Medical Education Original Article

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Perception of opioids among medical students: unveiling the complexities and implications

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Abstract

Context: From 2000 to 2019, drug overdoses, combined intentional and unintentional, were the number one cause of death for Americans under 50 years old,with the number of overdoses increasing every year. Between 2012 and 2018, approximately 85 % of all opioid users obtained their opioids through prescriptions from healthcare providers, predominantly physicians. Increased education about the severity of this issue may increase the likelihood of physicians integrating alternative forms of care such as cognitive behavioral approaches, nonopioid therapies, and nonpharmacologic therapies into treatment plans for chronic pain.
Objectives: This study investigates medical students' beliefs, experiences, and perceived impact of opioids at Ohio University Heritage College of Osteopathic Medicine (OU-HCOM) and University of Toledo College of Medicine and Life Sciences (UT).
Methods: A total of 377 students from OU-HCOM (years 1–4, n=312) and UT (years 1–2, n=65) were surveyed on their beliefs, experiences, and perceived impact of opioids. Multiple t tests were conducted to compare the difference in perceived severity and stigma between participants who were impacted by the epidemic and those who were not. A Kendall rank test was performed to analyze the relationship between the county drug overdose rate and perceived severity for medical students. $p < 0.05$ defined statistical significance for all statistical tests performed in this study.
Results: In comparing medical students' personal experiences with the opioid crisis, it was found that many more participants had experiences with an affected classmate or patient (4.1; 95 % CI, 4.0–4.2), as opposed to direct experiences within their family or group of friends (1.9; 95 % CI, 1.8–2.0). However, this group of participants who directly experienced the opioid crisis were found to be more likely to view the crisis as more severe in Ohio's adult population than those without that direct experience ($p=0.03$, $\alpha=0.05$). The difference in experience and severity outlook did not make one group of medical students more likely to hold a stigma toward those struggling with opioid addiction ($p=0.3$, $\alpha=0.05$). The study did not find a significant relationship between the county drug overdose rate and the perceived severity among medical students ($R=0.05$, $p=0.6$, $\alpha=0.05$).
Conclusions: This study gave an insight into the beliefs, experiences, and perceived impact of opioids within a group of 377 medical students. It was shown that differences in background can lead to differences in perception of the crisis. Knowing these differences can lead to beneficial changes in education and curriculum design in medical education.

Keywords: experience; medical students; opioids; perception

Since the mid-1990s, the opioid crisis has been one of the most serious public health challenges in North America, particularly in the United States [1]. This crisis has been characterized by the overprescription and misuse of opioids, leading to a staggering number of deaths – over 600,000 deaths in the United States and Canada since 1999 [2]. Tragically, overdose-related fatalities have rapidly risen over time, making it the leading cause of death among Americans under 50 from 2000 to 2020 [3].

The role of physicians is of paramount importance due to their involvement in opioid prescription practices. Between 2012 and 2018, approximately 85 % of all opioid users obtained their opioids through prescriptions from

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healthcare providers, predominantly physicians [3]. Moreover, from 1999 to 2008, annual increases in overdoses attributed to prescription opioids were observed, culminating in nearly 15,000 deaths in the United States in 2008 [4]. Individuals in rural areas were nearly twice as likely to experience prescription painkiller overdoses compared to those in urban regions [4].

Although opiate prescriptions have recently decreased, approximately 43.3 opioid prescriptions were issued in 2020 per 100 persons in the United States. Ohio, in particular, had an average rate of 47.4 opioid prescriptions per 100 people during the same year [5]. Within Ohio, prescription opioids were involved in 571 of the 3,237 drug overdose fatalities, accounting for 17.6 % of all drug overdose deaths in 2018 [6].

The perceived severity of this opioid epidemic has a direct impact on the approach taken by medical physicians. Having a heightened perception on severity of the opioid crisis may increase the likelihood of integrating alternative forms of care such as cognitive behavioral approaches, nonopioid therapies, osteopathic manipulative treatment (OMT), and nonpharmacologic therapies into treatment plans for chronic pain [7].

