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Mental health outcomes among osteopathic physicians during COVID-19

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ABSTRACT

Objective: SARS-CoV-2 infection responsible for the COVID-19 pandemic has demonstrated a significant burden on the mental health of health care providers. The purpose of the study is to evaluate the mental health symptoms among osteopathic physicians from a single academic institution during the COVID-19 pandemic.

Methods: This was a cross-sectional, survey-based study conducted during the COVID-19 pandemic from January 2021 to March 2021. The survey was emailed to 4239 alumni physicians from the single medical school in California, USA. Burnout, anxiety, and depression were assessed by the single-item Mini-Z Burnout Assessment, 7-item Generalized Anxiety Disorder Scale, and 2-item Patient Health Questionnaire, respectively.

Results: A total of 104 survey responses were analyzed. Of them, 53 (51.0%) were attending physicians and 51 (49.0%) were residents or fellow physicians. Anxiety, burnout, and depression were reported in 29 (29.9%), 31 (32%), and 11 (11.3%), respectively. Females had increased anxiety (OR 1.66, CI 1.21–2.27; P = 0.002). Residents had higher burnout symptoms (OR 1.28, CI 1.06–1.53; P = 0.009) and depression symptoms (OR 1.15, CI 1.01–1.30; P = 0.032) compared to attending physicians. Physicians who encountered >50 COVID-19 patients had higher depression symptoms (OR 1.17, CI 1.02–1.35; P = 0.027).

Conclusion: Our survey study demonstrated that osteopathic physicians graduated from a single academic institution experienced symptoms of anxiety, burnout, and depression during the COVID-19 pandemic based on the validated questionnaires. A higher prevalence was shown in the lesser experienced group of residents and fellow physicians compared to more experienced attending physicians. In addition, adjustments to the pandemic have caused a financial burden among osteopathic physicians. Future studies are warranted to assess the long-term effects of the pandemic on mental health among osteopathic physicians.

Implications for practice

• Our national survey-based study showed high proportions of osteopathic physicians experiencing mental health symptoms with 29.9% of participants having symptoms of anxiety, 32.0% having burnout, and 11.1% having been screened positive for depression. Our findings are concerning for the future mental wellbeing of osteopathic physicians, particularly regarding anxiety and burnout.
• In our study, female physicians reported three folds higher anxiety symptoms compared to male physicians. This is consistent with current literature on the female healthcare workers have higher rates of depression and anxiety, independent of COVID-19 exposure.
• Osteopathic physicians who encountered more than 25 COVID-19 patients reported higher symptoms of anxiety, and physicians who encountered more than 50 COVID-19 patients reported higher symptoms of depression. Thus, special attention should be given to physicians who have a frequent encounter with COVID-19 patients as they are not only at high risk for infection but is also at risk for mental health difficulties.
• Residents and fellow osteopathic physicians reported increased symptoms of burnout compared to attending osteopathic physicians. To address potential mental symptoms experienced by residents, the residency programs should consider placing more emphasis upon the mental health of the residents through providing mental health support and resources. Additionally, residents may benefit from shift breaks or time off to address mental fatigue.

1. Introduction

Since the World Health Organization (WHO) declared the COVID-19 a global pandemic on March 11, 2020, health care workers have faced unique challenges [1]. As frontline workers caring for patients, physicians are particularly at an increased risk of infection. While the risk of infection has partly been reduced with adequate personal protective

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equipment (PPE) and the recent emergence of vaccinations, physicians continue to face a surge in COVID-19 cases, workload strain, and concern about contracting the disease [2]. Additionally, there has also been anecdotal evidence of financial difficulty from decreased patient volume and increased investment in telehealth, adding additional burden to already strained health care workers.

Studies from previous pandemics have demonstrated a significant effect on the mental health of health care providers. A study showed that frontline health professionals during pandemics developed increased symptoms of posttraumatic stress disorder (PTSD), depression, anxiety, burnout, and mental health issues [3]. The prevalence of PTSD following recent pandemics was reported to be 22.6% among the general population, with the highest prevalence among health care workers at 26.9% [4]. With such significant implications on physicians who are the backbone of the healthcare system, there is a need for early intervention to prevent lasting effects on healthcare providers’ mental well-being.

