1	0.04 <sup>a</sup>
Role physical	64.7 $\pm$ 37.1	40.9 $\pm$ 38.2	0.01 <sup>a</sup>
Body pain	74.4 $\pm$ 20.5	63 $\pm$ 21.2	0.02 <sup>a</sup>
General health	76.1 $\pm$ 18.2	55.5 $\pm$ 18.8	0.00 <sup>a</sup>
Vitality	55.6 $\pm$ 20.5	38.4 $\pm$ 17.2	0.00 <sup>a</sup>
Social functioning	67.3 $\pm$ 25.5	50.3 $\pm$ 18.1	0.00 <sup>a</sup>
Role emotional	57.7 $\pm$ 38.4	40.8 $\pm$ 39.7	0.09 <sup>a</sup>
Mental health	69.7 $\pm$ 17.8	53.2 $\pm$ 17.8	0.00 <sup>a</sup>

Abbreviation: SD, standard deviation.

<sup>a</sup>Wilcoxon Mann-Whitney test.

analyze risk factors for severe burnout, a dichotomized approach was used.

Healthcare workers are believed to be particularly susceptible to burnout compared with the general public.<sup>16,22</sup> Amongst orthopedic surgeons, the prevalence of burnout ranges from 50 to 60%, with severe burnout been present in up to 10% of orthopedic surgeons.<sup>1,16,17</sup> The prevalence of burnout was higher in early career orthopedic surgeons.<sup>1,4</sup>



**Fig. 3** SF-36 domains according to the presence or not of severe burnout within residents. r, Spearman's rank correlation coefficient

Sargent et al.<sup>4</sup> showed that they are more emotionally exhausted, more depersonalized, and have less personal accomplishment than their faculty members. Similar results were reported in other studies.<sup>23-25</sup> In the present study, a high prevalence of burnout syndrome was observed among residents. Even though the residents showed values that were always higher than those of medical students, these values were significant only for the MBI\_DP. A possible interpretation of these findings is that there was no deliberate intention on the part of the residents to overestimate the effects of stress at work.

Acute health crises put healthcare services under pressure, making the environment even more stressful. Data from previous epidemics show that health care professionals can experience a broad range of psychological morbidities.<sup>26</sup> The COVID-19 pandemic has a tremendous impact on healthcare systems around the world. As a result, attention to the safety of healthcare professionals has become a concern.<sup>27</sup> Surprisingly, the stress related to the pandemic does not necessarily increase burnout prevalence. Wu et al. reported that the frequency of burnout was reduced in frontline workers. They hypothesized that by directly addressing the virus, they could have a greater sense of situation control that decreases the chances of burnout.<sup>27,28</sup> In the present study, the COVID-19 pandemic does not increase the prevalence of burnout in residents. Orthopedic surgeons are not the front line in the management of COVID-19, but many orthopedic patients may be carriers of the virus. Residents in the present study were mostly young and, therefore, less susceptible to severe cases of COVID-19. This fact might have reduced the stress related to the risk of been infected.

In the present study, sociodemographic characteristics and risk factors among residents were evaluated for the development of the severe form of burnout syndrome, which was present in 30% of the residents. We identified that low values in almost all the SF-36 domains might be a predictor of the severe form of burnout syndrome. The SF-36 is a widespread quality of life assessment tool. Many online tools allow obtaining individual SF-36 results in a few minutes. Thus, the SF-36 might be a more accessible tool for screening and monitoring resident medical groups regarding the risk of burnout. Residency programs vary widely between countries or specialties, which should be considered when analyzing our results. In Brazil, medical residency in orthopedics has a minimum duration of 3 years, with a workload regulated by the law of a maximum of 60 hours per week. Additional years of fellowship are optional.

The COVID-19 pandemic caused a reduction in the number of elective surgeries, which may have generated anxiety among residents due to the loss of training time. Measures of social distancing also restricted clinical activities severely, causing an impact on learning. However, the use of technological tools has allowed a large part of teaching activities to be moved to the virtual space, reducing the damage to theory. This fact may have reduced the stress associated with the fear of losing training time at the medical residency.

The present study has as limitations a small sample size and the fact that it is restricted to residents who were

training at the same hospital. However, the addition of a control group formed by medical students allowed to establish parameters to assess whether residents did not overestimate the effects of stress at work. There are many concerns related to the interpretation of MBI results. The use of a second assessment tool allowed us to control the results and confirm the relationship between quality of life and burnout. Finally, the possibility of carrying out assessments before and after a drastic change in the work environment caused by the pandemic suggests that burnout syndrome is mainly the result of chronic stress.

## Conclusion

The prevalence of burnout syndrome and of the severe form of the disease was high among residents in orthopedic surgery. Low values in the SF-36 domains might be a predictor of the severe form of burnout syndrome. The prevalence of burnout does not change as a result of the COVID-19 outbreak.

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### Conflict of Interests

The authors have no conflict of interests to declare.

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