Striking a delicate balance between utilizing opioids for their analgesic properties, while managing their highly addictive nature, poses a significant challenge for physicians. In this context, osteopathic physicians are encouraged to adopt a holistic mindset, incorporating various aspects of patients' lives, including pain, emotions, beliefs, social and cultural environments, and self-management strategies [7]. Additionally, even when overdose cases are not related to prescribed opioids, physicians remain intricately involved in patient care. Thus, a comprehensive examination of the impact of the opioid crisis on current and future physicians becomes essential.

One previous study utilized the same data set to compare health professional students (nurse practitioner, physician assistant, and doctor of osteopathic medicine) in terms of their perceptions and postgraduation plans regarding the opioid crisis [8]. It was found that students who had clinical experience with patients who struggle with opioid misuse were found to be more likely to plan on treating patients with opiate use disorder after graduation, as well as having the most confidence in treating patients with opiate use disorder [8]. These findings underscore the urgent need for enhanced opioid education within medical curricula, fostering greater confidence among students in treating patients affected by opioids after graduation.

Building upon these existing studies, the present research aims to explore the beliefs, experiences, and perceived impact of opioids among medical students at Ohio University Heritage College of Osteopathic Medicine (OU-HCOM) and University of Toledo College of Medicine and Life Sciences (UT). These data were collected after surveying current medical students at OU-HCOM and UT. The analysis of such data provides valuable insight into the experiences of future physicians, enabling medical schools to further enhance their curriculum and educate students from diverse backgrounds more effectively about the severity of opioids. This, in turn, plays a vital role in bolstering the collective efforts to combat the ever-present and devastating opioid crisis.

Methods

Study design

The descriptive, cross-sectional study involved surveying medical students from one osteopathic medical school with three campuses and one allopathic medical school to examine their beliefs, experiences, and perceived impact of opioids. See Supplementary Material for full survey. The Ohio University Office of Research Compliance approved the protocol (18E195).

Participants

An anonymous, electronic survey was administered via email to medical students (osteopathic medical students [OMS] years 1–4 and medical students [MS] years 1–2) between April 2018 and May 2018. Participation in the study was voluntary. Participants received a $10 gift card for participation; funding was provided from the investigator's research endowment. To receive the gift card, participants received a new Qualtrics link at the end of the questionnaire where they could provide their email address to receive a gift card. This ensured that participants' survey responses were not linked to identifiable information. Given the anonymous nature of the data collection method, a participant did not have to complete the survey to receive the gift card.

Data collection

Participants completed the measures via the electronic questionnaire service, Qualtrics (Provo, UT). To consent, participants selected "Yes, I consent to participate in this study. I may withdraw my participation at any time." To decline, participants selected "I decline to participate." Both the online survey screen and the informed consent document specified that participation was voluntary. Informed consent explicitly informed potential respondents that their responses had no bearing on academic performance. Completion of the survey took approximately 15 min.

Measures

All participants completed a brief demographic form that collected participants' age, gender, year in medical school, desired specialty postgraduation, and community in which they grew up. Per the United States Census Bureau, urban communities were defined as having a

population greater than 500,000 people, suburban communities as having a population of 50,001–500,000 people, and rural communities as having a population of less than 50,001 people.

Next, the participants completed the Opioid Impact, Beliefs, and Experiences Survey, which consisted of 38 questions. Eight questions utilized a sliding scale from 0 (Not at All) to 100 (Extremely) to measure perceived severity of the opioid crisis. The remaining beliefs, experiences, and postgraduate plans subscales were measured on a conventional 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Data analysis

The responses of OU-HCOM and UT medical students regarding their personal experiences with opioids were assessed and plotted. The responses to these questions were plotted to assess the perceived severity. To examine the impact of opioid severity on Ohio's adult population, a comparison was made between participants who reported immediate impact and those who did not. Immediate impact was defined based on survey responses indicating agreement (4–5 on the scale) with either of the following statements: "Opioid use has impacted my nuclear family" or "Opioid use has impacted my circle of friends." The group of participants who were immediately impacted consisted of individuals who had direct, personal, and intimate interactions with people affected by opioids. A t test was conducted to analyze the differences between participants immediately impacted and those who were not.