Despite numerous studies exploring the impact of COVID-19 studies on various healthcare providers, there has not yet been a study investigating the effect of COVID-19 specifically on osteopathic physicians in the United States. Osteopathic physicians are in a unique position as the majority practice in primary care settings, which exposes them to high volumes of COVID-19 patients. Additionally, some osteopathic physicians who perform the osteopathic manipulative treatment (OMT) may have to adjust their practice during the COVID-19, given the hands-on nature of the treatment. Thus, our study aims to evaluate the mental health symptoms among osteopathic physicians graduated from a single medical school by assessing the symptoms of anxiety, burnout, and depression, and identify factors that are at increased risk for poor mental health outcomes.

2. Methods

2.1. Survey design and distribution

We performed a cross-sectional, survey-based study during the COVID-19 pandemic from January 26, 2021, to March 5, 2021. We contacted 4239 alumni from 2000 to 2019 at a single medical school in California, USA inviting them to participate in the 57-question online survey. Qualtrics database was developed for the project and was used to capture survey data. Two healthcare physicians internally validated the survey and resolved any discrepancies. Informed consent was presented to the participants at the beginning of the survey. Participation was voluntary, and participants were allowed to terminate the survey at any time. Inclusion criteria include licensed osteopathic physicians who practiced medicine during the COVID-19 pandemic. Exclusion criteria include physicians who did not practice medicine during the COVID-19 pandemic. The project was approved by the Institutional Review Board (IRB number: 1,646,112–1).

Demographic data were collected, including gender, race, age, geographic location, practice years, position, specialty, type of practice, type of community, and vaccine status. Race was assessed in the study as the previous literature has reported a disproportionate burden of COVID-19-related outcomes among different racial groups [5]. The race was categorized based on US Census Bureau classification into “White or Caucasian,” “Asian,” “Hispanic,” “African American or black,” “American Indian or Alaska Native,” “Native Hawaiian or Other Pacific Islander,” “Multiracial,” or “Other.” [6] COVID-19 exposure factors were obtained including the number of COVID-19 patients encountered and the various COVID-19 related encounters or experiences.

Symptoms of anxiety, burnout, and depression during the COVID-19 pandemic were measured using validated measurement tools [7–9]. The 7-item Generalized Anxiety Disorder (GAD-7) Scale (range, 0–21) was used to assess symptoms of anxiety over the past two weeks, with a scale of normal (0–4), mild (5–9), moderate (10–14), and severe (15–21) anxiety. A score of 10 has been reported to be a cutoff point for identifying cases of GAD. The GAD-7 included a final question assessing the “difficulty (these problems) made it for you to do your work, take care of things at home, or get along with other people” (range, 0–3) [7]. The single-item Mini-Z Burnout Assessment (range, 1–5) was used to assess burnout, with burnout defined as ≥3 [8]. The 2-item Patient Health Questionnaire (PHQ-2; range, 0–6) was used to evaluate symptoms of depression over the previous two weeks, with a score of 3 as the cutoff for a positive depression screening requiring further evaluation with the more in-depth PHQ-9 [9].

Various adjustments related to personal life and medical practice during COVID-19 and their relation to the participants’ current mental health were collected. Adjustments related to personal life included changing habits (ex. change from outdoor to indoor activities), changing hobbies (ex. change from outdoor to indoor activities), wearing certain clothes only for work, doing more laundry, etc., living situation (ex. living in a separate room, hotel, or basement, using a different bathroom, etc), and limiting exposure (ex. avoiding to meet friends/family, going to public places, etc). The impact of COVID-19 in medical practice was obtained, including adjustment to practice, financial burden, career change, and early retirement. Causes of financial burden were explored, including telemedicine, a decline in the elective procedure, decline in the inpatient visit, and reduced work time. Adjustments to medical practice were further categorized into no adjustment needed, telemedicine, reduced staff, reduced work time, reduced elective procedure, and decreased inpatient visit. Impact of mental health from new adjustments and the type of adjustments or impact that has the most mental health difficulty were also asked.

