Cross-sectional Study

Anxiety in anesthesia providers during coronavirus disease 19 pandemic: Insights into perception of harm a cross-sectional study

Efrain Riveros-Perez [*], Javier Polania, Maria Gabriela Sanchez, Bibiana Avella-Molano, Alexander Rocuts

Department of Anesthesiology and Perioperative Medicine, Medical College of Georgia at Augusta University, USA

A B S T R A C T

Background: The influence of Coronavirus disease 2019 (COVID-19) pandemic on mental health has been widely studied; however, literature evaluating the mental health effects of the pandemic on small groups of people is scarce. We aim to evaluate the impact of the COVID-19 pandemic on anxiety levels of anesthesiology providers in an academic institution.
Materials and methods: We conducted a cross-sectional study including one hundred and five participants (Faculty anesthesiologists, anesthesia residents, certified registered and student nurse anesthetists). The generalized anxiety disorder questionnaire (GAD-7) was administered to participants.
Results: Approximately half of the 105 participants experienced various degrees of anxiety, with only 14.3% exhibiting moderate to severe symptoms of anxiety. Anxiety interfering with daily activities was reported in 54.9% of the participants. Anxiety-generating factors such as access to protective equipment and transmitting the disease to family members were identified.
Conclusion: The COVID-19 pandemic is associated with different degrees of anxiety. The prevalence of severe anxiety is relatively low, probably due to differential individual perceptions, feelings of invulnerability, and resilience of anesthesia providers.

1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic has affected multiple aspects of everyday life worldwide. Pandemics unleash a societal sense of fear and anxiety. Hence, the COVID-19 pandemic and subsequent lockdowns authorized by governments have profoundly impacted mental health. This has led to substantial research on this topic; however, literature evaluating the mental health effects of the pandemic on small groups of people is scarce [1]. Healthcare workers have undergone significant psychological pressure and stress during viral surges of this pandemic [2]. Furthermore, anxiety levels vary as the number of cases varies between regions and across time. This study aims to evaluate the anxiety levels and associated factors in anesthesia providers at an academic institution during the second wave of COVID-19 in the state of Georgia, United States.

2. Methods

This study has been reported according to the STROCSS criteria [3]. According to the Declaration of Helsinki was registered in https://clinicaltrials.gov/, under the registration code NCT05212909. After approval by the Institutional Review Board (Protocol # 160167), a cross-sectional study was conducted to identify anxiety levels during the COVID-19 pandemic among anesthesia providers at our institution. The participants included Faculty anesthesiologists, anesthesiology residents, Certified Registered Nurse Anesthetists (CRNAs), and CRNA students. Data were collected from August 26 to September 15, 2020. A questionnaire containing the General Anxiety Disorder-7 (GAD-7) scale, followed by a set of questions with binary answers to evaluate the presence or absence of anxiety-related factors during the COVID-19 pandemic, was administered through direct approach and voluntary participation of the subjects.

* Corresponding author.
E-mail addresses: eriverosperez@augusta.edu (E. Riveros-Perez), jpolaniagutierr@augusta.edu (J. Polania), marsanchez@augusta.edu (M.G. Sanchez), bavellamolano@augusta.edu (B. Avella-Molano), krocutsmartinez@augusta.edu (A. Rocuts).

2.1. Statistical analysis

All statistical analyses were performed using JMP® Version 15.0.0 (SAS Institute Inc. Cary, NC). Descriptive analysis was utilized for demographic and study characteristics. Anxiety prevalence was calculated using a cut-off of 10 points on the GAD-7, conferring a sensitivity of 89% and specificity of 82% for the diagnosis of anxiety [4]. Chi-square test was used for comparison of study subjects for qualitative variables and prevalence of anxiety. Subsequently, univariate logistic analysis was performed to establish the association between anxiety-generating factors and the diagnosis of anxiety with moderate to severe symptoms. A p-value of 0.05 was considered statistically significant.

3. Results

A total of 105 of 115 anesthesia providers at our institution voluntarily participated in the study, achieving a response rate of 91.3%. Subjects had a mean age of 38 years (SD = 9.63), approximately two-thirds were younger than 40 years old (71.4%), more than half were male (60%), 63.8% were married, and most of them were U.S. citizens (72%). Two-thirds of participants had less than five years of experience as anesthesia providers (66.7%). The latter can be explained by the high participation rate of anesthesiology residents (37.1%), followed by CRNAs (34.3%). (Table 1).