Similarly, participants who reported secondary impact were compared to those who did not. Secondary impact was defined based on survey responses indicating agreement (4–5 on the scale) with the statements: "Opioid use has impacted someone in my training program" or "Opioid use has impacted the community where I permanently reside." The group of participants secondarily impacted comprised individuals who had indirect interactions with people affected by opioids. A t-test was performed to compare the differences between participants who were secondarily impacted and those who were not.

The perceived stigma associated with opioids was examined by comparing participants who reported immediate impact with those who did not. The level of agreement among participants regarding the belief that "opioid addiction is a symptom of poor moral character" was utilized as a measure of perceived stigma. A t test was employed to assess the differences in stigma between participants who were immediately impacted and those who were not.

The relationship between the drug overdose rate and the perceived severity score for the adult population was calculated. Participants were grouped based on the county they identified as their "home." The drug overdose rate for each county was determined by averaging data from CDC Wonder [9]. Due to the nonnormality of the data, a Kendall rank test was conducted to calculate the significance. In this study, a significance level of $p < 0.05$ was utilized to define statistical significance for all performed statistical tests. All statistical tests were performed in the programming language, R version 2022.12.0+353.

Results

The study sample consisted of 377 medical students, specifically from OU-HCOM and UT (Table 1). Among these participants, the majority, comprising 312 individuals (82.7 %), were affiliated with OU-HCOM. Of the total sample, 221 participants (58.6 %) were aged 25 years or older, and 214 participants (56.7 %) identified as female. When considering the participants' stage in their medical education, a significant portion (280 individuals [74.2 %]), were in their preclinical years, encompassing the first and second years of medical school.

The average level of agreement for the participants was plotted based on their responses to various questions about their experiences and how they perceived the impact of opioids (Table 2). The majority of participants disagreed that opioids

Table 1: Demographics of the participant population (n=377).

Individual demographic	OU-HCOM, n=312 (82 %) Number (%)	UT, n=65 (18 %) Number (%)
Age, years		
<25	115 (37.0)	40 (61.5)
≥25	196 (63.0)	25 (38.5)
Gender		
Female	169 (54.2)	45 (69.2)
Male	143 (45.8)	20 (30.8)
Year in medical school		
Year 1	113 (36.2)	64 (98.5)
Year 2	102 (32.7)	1 (1.5)
Year 3	41 (13.1)	0 (0.0)
Year 4	53 (17.0)	0 (0.0)
Year 5	3 (1.0)	0 (0.0)
Race/ethnicity		
Asian/Pacific Islander	31 (10.0)	38 (61.3)
Black/African American	12 (3.9)	1 (1.6)
Hispanic/Latino	4 (1.3)	0 (0.0)
Middle Eastern	11 (3.5)	17 (27.4)
Multiracial	15 (4.8)	2 (3.2)
American Indian/Alaskan Native	0 (0.0)	3 (4.8)
White/Caucasian	235 (75.6)	1 (1.6)
Other	3 (1.0)	0 (0.0)
Community where participant grew up		
Major metropolitan area (over 1 million people)	14 (4.5)	4 (6.2)
Metropolitan area (500,001–1,000,000 people)	27 (8.7)	9 (13.8)
City (100,001–500,000 people)	70 (22.4)	17 (26.2)
Small city (50,001–100,000 people)	46 (14.7)	11 (16.9)
Town (2,500–50,000 people)	118 (37.8)	20 (30.8)
Rural area (fewer than 2,500 people)	37 (11.9)	4 (6.2)

OU-HCOM, Ohio University Heritage College of Osteopathic Medicine; UT, University of Toledo College of Medicine and Life Sciences.

Table 2: Participant responses to opioid experience questions.

