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RESEARCH ARTICLE

Facing the COVID-19 pandemic as a resident: a before-and-after study of mental health

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Abstract

Background: *Residents endure psychosocial and work-related situations associated with an increased risk of developing mental health problems. Mental health is often affected during epidemics. Knowledge about the mental health state of residents before and after the onset of the COVID-19 pandemic is scarce.* **Method:** *In this cohort study, demographic features, psychosocial characteristics, and mental health disorders were examined before and after one year of training. The second evaluation assessed burnout syndrome (BS) and individual experiences with the pandemic. Non-parametric tests and logistic regression were used to evaluate differences after 1 year and to analyze the relationship between mental health outcomes and the independent variables. Models were adjusted on a priori supposition of confounding variables.* **Results:** *A total of 49 pediatric residents were included; none were lost to follow-up. Overall, mental health disorders prevalence increased by 30.6%. The prevalence of depressive episodes and generalized anxiety disorder also increased significantly. The prevalence of BS was 57.1%. The main risk factor for developing a mental health disorder was having a family history of mental health disorders.* **Conclusions:** *The increase in the prevalence of mental health disorders after 1 year during the COVID-19 pandemic was more significant than the one observed in pre-pandemic studies. Further research is needed to find strategies to protect mental health among residents, especially during health crises.*

Keywords: *Anxiety. Burnout syndrome. COVID-19. Depression. Mental health. Medical residencies.*

Enfrentando la pandemia de COVID-19 como médico residente: un estudio de la salud mental antes y después

Resumen

Introducción: *Los médicos residentes enfrentan situaciones psicosociales asociadas con mayor riesgo para desarrollar problemas de salud mental. El conocimiento acerca de la salud mental de los médicos residentes antes y después del inicio de la pandemia de COVID-19 es escaso.* **Método:** *Estudio de cohorte en el que se examinaron las características demográficas y psicosociales, y los problemas de salud mental, antes y después del primer año de formación. En la segunda*

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evaluación se examinaron el síndrome de burnout y las experiencias individuales acerca de la pandemia. Se utilizaron pruebas no paramétricas y regresión logística para determinar las diferencias después de 1 año y para analizar la relación entre los resultados de salud mental y las variables independientes. **Resultados:** *Se incluyeron 49 médicos residentes. La prevalencia de trastornos mentales incrementó un 30.6%. Las prevalencias de episodio depresivo y de trastorno de ansiedad generalizada incrementaron significativamente. La prevalencia del síndrome de burnout fue del 57.1%. El principal factor de riesgo para desarrollar un trastorno de salud mental fue tener historia familiar de trastornos mentales.* **Conclusiones:** *El incremento en la prevalencia de trastornos de salud mental después de 1 año durante la pandemia de COVID-19 fue mayor que el observado en estudios previos a la pandemia. Se requieren más estudios para encontrar estrategias para proteger la salud mental de los médicos residentes, en especial durante emergencias sanitarias.*

Palabras clave: *Ansiedad. Síndrome de burnout. COVID-19. Depresión. Salud mental. Médicos residentes.*

Introduction

Residents are a vulnerable population to developing mental health problems (MHP)[1-7]. One study found that 20.37% of residents who died while enrolled in residency programs died by suicide[8].

In Mexico, an urban tertiary pediatric hospital was designed to be the institute that would treat children and adolescents with severe Coronavirus disease (COVID-19)[9,10]. Residents in this hospital worked on shifts, most of their academic activities were suspended, and they could not visit their families[11]. Mental health is often negatively affected during epidemics[12-15]. There has been an increase in the prevalence of MHP among healthcare workers since the COVID-19 pandemic onset[16-23]. Since residents form the bulk of the frontline physician healthcare workforce, some cross-sectional studies have found that the pandemic has led them to experience increased levels of stress, burnout syndrome (BS), and depression[24].