Fifty-two subjects (49.5%) reported some degree (mild to severe) of anxiety measured by the GAD-7 (Table 2), while 17.2% Presented moderate to severe intensity symptoms determined by a score of 10 or

Table 1

Demographic Characteristics. CI, confidence interval. CRNA, Certified Registered Nurse Anesthetist. US, United States.

Variables		Frequency	Percentage (CI 95%)
Age	Mean(DS)	38.13 (9.63)	(36.27–39.99)
	<40	75	71,4 (62.31–80.55)
	>40	30	28,6 (19.45–37.69)
Years of experience	Mean(DS)	7.32 (8.99)	5.58–9.06
	<5	70	66,7 (57.17–76.16)
	>5	35	33,3 (23.84–42.83)
Gender	Female	42	40 (30.15–49.87)
	Male	63	60 (50.15–69.85)
Marital status	Single	34	32,4 (22.95–41.80)
	Married	67	63,8 (54.14–73.48)
	Divorced	4	3,8(1.05–9.47)
Nationality	U.S. Citizen	72	68,6 (59.22–77.93)
	Dual citizenship	3	2,9 (0.59–8.12)
	Non-U.S. citizen	30	28,6 (19.45–37.69)
Profession	CRNA	36	34,3 (24.73–43.84)
	Physician anesthesiologist	22	21,0 (12.69–29.21)
	Anesthesiology resident	39	37,1 (27.43–46.86)
	CRNA Student	8	7,6 (2.07–13.17)
Have children	No	54	51,4 (41.39–61.46)
	Yes	51	48,6 (38.53–58.61)
Lives with an older than 60-year-old	No	94	89,5 (83.19–95.86)
	Yes	11	10,5 (4.14–16.81)
Total		105	100

Table 2

GAD-7 (Generalized Anxiety Disorder) Prevalence and severity levels. CI, confidence interval.

GAD		Frequency	% (IC 95)
Prevalence	Yes GAD (>10 points)	15	14,3 (7.12–21.46)
	No GAD (≤10 points)	90	85,7 (78.55–92.88)
Severity levels	Minimal (0–4)	53	50,5 (40.44–60.52)
	Mild (5–9)	34	32,4 (22.96–41.81)
	Moderate (10–14)	11	10,5 (4.14–16.81)
	Severe (15–21)	7	6,7 (1.42–11.91)
Total		105	

more points on the GAD-7 scale. Anxiety symptoms interfering with daily work activities were reported by 54.9% of the sample. A small proportion of 6.7% and 1.9% disclosed that performing their job was very difficult or extremely difficult, respectively, in light of symptom intensity. Comparing the prevalence of moderate to severe anxiety symptoms, no statistically significant associations were found for gender (p = 1.00), being older or younger than 40 years (p = 0.86), or having less than five years of experience in anesthesiology (p = 0.23). Similarly, being married or single (p = 0.33), having children (p = 0.87), being a graduated professional, or in-an individual in training (p = 0.58) were unrelated to anxiety disorder prevalence (Table 3).

Uncertainty regarding institutional support should the anesthesia provider and their family develop COVID-19 infection seems to have a considerable anxiety-generating effect (OR = 3.01); however, this result did not achieve statistical significance. Interestingly, other factors such as access to appropriate personal protective equipment (OR = 1.05), exposure to COVID-19 at work, and transmitting the infection to their family (OR = 1.07) had a small anxiety-generating effect in our sample. Likewise, not having appropriate access to COVID-19 testing or being afraid of spreading the virus among co-workers (OR = 0.88) does not increase anxiety levels among anesthesia providers.

Overall, organizational factors seem to be contributing to anxiety in anesthesia providers. Having access to childcare (OR = 2,61), lack of access to updated communications and information (OR = 2,04), and having the support to be able to provide for the basic family needs as work hours and demands increase (OR = 2,40) were reported as anxiety generating factors. These associations did not achieve statistical significance. The versatility of anesthesia providers was evidenced by the fact that 62% of them reported being able to provide competent medical care if deployed to a new area (i.e., emergency department) without experiencing anxiety (Table 4).

4. Discussion

Anxiety is an emotional state characterized by the fear of an imminent threat and the anticipatory representation of possible adverse future events. In this study, we used a previously validated questionnaire (GAD-7) to evaluate the effect of the COVID-19 pandemic on anxiety levels of anesthesia providers in an academic institution. We report anxiety prevalence of 17.2% for moderate to severe anxiety symptoms among anesthesia providers. Our prevalence is low compared to the most recent reports, including those for the general population [5]. This finding may be explained by different factors, including differential perceptions in relation to timing of COVID-19 peak waves; 'invulnerability' feelings among healthcare workers, especially physicians; and high levels of resilience in healthcare workers.