Statement	OU-HCOM, n=312 (82 %)			UT, n=65 (18 %)			Combined, n=377		
	Number of responses, %	Mean	95 % CI	Number of responses, %	Mean	95 % CI	Number of responses, %	Mean	95 % CI
Opioid use has impacted my nuclear family									
1 (Strongly disagree)	145 (46.5)	2.0	1.8–2.1	52 (80.0)	1.4	1.1–1.6	197 (52.3)	1.87	1.8–2.0
2 (Disagree)	105 (33.7)			8 (12.3)			113 (30.0)		
3 (Neutral)	12 (3.8)			1 (1.5)			13 (3.4)		
4 (Agree)	23 (7.4)			3 (4.6)			26 (6.9)		
5 (Strongly agree)	27 (8.7)			1 (1.5)			28 (7.4)		
Opioid use has impacted my circle of friends									
1 (Strongly disagree)	106 (34.0)	2.4	2.3–2.6	38 (58.5)	1.9	1.6–2.3	144 (38.2)	2.3	2.2–2.5
2 (Disagree)	99 (31.7)			12 (18.5)			111 (29.4)		
3 (Neutral)	19 (6.1)			1 (1.5)			20 (5.3)		
4 (Agree)	50 (16.0)			9 (13.8)			59 (15.6)		
5 (Strongly agree)	38 (12.2)			5 (7.7)			43 (11.4)		
Opioid use has impacted someone in my training program									
1 (Strongly disagree)	81 (26.0)	2.5	2.3–2.6	32 (49.2)	2.0	1.7–2.2	113 (30.0)	2.4	2.3–2.5
2 (Disagree)	92 (29.5)			10 (15.4)			102 (27.1)		
3 (Neutral)	75 (24.0)			19 (29.2)			94 (24.9)		
4 (Agree)	44 (14.1)			2 (3.1)			46 (12.2)		
5 (Strongly agree)	20 (6.4)			2 (3.1)			22 (5.8)		
Opioid use has impacted the community where I permanently reside									
1 (Strongly disagree)	10 (3.2)	4.1	4.0–4.2	5 (7.7)	4.2	3.9–4.5	15 (4.0)	4.1	4.0–4.2
2 (Disagree)	8 (2.6)			1 (1.5)			9 (2.4)		
3 (Neutral)	39 (12.5)			7 (10.8)			46 (12.2)		
4 (Agree)	133 (42.6)			16 (24.6)			149 (39.5)		
5 (Strongly agree)	122 (39.1)			36 (55.4)			158 (41.9)		
I have treated a patient with acute opioid overdose									
1 (Strongly disagree)	108 (34.6)	2.5	2.4–2.7	47 (72.3)	1.5	1.3–1.8	155 (41.1)	2.4	2.2–2.5
2 (Disagree)	75 (24.0)			7 (10.8)			82 (21.8)		
3 (Neutral)	31 (9.9)			5 (7.7)			36 (9.5)		
4 (Agree)	46 (14.7)			4 (6.2)			50 (13.3)		
5 (Strongly agree)	51 (16.3)			1 (1.5)			52 (13.8)		

CI, confidence interval; OU-HCOM, Ohio University Heritage College of Osteopathic Medicine; UT, University of Toledo College of Medicine and Life Sciences.

had affected their nuclear family, circle of friends, or the community where they reside. The average level of agreement for opioids impacting participants' immediate family was 1.9 (95 % CI, 1.8–2.0), and for impacting their circle of friends, it was 2.3 (95 % CI, 2.2–2.5). Regarding the impact on the community where participants reside, the average level of agreement was 2.4 (95 % CI, 2.3–2.5). Interestingly, participants generally agreed that opioids had impacted someone in their training program, with a mean of 4.1 (95 % CI, 4.0–4.2), but that they had not treated a patient with acute opioid overdose, with a mean of 2.4 (95 % CI, 2.2–2.5).

The average perception that participants had on the impact of opioids' severity was determined (Table 3). Participants perceived the impact of opioids on Ohio's adult

population to be greater than the impact on Ohio's minors. The severity score average for adults was 74.3 (95 % CI, 72.4–76.3), while for minors, it was 65.6 (95 % CI, 63.3–67.9). Of note, one of the lowest rated areas was the impact on their profession's ability to provide quality work, which had an average score of 66.4 (95 % CI, 64.1–68.8) – even though the impact on Ohio's healthcare systems was rated as the second most severe on the questionnaire, with an average score of 80.4 (95 % CI, 78.8–82.0). Moreover, when comparing severity ratings among rural, suburban, and urban areas, the highest severity was reported in rural communities, with an average score of 80.7 (95 % CI, 78.8–82.6).