2.2. Statistical analysis

Data analysis was performed using SPSS, version 27. The different

Table 1

| Category                          | N   | %    |
|-----------------------------------|-----|------|
| Gender                            |     |      |
| Male                              | 53  | 51.0 |
| Female                            | 51  | 49.0 |
| Race                              |     |      |
| White                             | 62  | 59.6 |
| Asian                             | 30  | 28.8 |
| Hispanic                          | 6   | 5.8  |
| African American                  | 2   | 1.9  |
| Multiracial                       | 3   | 2.9  |
| Age                               |     |      |
| 25–30                             | 22  | 21.2 |
| 31–35                             | 37  | 35.6 |
| 36–40                             | 20  | 19.2 |
| >41                               | 24  | 23.1 |
| Region                            |     |      |
| West                              | 68  | 65.4 |
| Midwest                           | 14  | 13.5 |
| South                             | 11  | 10.6 |
| Northeast                         | 10  | 9.6  |
| Practice years                    |     |      |
| 0–5                               | 76  | 73.1 |
| 6–10                              | 15  | 14.4 |
| >11                               | 12  | 11.5 |
| Position                          |     |      |
| Attending physician               | 53  | 51.0 |
| Resident or fellow physician      | 51  | 49.0 |
| OMM                               |     |      |
| No OMM                            | 80  | 76.9 |
| Up to 25%                         | 22  | 21.2 |
| 26–50%                            | 2   | 1.9  |
| Type of practice                  |     |      |
| Hospital affiliated inpatient     | 53  | 51.0 |
| Hospital affiliated outpatient    | 34  | 32.7 |
| Private outpatient                | 16  | 15.4 |
| Type of community                 |     |      |
| Suburban                          | 47  | 45.2 |
| Urban                             | 39  | 37.5 |
| Rural                             | 18  | 17.3 |
| Vaccine status                    |     |      |
| Vaccinated                        | 97  | 93.3 |
| Not vaccinated                    | 7   | 6.7  |
| Impact of vaccine on anxiety      |     |      |
| No impact                         | 34  | 35.1 |
| Reduced anxiety                   | 57  | 58.8 |
| Cause anxiety                     | 6   | 6.2  |
| Reason for not vaccinated         |     |      |
| Waiting to get vaccine            | 4   | 3.8  |
| Personal choice                   | 2   | 1.9  |
| Adverse reaction to Previous vaccine | 1  | 1.0  |
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distribution of symptoms across subgroups is tested by the chi-square independence test and fisher’s exact test. This is summarized in Table 2. Multiple logistic regression models were used to determine risk factors for the severity of anxiety, burnout, and depression. The binary outcomes were developed for anxiety (no symptoms of anxiety vs. symptoms of anxiety). Variables were considered for inclusion in multiple logistic regression when p < 0.05 in univariate analysis. Details of multiple logistic regression are summarized in Table 3. All tests were two-sided, and the significance was determined at p < 0.05.

3. Results

3.1. Baseline characteristics

A total of 139 physicians completed the survey with a response rate of 2.5%. After excluding 35 incomplete responses, 104 responses were analyzed. Most responses came from white (62 [59.6%]), male (53 [51.0%]), age between 31 and 35 years old (37 [35.6%]) with 0–5 practice years (76 [73.1%]). Of them, 53 [51.0%] were attending physicians, and 51 (49.0%) were resident or fellow physicians. The majority of the participants specialized in family medicine (30 [28.8%]), followed by internal medicine (20 [19.2%]). Twenty-four (23.1%) participants reported using the osteopathic manipulative treatment in practice. Most responses came from participants from the West coast (68 [65.4%]) and practiced in hospital-affiliated inpatient (53 [51.0%]) in the suburban community (47 [45.2%]). The majority of the participants were vaccinated for COVID-19 (97 [93.3%]) and reported a reduction of burden, seven participants (6.7%) reported a decline in the elective practice years (76 [73.1%]). Of them, 53 (51.0%) were attending physicians, residents, or fellow physicians. The majority of the participants who had at least 50 encounters with COVID-19 patients (47 [45.2%]) and worked with active COVID-19 patients (76 [73.1%]). The majority of the participants did not test positive for COVID-19 or quarantined for possible unprotected COVID-19 exposure. Of those who reportedly tested positive for COVID-19 (17 [16.3%]), the majority reported having severe symptoms of COVID-19 (14 [82.4%]). Most of them had friends/close relatives that have contracted COVID-19 (75 [72.1%]). Of them, 25 (24.0%) had a severe form of COVID-19 or died from COVID-19. A number of 75 participants (72.1%) were afraid they might pass COVID-19 on to others, and most of them reported that their family and friends are worried about cross-infection from them (44 [52.9%]). The majority reported having adequate personal protective equipment (PPE) to protect from COVID-19 at the time of the survey from January to March 2021 (94 [90.4%]). However, this was not the case in the earlier phase of the COVID-19 pandemic. Table 1 lists the demographic characteristics for the study population.