Several models attempt to explain the development of anxiety. According to the looming vulnerability model, individuals live in an environment that presents multiple situations of potential harm. Such situations are dynamic and may induce different emotional states across time as the threat comes and goes [6]. This model emphasizes the variability of anxiety levels and reality perceptions as a function of time. In our study, the data collection period coincided with a steady decline of new cases in the United States, concurrent with the loosening of

Table 3
Association between anxiety by GAD-7 and characteristics of participants.

Variables	Category	GAD Yes		GAD No		Chi-square	p-value
		Frequency	%	Frequency	%		
Gender	Female	6	14,29	36	85,71	0,00	1,00
	Male	9	14,29	54	85,71		
Age	<40	11	14.70	64	85.30	0.03	0.86
	>40	4	13.30	26	86.70		
Years of experience	<5	12	17.10	58	82.90	1.40	0.23
	>5	3	8.60	32	91.40		
Marital status	Single	3	8,82	31	91,18	2,21	0,33
	Married	12	17,91	55	82,09		
	Divorced	0	–	4	100,00		
	Widowed	0	–	0	–		
Nationality	U.S. Citizen	7	9,72	65	90,28	4,12	0,13
	Dual citizenship	1	33,33	2	66,67		
	Non-U.S. citizen	7	23,33	23	76,67		
Profession	CRNA	4	11,11	32	88,89	1,96	0,58
	Physician anesthesiologist	2	9,09	20	90,91		
	Anesthesiology resident	7	17,95	32	82,05		
	CRNA Student	2	25,00	6	75,00		
Have children	No	8	14,81	46	85,19	0,03	0,87
	Yes	7	13,73	44	86,27		
Lives with an older than 60-year-old	No	14	14,89	80	85,11	0,27	0,60
	Yes	1	9,09	10	90,91		

restrictions and lockdowns in the State of Georgia [7–9]. We may argue that these contextual factors created a general perception of waxing and waning intensity of a perceived threat related to the ubiquity of the virus that could be translated into different degrees of anxiety [10]. Interestingly, although this changing anxiety phenomenon affects the general population, the population of healthcare workers is particularly vulnerable to this phenomenon. A study in Shanghai evaluated anxiety prevalence during outbreak and non-outbreak periods, identifying a clear reduction from 33.6% to 7.6%, respectively, in anxiety prevalence among healthcare workers [11]. We think that our results reflect the anxiety-generating effect of COVID during the lower part of the viral incidence curve.

We consider healthcare workers a particularly unique population of interest. A culture of invulnerability is prevalent from medical students to practicing physicians [12]. Feelings of invulnerability were addressed by the Canadian psychiatrist JT MacCurdy, who in his book titled "Structure of Morale," described the discrepancy in psychological response among the population of London during World War II [13]. According to MacCurdy, the population can be divided into three groups regarding their response to a psychologically traumatic event. The first group, called direct hits, includes those who experienced the event firsthand with incapacitation or death. The effect of this group on the population in terms of generation of fear and anxiety is negligible as "… corpses do not run about spreading panic." The second group, near misses, consisted of those who felt the blast but survived. The final group, remote misses, was composed by those who witnessed the traumatic event but evaded physical or emotional harm. According to the author, the traumatic experience leads to what he calls passive adaptation to danger, characterized by being cautious in the near misses' group, whereas the remote misses exhibit feelings of invulnerability [14]. Our population represents a relatively young cohort, inherently less susceptible to infection by COVID-19. We think that our sample belongs to the remote misses group of MacCurdy for the most part and is more prone to exhibit a feeling of immunity to harm [15].

Added to feelings of invulnerability, healthcare workers seem to experience higher levels of resilience [16]. In multiple studies, resilience has demonstrated an inverse relationship with anxiety, stress, and burnout, even during the COVID-19 pandemic [17–19]. While the number of COVID-19 cases was not overwhelming in the geographical area where this study took place, the social impact of the disease is still significant in the community. At the end of our study, 11,369 COVID-19 cases were reported in the surrounding counties, and 82 were healthcare workers.