The perceived severity of the opioid impact on Ohio's adult population was compared between participants who

Table 3: Participant responses to opioid severity questions (n=377).

Statement	OU-HCOM, n=312 (82 %)			UT, n=65 (18 %)			Combined, n=377		
	Number of responses, %	Mean	95 % CI	Number of responses, %	Mean	95 % CI	Number of responses, %	Mean	95 % CI
Impact on Ohio's adult population									
0–25 (least severe)	8 (2.6)	72.7	70.5–74.9	0 (0.0)	80.9	77.3–84.5	8 (2.1)	74.3	72.4–76.2
26–50	36 (11.5)			1 (1.5)			37 (9.8)		
51–75	126 (40.3)			21 (32.3)			147 (39.0)		
76–100 (most severe)	141 (45.2)			43 (66.2)			184 (48.8)		
Impact on Ohio's minors (<18 years of age)									
0–25 (least severe)	18 (5.8)	63.1	60.5–65.7	1 (1.5)	76.5	72.0–81.0	19 (5.0)	65.6	63.3–67.9
26–50	88 (28.2)			7 (10.8)			95 (25.2)		
51–75	102 (32.7)			21 (32.3)			123 (32.6)		
76–100 (most severe)	103 (33.0)			36 (55.4)			139 (36.9)		
Impact on your profession's ability to provide quality patient care									
0–25 (least severe)	24 (7.7)	64.0	61.3–66.7	0 (0.0)	76.0	71.6–80.4	24 (6.4)	66.4	64.1–68.8
26–50	66 (21.2)			10 (15.4)			76 (20.2)		
51–75	111 (35.6)			21 (32.3)			132 (35.0)		
76–100 (most severe)	109 (34.9)			34 (65.3)			143 (37.9)		
Impact on Ohio's healthcare systems									
0–25 (least severe)	1 (0.3)	79.0	77.1–80.9	0 (0.0)	85.7	82.6–88.8	1 (0.3)	80.4	78.8–82.0
26–50	19 (6.1)			0 (0.0)			19 (5.0)		
51–75	90 (28.8)			15 (23.1)			105 (27.9)		
76–100 (most severe)	201 (64.4)			50 (76.9)			251 (66.6)		
Impact on healthcare funding in Ohio									
0–25 (least severe)	12 (3.8)	68.9	66.5–71.2	0 (0.0)	76.6	72.2–81.0	12 (3.2)	70.4	68.3–72.5
26–50	51 (16.3)			9 (13.8)			60 (15.9)		
51–75	125 (40.1)			15 (23.1)			140 (37.1)		
76–100 (most severe)	123 (39.4)			41 (63.1)			164 (43.5)		

Table 3: (continued)

Statement	OU-HCOM, n=312 (82 %)			UT, n=65 (18 %)			Combined, n=377		
	Number of responses, %	Mean	95 % CI	Number of responses, %	Mean	95 % CI	Number of responses, %	Mean	95 % CI
Impact on Ohio's rural communities									
0–25 (least severe)	4 (1.3)	79.9	77.8–82.0	1 (1.5)	83.4	78.7–88.1	5 (1.3)	80.7	78.8–82.6
26–50	28 (9.0)			5 (7.7)			33 (8.8)		
51–75	63 (20.2)			7 (10.8)			70 (18.6)		
76–100 (most severe)	216 (69.2)			52 (80.0)			268 (71.1)		
Impact on Ohio's suburban communities									
0–25 (least severe)	10 (3.2)	69.9	67.7–72.2	0 (0.0)	75.7	71.7–79.7	10 (2.7)	71.1	69.1–73.1
26–50	47 (15.1)			7 (10.8)			54 (14.3)		
51–75	120 (38.5)			23 (35.4)			143 (37.9)		
76–100 (most severe)	134 (42.9)			35 (53.8)			169 (44.8)		
Impact on Ohio's urban communities									
0–25 (least severe)	2 (0.6)	77.3	75.3–79.3	0 (0.0)	85.1	81.6–88.5	2 (0.5)	78.9	77.1–80.6
26–50	29 (9.3)			3 (4.6)			32 (8.5)		
51–75	93 (29.8)			8 (12.3)			101 (26.8)		
76–100 (most severe)	187 (59.9)			54 (83.1)			241 (63.9)		