Initially, this study aimed to compare the prevalence of MHP among residents before and after the 1st year of the residency course. However, the onset of the COVID-19 pandemic occurred one month after the baseline evaluation, providing the rare opportunity to compare the residents' mental health before and 1 year after the pandemic onset. This work hypothesized that the increase in the prevalence of MHP and the prevalence of BS after 1 year would be higher than the ones observed in pre-pandemic studies (15.5% and 45%, respectively)[25-27]; hence, the objectives were to compare the prevalence of MHP among residents before and after 1 year of training during the onset of the COVID-19 pandemic, to determine the prevalence of BS, to identify the psychosocial characteristics associated with MHP, and to describe the participants' individual experiences during the pandemic.

Method

Study design

This was a before-and-after cohort study. The primary exposures were the 1st year of specialty training and the onset of the COVID-19 pandemic, declared in Mexico on March 28, 2020.

Subjects

A total of 49 individuals were accepted to the pediatric residency program, and all of them were invited and agreed to participate in the study, so no sample size estimation was performed. No participants were lost at follow-up. Measurements were obtained at baseline (February 26, 2020) and follow-up (February 26, 2021).

Procedures

The Mini International Neuropsychiatric Interview (MINI), the Social Support Questionnaire-Short Form (SSQ-6), and a psychosocial characteristics questionnaire were administered before the beginning of the residency program and after 1 year. During the follow-up, the Maslach BS-Human Services Survey (MBI-HSS) and an individual questionnaire on individual experiences with COVID-19 were administered.

Study measures

Having an MHP was considered a dichotomous variable defined by the MINI for a current psychiatric diagnosis. The MINI is a short, structured diagnostic interview for psychiatric disorders[28]. Trained personnel individually and privately administered it. Criterion-related validity for an earlier version of MINI has been reported as high/acceptable (Kappa > 0.49). High inter-rater reliability has been observed for all disorders

(Kappa > 0.72)[29,30]. The MINI has been validated for use in the Mexican population[31,32].

The SSQ-6 defined the social support level. It is a self-administered 6-item measure in which respondents rate their overall level of satisfaction with the support they receive. The instrument's internal consistency oscillates between 0.90 and 0.93 and has been validated in the Mexican population[33,34].

Psychosocial characteristics were assessed using a self-administered questionnaire inquiring about variables associated with MHP in medical trainees, such as sleeping and eating habits, hobbies, and personal and family history of MHP[35].

Having BS was considered a dichotomous variable defined by the MBI-HSS. The MBI-HSS is a self-administered instrument with 22 statements divided into three sub-dimensions: emotional exhaustion, depersonalization, and personal accomplishment[36]. The instrument's internal consistency oscillates between 0.70 and 0.90 and has been validated in the Mexican population[37-39]. There is considerable variability in how researchers have defined BS, and no standard definition is accepted[40]. For this study, the MBI-HSS subscales were categorized dichotomously, with the participants being divided into those who showed symptoms of high emotional exhaustion, high depersonalization, and low personal accomplishment based on the cutoff sub-scores of ≥ 27, ≥ 10, and ≤ 33, respectively[37]. An individual was considered as having BS when either a high emotional exhaustion score, a high depersonalization score, or a low personal accomplishment score were present.

Individual experiences related to the COVID-19 pandemic were assessed using a self-administered questionnaire inquiring about having been infected with COVID-19 during the last year, having a close friend or relative who had to be hospitalized or died because of COVID-19, and whether they considered that their mental health was affected by the pandemic.

Statistical analysis

Statistical analysis was performed using STATA v.13.1 software (STATA Corp, College Station, TX). The statistical significance level was defined with two-tailed $p < 0.05$. Confidence intervals were determined at the 95% confidence level.

Descriptive statistics were used to describe sociodemographic variables. To assess differences between baseline and follow-up measurements, the McNemar test was used for categorical variables, the McNemar-Bowker test for ordinal variables, and the Wilcoxon test for continuous variables. Logistic regression was used to analyze the relationship between mental health dichotomous outcomes in the medical residents and psychosocial characteristics, as well as their individual experiences during the pandemic. The variables were chosen based on previous assumptions to evaluate for possible confounding or effect modification since they have been associated with MHP in trainee physicians[35].