3.2. GAD-7 anxiety scale scores

Symptoms of anxiety were reported from 29 participants (29.9%), with 13.4% in the mild range, 13.4% in the moderate range, and 3.1% in the severe range. The last question assessed for the difficulty functioning due to anxiety asking, “How difficult have these symptoms made it for you to do your work, take care of things at home, or get along with other people.” 31.9% of participants reported “somewhat difficult,” 5.3% reported “very difficult,” and 1.1% reported “extremely difficult.” Females reported increased symptoms of anxiety (p = 0.031) and increased difficulty with getting work done, tasks at home, or getting along with other people (p = 0.014) (Table 2). Participants who had 25–50 COVID-19 patient encounters reported increased symptoms of anxiety (p = 0.001). The multivariable logistic regression analysis has also confirmed these findings. (Gender “anxiety symptoms”: OR 1.66, CI (1.21–2.27); p = 0.002; “difficulty functioning”: 1.33, (1.09–1.61); (0.004) (25–50 COVID-19 patient encounters: 2.01, (1.34–3.02); 0.001)(Table 3).

3.3. Mini-Z burnout scale scores

Burnout was reported in 31 (32.0%) of participants. Residents and fellow physicians showed a two-fold higher incidence of burnout symptoms (20 out of 51 [39.2%]) compared to attending physicians (11 out of 53 [20.8%]) (Table 2). Similarly, multivariable logistic regression analysis showed that compared to attending physicians, residents or fellow physicians were more likely to experience burnout symptoms (1.28 [1.06–1.53]; 0.009) (Table 3).

3.4. PHQ-2 depression scale scores

Eleven (11.3%) participants were positive on depression screen questions (Table 2). Patients who screen positive for this questionnaire would require a more detailed screening to assess depression. Multivariable logistic regression analysis showed that residents or fellow physicians were more likely to experience depression symptoms compared to attending physicians (1.15 [1.01–1.30]; 0.032). Moreover, participants who had >50 COVID-19 patient encounters were more likely to experience depression symptoms compared to participants who had <25 COVID-19 patient encounters (1.17 [1.02–1.35]; 0.027) (Table 3).

3.5. Lifestyle adjustments and its impact on mental health during the COVID-19 pandemic

The majority of the patients reported developing a new mental health difficulty during the COVID-19 pandemic (66 [64.7%]). Of them, the majority reported not seek treatment for mental health (41 [78.5%]) mainly due to not considering current mental health difficulty to need treatment (39 [78.0%]). When asked about adjustments made to personal life, the majority reported having to limit exposure (70 [67.3%]) and change habits (65 [62.5%]), with limit exposure being the type of adjustments to a personal life that has the most impact on their mental health difficulty. When asked about the impact of COVID-19 in medical practice, the majority reported having to make adjustments to their practice (88 [84.6%]) followed by financial burden (16 [15.4%]). Type of adjustments made to medical practice included implementing telemedicine (58 [55.8%]), reduced elective procedures (33 [31.7%]), decreased patient visit (26 [25.0%]), reduced work time (16 [15.4%]), and reduced staff (7 [6.7%]). When asked about the cause of financial burden, seven participants (6.7%) reported a decline in the elective procedure to be the most common cause. A number of 57 participants
The COVID-19 pandemic has undoubtedly strained mental health among physicians. In May 2020, the surge of COVID-19 cases resulted in a global total of 152,888 infections and 1413 deaths among healthcare workers, with the highest risk among general practitioners [10]. Physicians who already have a higher risk of burnout, depression, and suicide prior to the pandemic faced additional frustration and fear from lack of adequate PPE, traumatic patient outcomes, and exhaustion [11]. These experiences resulted in a high prevalence of anxiety, depression, and stress among those caring for COVID-19 patients [12,13]. Thus, putting a spotlight on physician mental well-being during the pandemic is critical for protecting our healthcare providers at the frontline fighting against COVID-19.

Our survey-based study demonstrated high proportions of osteopathic physicians experiencing symptoms of anxiety, burnout, and depression during the COVID-19 pandemic. We identified demographic risk factors for the presence of symptoms associated with mental health, including position, gender, and the number of COVID-19 patient encounters. To our knowledge, this is the first study to assess the impact of the COVID-19 pandemic on mental health among osteopathic physicians.