Our study has limitations. The observational nature of the analysis makes it impossible to control for stressors different than those related to COVID-19. Furthermore, the nature of this study makes it vulnerable to the Hawthorne effect, which can influence the answers given in the questionnaire [20]. However, having a population socially similar in the context of healthcare, and even more specifically, doing the same kind of job with firsthand exposure to the virus, allowed to draw some conclusions regarding the psychological impact of the pandemic at the local level. Additionally, our sample size is small for a conventional cross-sectional study and only accounts for anesthesia providers from a single health care center with moderate to low incidence of COVID-19 cases.

On the other hand, since our data was collected and analyzed before the widespread use of vaccines, further research is required to answer the same question in this new context. Some authors have postulated that the viral incidence cycles on just a few factors [21], studies with longitudinal design are necessary to clarify the relationship between anxiety and the fluctuation of cases during a pandemic. The strengths of our study include the high response rate to the survey, the use of a well-validated tool for assessing anxiety, and the low likelihood of recall bias conferred by the prospective recollection of data over a short time period. Our study is an important contribution to understanding the phenomenon of dynamic anxiety among healthcare providers during the pandemic, especially as new waves of cases seem to be looming worldwide.

5. Conclusions

The COVID-19 pandemic affects anesthesia providers from psychological and behavioral standpoints by generating different degrees of anxiety. However, the prevalence of severe anxiety is relatively low, probably due to differential individual perceptions, feelings of invulnerability, and resilience of anesthesia providers.

Provenance and peer review

Not commissioned, externally peer-reviewed.

Ethical approval

Augusta University Institutional Review Board, protocol #160167.

Table 4

Factors generating concern in relation to anxiety by GAD-7. CI, confidence interval. OR, odds ratio.

		GAD Yes	GAD No	OR	IC 95% Low	IC 95% High	p-value
Access to appropriate personal protective equipment (PPE)	Yes	9	53	1,05	0,34	3,19	0,94
	No	6	37				
Being exposed to COVID-19 at work and taking the infection home to their family	Yes	12	71	1,07	0,27	4,18	0,92
	No	3	19				
Not having rapid access to testing if they develop COVID-19 symptoms and concomitant fear of propagating infection at work	Ye	3	20	0,88	0,22	3,41	0,85
	N	12	70				
Uncertainty that their organization will support/take care of their personal and family needs if they develop infection	Yes	11	43	3,01	0,89	10,15	0,07
	No	4	47				
Access to childcare during increased work hours and school closures	Yes	4	11	2,61	0,71	9,65	0,14
	No	11	79				
Support for other personal and family needs as work hours and demands increase (food, hydration, lodging, transportation)	Yes	8	29	2,40	0,79	7,27	0,11
	No	7	61				
Being able to provide competent medical care if deployed to a new area (eg, non-ICU nurses having to function as ICU nurses)	Yes	2	26	0,38	0,08	1,80	0,21
	No	13	64				
Lack of access to up-to-date information and communication	Yes	7	27	2,04	0,67	6,20	0,20
	No	8	63				

Sources of funding

Author contribution

Efrain Riveros-Perez – PI coordinate the process from the study design to writing the paper. Gabriela Sanchez- Data collection and analysis. Javier Polania – Subjects enrolment and administer the questionnaire. Bibiana Avella-Molano – contributed to paper writing. Alexander Rocuts – Data analysis.

Consent

Subjects enrolled in this study signed a informed consent prior to be included.

Registration of research studies

https://clinicaltrials.gov/ct2/show/NCT05212909.
Unique Protocol ID: 1601067.

Guarantor

Efrain Riveros-Perez.

Declaration of competing interest

None of the authors have any conflict of interest to disclose.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2022.103566.

References

[1] S. Taylor, The Psychology of Pandemics: Preparing for the Next Global Outbreak of Infectious Disease, Cambridge Scholars Publishing, 2019, https://doi.org/10.1146/annurev-clinpsy-072720-020131.

[2] X. Xiao, X. Zhu, S. Fu, Y. Hu, X. Li, J. Xiao, Psychological impact of healthcare workers in China during COVID-19 pneumonia epidemic: A multi-center cross-sectional survey investigation. Journal of affective disorders. 2020274, 405- 410. 10.1016/j.jad.2020.05.081.

[3] G. Mathew, R. Agha, for the STROCSS Group, STROCSS 2021: strengthening the Reporting of cohort, cross-sectional and case-control studies in Surgery, Int. J. Surg. 96 (2021) 106165.