Table 1. Sociodemographic characteristics of participants at baseline (n = 49)

Baseline characteristic	n	%
Sex		
Female	32	65.3
Male	17	34.7
Birthplace		
Mexico city	19	38.7
Another city	26	53
Another country	4	8.1

The mean age of the participants was 26.04 years (standard deviation = 1.7).

Results

Participant demographics

The total sample consisted of 49 residents; none were excluded or lost to follow-up. Most participants were women who had to relocate from their hometowns to study. Their average age was 26, ranging between 24 and 30 (Table 1).

Prevalence and cumulative 1-year incidence of MHP

After 1 year, 55.1% of residents developed a new MHP. The overall prevalence of MHP doubled, and the prevalence of current depressive episodes and generalized anxiety disorder was significantly higher at the follow-up. There was a not significant increase in the prevalence of panic disorder, social anxiety disorder, and bulimia nervosa, and a not significant decrease in the prevalence of alcohol use disorder, substance use disorder, and post-traumatic stress disorder (Table 2).

Prevalence of BS

At the end of the year, 57% of the participants had positive scores on at least one of the subscales for BS,

Table 2. Changes in mental health problems prevalence and cumulative year incidence (n = 49)

Mental health problem	Prevalence				New cases	Incidence
	Baseline		Follow-up			
	n	%	n	%	n	%
Current depressive episode[a,b]	0	0	9	18.4	9	18.4
Generalized anxiety disorder[a,b]	4	8.2	21	42.9	18	36.7
Overall prevalencea[a,b]	15	30.6	30	61.2	27	55.1

[a]Reflects the number and percentage of participants meeting the criteria for the disorder by the MINI.
[b]McNemar test. Two-tailed exact significance p < 0.005.

whereas 6.1% had positive scores on the three subscales. Considering each subscale, 42.9% had a high score on emotional exhaustion, 24.5% had a high score on depersonalization, and 22.4% had a low score on personal accomplishment.

Associations between sociodemographic and psychosocial characteristics and MHP

Holding all other predictor variables constant, the odds of developing at least one MHP were higher for participants who reported having a positive family history of MHP (odds ratio [OR] = 7.71, 95% confidence interval [CI] 2.02-29.3). The odds of having a high score in the emotional exhaustion subscale were higher for participants who perceived a decrease in the quality of their diet (OR = 8.7, 95% CI 1.8-40.3). No significant associations were found between developing other MHP and sociodemographic or psychosocial characteristics (Table 3).

Significant changes in psychosocial characteristics after 1 year

There was a significant decrease in the average daily hours of sleep and mealtimes, as well as in the participants' perception of the quality of their diet. There was also a significant reduction in the participants who reported having experienced bullying. However, there was a substantial increase in participants who exercised at least once per week and in participants who were currently under psychiatric treatment.

The number of participants who considered their income insufficient increased, whereas the number of participants who practiced their hobbies decreased. The participants who perceived their social support level as high increased; however, these differences were not statistically significant (Table 4).

Table 3. Logistic regression model result (n = 49)

A significant predictor of developing at least one mental health problem[a]	B	p	OR	95% CI	
				LL	UL
Family history of mental health problems[b]	2.04	0.003	7.71	2.02	29.36
Constant	–1.09	0.033	0.33		
A significant predictor of having emotional exhaustion[c]					
Perceived a decrease in the quality of their diet[b]	2.16	0.006	8.7	1.87	40.37
Constant	–0.79	0.153	0.452		

[a]MINI.
[b]Self-applied anonymous questionnaire.
[c]MBI-HSS.
CI: confidence interval; LL: lower limit; OR: odds ratio; UL: upper limit.