CI, confidence interval; OU-HCOM, Ohio University Heritage College of Osteopathic Medicine; UT, University of Toledo College of Medicine and Life Sciences.

were immediately impacted and those who were not. The results were plotted in a bar chart. Of the 377 participants, 129 (34 %) stated that opioids impacted their nuclear family or circle of friends, indicating that they were immediately impacted. The mean severity score for participants immediately impacted was 77.3 (95 % CI, 74.0–80.5). However, for those not immediately impacted, it was 72.8 (95 % CI, 70.5–76.2). The t test illustrated a significant difference in perceived severity for participants in these two groups ($p=0.03$, $\alpha=0.05$).

Furthermore, when comparing participants who were secondarily impacted by opioids with those who were not, the mean severity score was 75.4 (95 % CI, 73.4–77.5) and 68.7 (95 % CI, 63.5–73.9), respectively. Similarly, the t test demonstrated a significant difference in perceived severity between these two groups ($p=0.02$, $\alpha=0.05$).

The perceived stigma of opioids was compared for participants immediately impacted and those who were not. The results were plotted in a bar chart. Participants who were immediately impacted disagreed with the statement that opioid addiction is a symptom of poor moral character, with a mean rank of 1.5 (95 % CI, 1.4–1.6). Participants not immediately impacted were closer to neutral, with a mean rank of 1.6 (95 % CI, 1.5–1.7). The t test did not illustrate a significant difference in stigma associated with opioid users for participants that were immediately impacted by opioids and those who were not ($p=0.3$, $\alpha=0.05$).

The correlation between the drug overdose rate and perceived severity score for Ohio counties was assessed utilizing the Kendall rank test. The results of the test did not indicate a significant relationship between perceived severity and the drug overdose rate ($R=0.05$, $p=0.6$, $\alpha=0.05$).

Discussion

This study assessed medical students' beliefs, experiences, and perceptions of the opioid crisis. Such insights are crucial because these future physicians will play a significant role in addressing the challenges faced by individuals struggling with opioids.

First, it is important to see how the lives of medical students have been impacted by opioids. The study's findings indicate that the impact on medical students' nuclear

families or their circle of friends is relatively less compared to the impact on individuals in their training program or the community where they reside (Table 2). Comparing these two groups reveals the disparity in how immediate or indirect exposure to the opioid crisis influences medical students' perception of its severity. As previously stated, those immediately impacted by the opioid crisis were statistically more likely to see the crisis as severe compared to those without such a direct impact. Likewise, those secondarily impacted showed a statistically significant difference in their perception of severity when compared to individuals who were not. Recognizing this variation in severity outlook due to personal experience could lead to significant changes in the medical curriculum, aiming to provide comprehensive education on the severity of opioids to students from diverse backgrounds.

However, it is important to distinguish between perceived severity and stigma. As future physicians, harboring a stigma toward individuals involved in the opioid crisis could potentially lead to unsatisfactory care for that patient due to potential implicit biases. Encouragingly, the results from this study show that there is no statistically significant difference in the level of stigma between those who were immediately impacted by the crisis and those who were not. In fact, survey responses revealed that students rated the impact of opioids on their capacity to deliver quality patient care as the second lowest concern, while ranking the impact of opioids on the healthcare system as the second most severe (Table 3).

In addition to personal experiences, the experiences gained throughout medical school have a significant influence on perceptions of opioids. While this study deals predominately with analyzing how personal experiences contribute to the perceptions of opioids held by medical students, literature can offer insight into how experiences gained throughout medical school can also contribute to beliefs. Previous research indicates that a patient panel has led to a change in approximately 70 % of students' perceptions of individuals with substance use disorders (n=369) [10]. The same study stated that the patient panels shifted student attitudes, due to the power of hearing real patient stories, toward a more humanistic perspective and exploring more alternative treatment options [10].