Our study demonstrated that 29.9% of participants had symptoms of anxiety, 32.0% reported burnout, and 11.1% screened positive for depression symptoms. A high prevalence of psychological symptoms has been reported in frontline healthcare workers during the COVID-19 pandemic. A meta-analysis on the psychological impact of COVID-19 on healthcare workers from 13 Asian studies reported a comparable prevalence of 23.2% in anxiety and a higher prevalence of 22.8% in depression compared to our study [14]. Such discrepancy in the prevalence of depression can be explained by development of coping mechanisms in our cohort as the survey was distributed later in the pandemic. Furthermore, a cross-sectional study evaluating mental health among otolaryngologists who are at increased infection risk from frequent aerosolizing procedures showed comparable burnout of 21.8% and depression symptoms of 10.6% [15]. Our findings are concerning for the future mental wellbeing of osteopathic physicians, particularly regarding anxiety and burnout. Additionally, our study identified factors that are associated with increased risk of anxiety, burnout, and depression, which can help provide early support and interventions to prevent long-lasting implications.

In our study, female physicians reported three folds higher anxiety symptoms compared to male physicians. This is consistent with current literature on the female healthcare workers have higher rates of depression and anxiety, independent of COVID-19 exposure [2,16]. Female physicians often have to make sacrifices in their personal/familial and professional lives during the COVID-19 pandemic, adding a further burden to their existing stress and exhaustion [10]. However, this gender difference may be due to risks of response and measurement bias in these screening tools in which male respondents are less likely to report symptoms [17]. Thus, we may not accurately capture the mental health among males using these tools, and focus should be given to improve mental wellness in all physicians regardless of their gender [15].

Furthermore, our study showed that physicians who encountered more than 25 COVID-19 patients reported higher symptoms of anxiety, and physicians who encountered more than 50 COVID-19 patients reported higher symptoms of depression. Gainer et al. showed a similar finding in that the physicians who spend more time treating COVID-19 patients, thus having more frequent encounters with COVID-19 patients, had worse mental health outcomes, including depression, anxiety, and PTSD [11]. Thus, special attention should be given to physicians who have a frequent encounter with COVID-19 patients as they are not only at high risk for infection but is also at risk for mental health difficulties.

Residents and fellow osteopathic physicians reported increased symptoms of burnout compared to attending osteopathic physicians as assessed by Mini-Z Burnout Assessment. Our study showed that 39% of residents reported symptoms of burnout which was similar to previously reported burnout rates among residents during the COVID-19 pandemic (41%) [11]. Resident burnout is well-known in the literature, given the long work hours and heavy clinical duties coupled with education.

Table 3

| Position                  | Total | Resident or fellow physician | Attending physician | P value |
|---------------------------|-------|------------------------------|--------------------|---------|
| N %                       |       | N %                          | N %                |         |
| GAD-7 Anxiety symptoms    |       |                              |                    |         |
| Normal                    | 68    | 70.1                         | 38                 | 73.1    | 0.238  |
| Mild                      | 13    | 13.4                         | 6                  | 15.6    |        |
| Moderate                  | 13    | 15.4                         | 9                  | 15.4    |        |
| Severe                    | 3     | 3.1                          | 0                  | 6.7     |        |
| Total                     | 97    | 97.0                         | 50                 | 100     |        |
| GAD-7: Difficulty functioning |      |                              |                    |         |
| Not difficult             | 58    | 61.7                         | 33                 | 66      | 0.587  |
| Somewhat difficult        | 30    | 31.9                         | 15                 | 34.1    |        |
| Very difficult            | 5     | 5.3                          | 2                  | 6.8     |        |
| Extremely difficult       | 1     | 1.1                          | 0                  | 2.3     |        |
| Total                     | 94    | 100                          | 50                 | 100     |        |
| Mini-Z: Burnout symptoms  |       |                              |                    |         |
| Negative                  | 66    | 68                            | 41                 | 78.8    | 0.017  |
| Positive                  | 31    | 32                            | 11                 | 21.2    |        |
| Total                     | 97    | 97.0                         | 52                 | 100     |        |
| PHQ-2 Depression symptoms |       |                              |                    |         |
| Negative                  | 86    | 88.7                         | 49                 | 94.2    | 0.061  |
| Positive                  | 11    | 11.3                         | 3                  | 17.8    |        |
| Total                     | 97    | 100                          | 52                 | 100     |        |

Note: All statistically significant values are marked in bold.