Individual experiences on the COVID-19 pandemic

After 1 year, 32.7% of participants reported having been infected with COVID-19. 71.4% considered that their mental health was affected by the pandemic, 38.8% mentioned having at least one close friend or relative who had been hospitalized due to COVID-19, and 32.7% reported having at least one close friend or relative who died due to the same reason.

Discussion and conclusion

The findings from this study confirmed the hypothesis that the increase in the prevalence of MHP and BS after 1 year of training would be higher than the ones observed in pre-pandemic studies[1,4,25]. While an increase in MHP after 1 year of training is expected,

Table4. Significant changes in psychosocial characteristics[a]

Psychosocial characteristic	Baseline		Follow-up	
	n	%	n	%
They had been bullied[b,c]	19	38.8	10	20.4
Exercises at least once per week[b,c]	13	26.5	23	46.9
Is under psychiatric treatment[b,c]	1	2	11	22.4
Diet quality perception[b,d]				
Good	23	46.9	15	30.6
Medium	24	29	20	40.8
Bad	2	4.1	14	28.6
	Baseline		**Follow-up**	
	M	**SD**	**M**	**SD**
Average daily hours of sleep[e]	6.6	1.1	6.7	1
Average daily mealtimes[e]	3.3	0.87	2.8	1

[a]Self-applied anonymous questionnaire.
[b]Reflects the number and percentage of participants answering "yes" to this question.
[c]McNemar Test. Two-tailed significance $p < 0.05$.
[d]McNemar Bowker Test. Two-tailed significance $p < 0.05$.
[e]Wilcoxon signed-rank test.
Two-tailed significance $p < 0.05$.
M: mean; SD: standard deviation.

the onset of the COVID-19 pandemic may have affected the residents' mental health.

The post-pandemic prevalence of depressive episodes and generalized anxiety disorder was different than the ones reported in other studies[41-43]. There were significant differences in the way each country managed the pandemic situation, especially in terms of their available resources and their health-care systems, so it is expected that the residents experienced different stress levels.

The prevalence of suicide risk in this study remained the same pre- and post-pandemic (2%). This aligns with the findings of a post-pandemic Mexican survey[44]. Both the baseline and the follow-up prevalences of suicide risk were lower than the ones found in pre-pandemic[45-48] and post-pandemic studies[44,49]. Suicide risk was assessed by an in-person interview, which may have contributed to an underreport due to the existing stigma surrounding MHP among physicians[50].

The prevalence of alcohol and/or substance use disorder at baseline and follow-up was inferior to the ones reported in pre-pandemic studies[45,48]. There might have been an under-report since identifying problematic alcohol and other substance use disorders in residents is difficult due to the fear of reprisal[51].

This study found that 30.6% of the residents had a MHP before residency. This is higher than the prevalence in the general population before the pandemic (13.04%)[52]. At baseline, 2% of participants reported receiving psychiatric treatment; by the end of the year, the percentage increased to 22.4%. One study found that only 22% of undergraduate medical students with depression sought psychiatric attention; the percentage of residents would likely be even lower[53,54]. The hospital provided a cost-free mental health service to identify and treat MHP related to the pandemic, which contributed to the increase in the number of residents who received psychiatric treatment.

Most participants had positive scores on at least one BS subscale. The prevalence is similar to the ones reported in studies conducted during the pandemic[55], but it is higher than the ones reported in pre-pandemic studies[26,27,56-58]. It is also higher than the one reported in a Mexican study among residents during the AH1N1 influenza pandemic[59]. While high emotional exhaustion was higher in this study than among residents in a pre-pandemic meta-analysis, the prevalence of high depersonalization and low personal accomplishment was lower[56]. While the workload and added stress of the pandemic may have contributed to the high prevalence of BS among this population, it should also be considered that there was considerable heterogeneity in the definitions of BS used across studies[60,61].

A family history of MHP was associated with an increased probability of developing at least one MHP. Familial aggregation or positive family history is thus a known risk factor across psychiatric illnesses[62].