[4] R.L. Spitzer, K. Kroenke, J.B. Williams, B. Löwe, A brief measure for assessing generalized anxiety disorder: the GAD-7, Arch. Intern. Med. 166 (2006) 1092–1097, https://doi.org/10.1001/archinte.166.10.1092.

[5] N. Salari, A. Hosseinian-Far, R. Jalali, A. Vaisi-Raygani, S. Rasoulpoor, M. Mohammadi, Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis, Glob. Health 16 (2020) 1–11, https://doi.org/10.1186/s12992-020-00589-w.

[6] J.H. Riskind, E. Calvete, Anxiety and the dynamic self as defined by the prospection and mental simulation of looming future threats, J. Pers. 88 (2020) 31–44, https://doi.org/10.1111/jopy.12465.

[7] V. Grech, S. Cuschieri, COVID- 19: A Global and Continental Overview of the Second Wave and its (Relatively) Attenuated Case Fatality Ratio, 2020, https://doi.org/10.1016/j.earlhumdev.2020.105211.

[8] J. Gazmararian, R. Weingart, K. Campbell, T. Cronin, J. Ashta, Impact of COVID-19 pandemic on the mental health of students from 2 semi-rural high schools in Georgia, J. Sch. Health (2021), https://doi.org/10.1111/josh.13007.

[9] L. Wang, Re-infection and its potential impact on economy: a policy-based analysis with mathematical modelling (SIR), DFHMC (2020), https://doi.org/10.1109/DFHMC52214.2020.00064.

[10] J. Thaler, The Next Surges are Here: what Can American Governments Lawfully Do in Response to the Ongoing COVID-19 Pandemic? 42, 2020, p. 165.

[11] J. Xu, Q.H. Xu, C. Wang, J. Wang, Psychological status of surgical staff during the COVID-19 outbreak, Psychiatr. Res. 288 (2020), 112955, https://doi.org/10.1016/j.psychres.2020.112955.

[12] J. Spiers, M. Buszewicz, C. Chew-Graham, C. GeradA, D. Kessler, N. Leggett, Who cares for the clinicians? The mental health crisis in the GP workforce, Br. J. Gen. Pract. (2016), https://doi.org/10.3399/bjgp16X685765.

[13] J.T. MacCurdy, The Structure of Morale, Cambridge University Press, 2014.

[14] A. Moura, The Remote Misses of COVID-19, American College of Physicians, 2020, https://doi.org/10.7326/M20-4984.

[15] G. Bennet, The Doctor's Losses: ideals versus Realities 316, 1998, pp. 1238–1240, https://doi.org/10.1136/bmj.316.7139.1238.

[16] N. McKinley, P.N. Karayiannis, L. Convie, M. Clarke, S.J. Kirk, W.J. Campbell, Resilience in medical doctors: a systematic review, Postgrad. Med. 95 (2019) 140–147, https://doi.org/10.1136/postgradmedj-2018-136135.

[17] R. Barzilay, T.M. Moore, D.M. Greenberg, G.E. DiDomenico, L.A. Brown, L. K. White, Resilience, COVID-19-related stress, anxiety and depression during the pandemic in a large population enriched for healthcare providers, Transl. Psychiatry 10 (2020) 1–8, https://doi.org/10.1038/s41398-020-00982-4.

[18] E.M. Huffman, D.I. Athanasiadis, N.E. Anton, L.A. Haskett, D.L. Doster, D. Stefanidis, How resilient is your team? Exploring healthcare providers' well-being during the COVID-19 pandemic, Am. J. Surg. 221 (2021) 277–284, https://doi.org/10.1016/j.amjsurg.2020.09.005.

[19] M. Mosheva, N. Hertz-Palmor, S. Dorman Ilan, N. Matalon, I.M. Pessach, A. Afek, Anxiety, Pandemic-related Stress and Resilience among Physicians During the COVID-19 Pandemic 37, 2020, pp. 965–971, https://doi.org/10.1002/da.23085.

[20] G. Cizza, P. Piaggi, K.I. Rother, G. Csako, Group SES, Hawthorne effect with transient behavioral and biochemical changes in a randomized controlled sleep extension trial of chronically short-sleeping obese adults: implications for the design and interpretation of clinical studies, PLoS One 9 (2014), 104176, https://doi.org/10.1371/journal.pone.0104176.

[21] P. Duarte, E. Riveros, Understanding the cycles of COVID-19 incidence: principal Component Analysis and interaction of biological and socio-economic factors, Ann. Med. Surg. (2021), 102437, https://doi.org/10.1016/j.amsu.2021.102437.