Abbreviations: GAD-7 = 7 item Generalized Anxiety Disorder Scale; PHQ-2 = two-item Patient Health Questionnaire.
COVID-19 pandemic has created a new stressor exacerbating the challenges experienced by residents [11]. Gainer et al. observed that residents across the country had worse average mental health scores than attendings. Similarly, Kannamappillil et al. showed higher stress levels and burnout among resident trainees who treated COVID-19 patients [18]. To address potential mental symptoms experienced by residents, the residency programs should consider placing more emphasis upon the mental health of the residents through providing mental health support and resources. Additionally, residents may benefit from shift breaks or time off to address mental fatigue [19].

While 65% of osteopathic physicians reported new mental health difficulty, 79% of them did not seek treatment, primarily due to not considering their problem required treatment. Sadly, this is not surprising as seeking help may be perceived as a personality weakness among physicians [20]. With current trends of mental health awareness, there has been a slow shift to a more accepting mental health culture among physicians.

Our study also identified various adjustments to osteopathic physicians’ personal life and medical practice during the COVID-19 pandemic and its impact on their mental health. Among personal adjustment, the physicians identified limiting exposure to have the most impact on their mental health. Additionally, physicians reported adjustment to medical practice to be the most important adjustment to medical practice that impacted their mental health. Physicians also reported facing the financial burden with decreased in-patient visits, telemedicine visits, and its impact on their mental health. Among personal adjustment, the surprising as seeking help may be perceived as a personality weakness among physicians [20].

Table 4
Factors associated with symptoms of anxiety, burnout, and depression following multivariable logistic regression.

| GAD-7: Anxiety symptoms | Position | Attending physician (1, Reference) | 1 (Reference) | NA | 0.152 | (95% CI)  |
|-------------------------|----------|----------------------------------|--------------|----|-------|-----------|
|                         | Gender   | Male (0.92–1.72)                | 1.26         | 0.152 | 0.002 | (1.21–2.27) |
|                         | Gender   | Female (1.24)                    | 1.66         | 0.002 | 0.002 | (1.24–2.01) |
| Number of COVID-19 patient encounters | <25 | 1 (Reference) | 2.01 | 0.001 | (1.34–3.02) |
|                         |          | >50                              | 1.12         | 0.514 | 0.002 | (0.79–1.59) |
| GAD-7: Difficulty functioning | Position | Attending physician (1, Reference) | 1 (Reference) | NA | 0.113 | (95% CI)  |
|                         | Gender   | Male (0.96–1.42)                | 1.17         | 0.113 | 0.004 | (1.09–1.61) |
|                         | Gender   | Female (1.20)                    | 1.33         | 0.004 | 0.004 | (0.98–1.63) |
| Number of COVID-19 patient encounters | <25 | 1 (Reference) | 1.26 | 0.176 | (0.83–1.26) |
|                         |          | >50                              | 1.02         | 0.836 | 0.002 | (0.83–1.26) |
| Mini-Z: Burnout symptoms | Position | Attending physician (1, Reference) | 1 (Reference) | NA | 0.009 | (95% CI)  |
|                         | Gender   | Male (0.96–1.53)                | 1.28         | 0.009 | 0.009 | (1.06–1.53) |
|                         | Gender   | Female (0.90–1.30)               | 1.08         | 0.418 | 0.018 | (0.90–1.30) |
| Number of COVID-19 patient encounters | <25 | 1 (Reference) | 1.27 | 0.146 | (0.99–1.61) |
|                         |          | >50                              | 1.11         | 0.312 | 0.032 | (0.91–1.36) |
| PHQ-2 Depression symptoms | Position | Attending physician (1, Reference) | 1 (Reference) | NA | 0.032 | (95% CI)  |
|                         | Gender   | Male (1.01–1.30)                | 1.15         | 0.032 | 0.032 | (1.01–1.30) |
|                         | Gender   | Female (0.96–1.24)               | 1.09         | 0.167 | 0.167 | (0.96–1.24) |
| Number of COVID-19 patient encounters | <25 | 1 (Reference) | 1.12 | 0.079 | (0.95–1.32) |
|                         |          | >50                              | 1.17         | 0.027 | 0.027 | (1.02–1.35) |

Note: All statistically significant values are marked in bold. Abbreviations: GAD-7 = 7 item Generalized Anxiety Disorder Scale; PHQ-2 = two-item Patient Health Questionnaire.