No associations were found between developing an MHP and factors such as age, sex, daily hours of sleep, eating habits, perception of income, level of social support, and individual experiences during the COVID-19 pandemic. One pre-pandemic study found that a history of depression and other stressful life events, as well as a reduction of sleep and longer work hours, were robust predictors of the increase in depression during residency[63]. One possible explanation is that this study's principal factor associated with developing an MHP was experiencing the pandemic onset; however, this hypothesis cannot be proven without a control group.

Residents who perceived a decrease in the quality of their diet had an increased probability of having a high score in the emotional exhaustion subscale. A meta-analysis found increased odds for BS in medical trainees who perceived financial worries and reported poor physical or mental health, including

nutrition, sleep, and lifestyle characteristics, among other factors such as work demands, concerns about patient care, poor work environment, poor work-life balance, female sex, and low self-efficacy[35].

There was a decrease in average daily hours of sleep, average daily mealtimes, and the participants' perception of the quality of their diet. These results are similar to the ones found in other studies[64,65]. There was a significant increase in participants who exercised at least once per week, which differs from other studies[66]. There was also a decrease in the number of participants who reported having experienced bullying after 1 year. This might be explained by the measures taken by the hospital to attend to the pandemic, as it was sought that the residents worked on shifts so that when they were not on shift, they would stay at home. Hence, they had more time to exercise and spent less time with their peers, reducing the probability of bullying.

The hospital provided an online free-of-cost mental health service for the residents. However, most of the participants believed that the pandemic affected their mental health. One-third of participants reported having been infected with COVID-19 during the last year, and one-third reported having a close friend or relative who had to be hospitalized or died due to COVID-19. This aligns with the findings from other studies assessing the residents' mental health during the COVID-19 pandemic[41-43].

Very few studies on health workers' mental health since the pandemic have included residents. Resident depression has been linked to poor-quality patient care and increased medical errors[25], so this study highlights a significant problem in medical education and the need for appropriate support for residents' mental health. Some strategies have been designed to increase protective factors, especially during unforeseen events such as pandemics[67-71], but more research is needed on this subject.

Among the limitations of this study is the small sample size. This research will continue to evaluate residents at the beginning and end of each residency year. It will assess the next generation of pediatric residents so that the sample size will increase gradually. Another limitation is that this study was designed before the pandemic onset, hence the lack of a BS assessment before the beginning of the residency.

Outcomes such as exercising and practicing hobbies were analyzed as dichotomic values, so quantitative data could not be explored. Finally, having an MHP was also considered a dichotomous variable, so the severity of symptoms could not be determined.

A hypothesis arising from this study is that the changes in the prevalence of MHP could be different among residents without the pandemic situation, so longitudinal studies with more extensive samples are needed. Future studies should thoroughly assess the sociodemographic characteristics associated with an increased probability of developing an MHP or BS, including specific information about family history of MHP, sleeping and nutritional habits, and income perception. It would also be interesting to assess the effectiveness of different strategies to improve the residents' mental health and overall well-being.

According to the research, there are currently no studies that analyzed changes in the mental health of residents before and after the onset of the COVID-19 pandemic, so these results might deliver helpful information about the potential impact of the pandemic on the former and increase knowledge about the residents' mental health in these scenarios. This study highlights the importance of considering resident mental health during times of stress. Further research is needed to identify the immediate and long-term effects of the COVID-19 pandemic on residents' mental health and practical strategies to prevent and treat MHP among residents, especially during health crises.

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Conflicts of interest

The authors declare no conflicts of interest.

Ethical considerations

Protection of humans and animals. The authors declare that no experiments involving humans or animals were conducted for this research.

Confidentiality, informed consent, and ethical approval. The authors have followed their institution's confidentiality protocols, obtained informed consent from patients, and received approval from the Ethics Committee. The SAGER guidelines were followed according to the nature of the study.

Declaration on the use of artificial intelligence. The authors declare that no generative artificial intelligence was used in the writing of this manuscript.

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