Another study found that first-year medical students identified pain as a major concern in their early clinical experience [11]. Students' perceptions of pain-related encounters, combined with the results of this study that deal with medical students' personal experiences with opioid use, can inform curriculum design and ultimately benefit both physicians and the patients [10, 11]. For example, additional lectures on holistic medicine and alternative treatments for pain management, such as OMT, could enhance patient care.

This study also explored medical students' perceptions of the areas within society where they believe the opioid crisis is most severe. The perceived impact on the adult population was greater than that on the minor population (Table 3). However, opioid use disorders (OUDs) and adults ultimately impact the minor population [12]. Children and adolescents who grow up in households with OUDs experience an increased risk of mental health problems, accidental opioid poisoning, substance use disorder, and family dissolution that results from parents' incarceration, foster care placement, or loss of parent to an opioid overdose [13]. Additionally, the impact on the rural community was greater than that on either the urban or suburban communities (Table 3). The literature reinforces this idea that those in rural communities are more likely to misuse opioids [14, 15]. One study found that the lack of behavioral health and recovery resources in rural communities creates barriers to effectively manage OUD and chronic pain [16].

In order to alleviate the opioid crisis, outreach programs aimed at enhancing healthcare access can play a vital role in benefiting these regions [17]. Another possible solution is to expand medical school classes, and therefore have more graduating physicians who are able to serve those communities that are disproportionately affected by OUD. Alongside this expansion, there also needs to be additional training provided to these physicians that reinforces the notion that OUD is a chronic disease that requires it to be treated as such.

By utilizing this valuable information, medical institutions can adapt their curriculum and equip future physicians with a comprehensive understanding of the severity and intricacies surrounding opioid use and addiction. For example, medical schools can reiterate that treatment, and recovery from OUD includes more than just medications. Medical students may benefit from learning about non-pharmacologic alternatives to pain management, such as OMT, and incorporating the osteopathic philosophy of holistic medicine that addresses mental health. This expanded knowledge base enables medical students, regardless of their backgrounds, to develop the necessary skills and expertise to address the challenges posed by opioids in their future practice. With an enhanced understanding of the crisis, these future physicians are better prepared to provide effective prevention, treatment, and support to individuals affected by opioid addiction. Consequently, their contribution to the ongoing fight against the opioid crisis becomes more significant and impactful, fostering positive patient-centered relationships.

Study limitations include the small sample size from two institutions, self-reported data, and the cross-sectional study design. Data collection occurred exclusively at one osteopathic medical school and one allopathic medical school in Ohio, thereby constraining the generalizability of the findings to all medical students. Moreover, the smaller sample size from the allopathic medical school further hinders broad generalizations to allopathic medical students, although it is essential to acknowledge that this medical school's class size is half that of the osteopathic medical school. Additionally, the self-reported data collected are vulnerable to social desirability bias. To minimize bias, we informed all participants that their responses were anonymous. Finally, the cross-sectional study design prevents discerning causality. Future research should examine osteopathic and allopathic medical students' experiences and beliefs about the opioid crisis throughout their medical education and postgraduation to identify predictors for individuals most likely to provide treatment to people with OUD.

Conclusions

The findings of this study revealed a diverse range of backgrounds among students, highlighting distinct levels of exposure to the crisis, ranging from direct encounters to minimal experiences. Interestingly, a significant majority of students had greater exposure to the crisis through classmates or patients rather than family or friends. It was particularly noteworthy that individuals who had personal encounters with the crisis, especially through family or friends, tended to perceive the severity of the situation as more pronounced compared to those without such immediate impacts. Despite variations in perceived severity based on personal encounters, the study revealed that these differences did not necessarily translate into variances in the stigma attached to individuals grappling with opioid-related challenges. The study's insights underscored the nuanced perspectives held by students, suggesting that the impact of the crisis was shaped by diverse and multifaceted influences. The prevalence of indirect exposure through classmates and patients emphasized the broader societal implications of the crisis and its reverberations within academic and healthcare settings.

Research ethics: The study was approved by the Ohio University Office of Research Compliance (Institutional Review Board #18E195).

Informed consent: All participants provided electronic informed consent via Qualtrics prior to participation in the study.

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