Table 5
Mental health and adjustments during COVID-19.

| New mental health during COVID-19 | Yes | No | Total |
|-----------------------------------|-----|----|-------|
| Worsening of or developed mental health | 66  | 36  | 102  |
| Seek treatment for mental health   | 57  | 14  | 71   |
| Reason for not seeking treatment  | 30  | 40  | 70   |
| Impact mental health              | 42  | 55  | 97   |
| Type of adjustments               | 40  | 65  | 105  |
| Change in living situation        | 10  | 56  | 66   |
| Limit exposure                    | 70  | 43  | 113  |
| Type of adjustments that has the MOST impact on mental health difficulty | 8  | 14.5 | 22.5 |
| Change in living situation        | 10  | 6.7 | 16.7 |
| Limit exposure                    | 38  | 69.1 | 91.1 |
| Impact of COVID-19 in practice    | 88  | 44.6 | 133  |
| Type of impact                    | 15  | 55.6 | 70.6 |
| Adjustment to practice            | 12  | 15.4 | 27.4 |
| Financial burden                  | 1  | 3.7 | 0.6 |
| Career change                     | 2  | 1.9 | 2.9 |
| Retirement                        | 2  | 1.9 | 2.9 |
| Causes of financial burden        | 4  | 3.8 | 7.8 |
| Telemedicine                       | 7  | 6.7 | 13.7 |
| Decline elective procedure        | 2  | 1.9 | 2.9 |
| Decline inpatient visit           | 1  | 1  | 1  |
| Adjustment to practice            | 13  | 12.5 | 12.5 |
| No adjustment                     | 58  | 55.8 | 113.8 |
| Telemedicine                       | 7  | 6.7 | 13.7 |
| Reduce staff                       | 16  | 15.4 | 31.4 |
| Reduce work time                  | 33  | 31.7 | 64.7 |
| Reduce elective procedure         | 26  | 25  | 51  |
| Decrease in patient visit         | 70  | 72.2 | 102.2 |
| Impact mental health              | 27  | 27.8 | 54.8 |
| Yes                               | 97  | 100 | 197  |
| Continue post-COVID19             | 40  | 41  | 81  |

Considering their problem required treatment. Sadly, this is not surprising as seeking help may be perceived as a personality weakness among physicians [20]. With current trends of mental health awareness, there has been a slow shift to a more accepting mental health culture among physicians.

Our study also identified various adjustments to osteopathic physicians’ personal life and medical practice during the COVID-19 pandemic and its impact on their mental health. Among personal adjustment, the physicians identified limiting exposure to have the most impact on their mental health. Additionally, physicians reported adjustment to medical practice to be the most important adjustment to medical practice that impacted their mental health. Physicians also reported facing the financial burden with decreased in-patient visits, telemedicine visits, reduced staff, and reduced elective procedures. However, as the country
opens back up with increased vaccinations, these adjustments may slowly revert back to prior pandemic settings that will offset the financial burden.

Our study has several limitations. The cross-sectional survey-based study only captures the symptoms of mental health at one point in time. The respondents’ symptoms may change with changing trends during the COVID-19 pandemic. Thus, it is not possible to determine whether the respondents developed or experienced the mental health outcomes as a direct result of COVID-19 or whether they had these symptoms prior to COVID-19. Next, the prevalence of anxiety, burnout, and depression symptoms among physicians varies greatly in the literature due to the use of different screening assessment tools and the timing of the survey distribution during the COVID-19 pandemic. For this reason, it is difficult to directly compare our prevalence to that reported in the current literature. Furthermore, while associations between risk factors and outcomes can be considered, they should not be interpreted as causal. Additionally, we distributed the survey to alumni from a single academic osteopathic medical school, thus limiting the generalizability of the study results. Our low response rate leads to non-response bias. In this study, we have found that osteopathic physicians have developed symptoms of anxiety, burnout, and depression, and higher prevalence in the lesser experienced group of residents and fellow physicians compared to more seasoned physicians. In addition, adjustments to the pandemic have caused a financial burden for physicians. Future studies should assess the long-term effects of the pandemic on mental health. We hope our study will provide the foundation for actionable changes to improve the mental health of osteopathic physicians.

Ethical approval

The study was approved by Western University Health Sciences Institutional Review Board (protocol #: 1646112–1).

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Declaration of competing interest

We do not have any conflict of interest.

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