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5. von Elm E, Altman DG, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *PLoS Med* 2007; 4: e296
6. Gouel-Cheron A, Couffignal C, Elmaleh Y, Kantor E, Montravers P. Preliminary observations of anaesthesia ventilators use for prolonged mechanical ventilation in intensive care unit patients during the COVID-19 pandemic. *Anaesth Crit Care Pain Med* 2020; 39: 371–2
7. Alhazzani W, Møller MH, Arabi YM, et al. Surviving sepsis campaign: guidelines on the management of critically ill adults with coronavirus disease 2019 (COVID-19). *Crit Care Med* 2020; 48: e440
8. Laffey JG, Chikhani M, Bates DG, Hardman JG. Supporting more than one patient with a single mechanical ventilator: useful last resort or unjustifiable risk? *Br J Anaesth* 2020; 125: 247–50
9. Joint statement on multiple patients per ventilator. American Society of Anesthesiologists; 2020 Mar. Available from: <https://www.asahq.org/about-asa/newsroom/news-releases/2020/03/joint-statement-on-multiple-patients-per-ventilator>. [Accessed 26 March 2020]
10. van Klei WA, Hollmann MW, Sneyd JR. The value of anaesthesiologists in the COVID-19 pandemic: a model for our future practice? *Br J Anaesth* 2020; 125: 652–5
11. Wilkes AR. Heat and moisture exchangers and breathing system filters: their use in anaesthesia and intensive care: Part 2. Practical use, including problems, and their use with paediatric patients. *Anaesthesia* 2011; 66: 40–51
12. COVID-ICU Group on behalf of the REVA Network and the COVID-ICU Investigators. Clinical characteristics and day-90 outcomes of 4244 critically ill adults with COVID-19: a prospective cohort study. *Intensive Care Med* 2021; 47: 60–73
13. Gattinoni L, Chiumello D, Caironi P, et al. COVID-19 pneumonia: different respiratory treatments for different phenotypes? *Intensive Care Med* 2020; 46: 1099–102

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Biological, psychological, and social factors associated with worsening of chronic pain during the first wave of the COVID-19 pandemic: a cross-sectional survey

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Editor—Recent reviews have identified several specific problems of people with chronic pain arising during the COVID-19 pandemic.^{1,2} Likewise, the importance of examining particular vulnerable groups has also been pointed out.^{3,4} We aimed to identify biological, psychological, and social factors that correlate with the worsening of chronic pain during the first COVID-19-related lockdown.

This cross-sectional study was approved by the Ethics Committee of the Medical University of Graz, Austria (Number: 32–488 ex 19/20). From July 1 to July 15, 2020, an open, web-based survey was conducted using SoSci Survey software (SoSci Survey GmbH, Munich, Germany). Adults with chronic pain for at least 1 yr were recruited through self-help groups in Germany, Austria, and Switzerland.

The survey was developed in a stepwise process: formation of interdisciplinary team (three anaesthesiologists and pain physicians, one neurologist, two general practitioners, two pain nurses, one psychologist, one physiotherapist), individual identification of topics to be included in the questionnaire, and prioritisation and selection of the items to be included in

the questionnaire by voting of the team. To validate the questionnaire, the intraclass correlation in a sample of 10 people with chronic pain who answered the survey twice in 24 h was assessed as 0.87.

The survey is presented as Supplement file 1, with an English translation in Supplement file 2. It included questions on sociodemographic data, pain intensity (VAS 0–100) before and during the COVID-19 lockdown, pain-related variables, pharmacological and non-pharmacological pain management, physical activity, psychological factors (including the Pain Catastrophizing Scale [PCS], Resilience Scale [RS-13], and a short version of the Big Five Inventory [BFI-10]), social factors, and the availability of and satisfaction with healthcare. As there was no uniformity regarding the date on which the social restrictions came into effect in different regions, we used general expressions in the questionnaire such as ‘the weeks before COVID-19’ or ‘COVID-19 phase’.

To establish the predictive model of the dependent variables, and the difference between the average pain sensation before and after the COVID-19 lockdown, respectively,

Table 1 Linear prediction model. Relationship with children, suffering from social isolation and problems getting prescription were assessed on a 101-point scale. RS-13, Resilience Scale 13; PCS, Pain Catastrophizing Scale.

Category	Factor	Coefficient	Significance
Biological	Prescription of on-demand medication (before COVID-19)	0.028	0.000
	Prescription of co-analgetics (before COVID-19)	1.099	0.000
Psychological	Resilience (RS-13)	-0.045	0.000
	Pain catastrophising (PCS)	0.066	0.001
Social	Relationship with children	-0.095	0.000
	Suffering from social isolation	0.019	0.000
	Problems getting prescriptions	1.599	0.000

automatic linear modelling was performed with IBM SPSS 20 software (IBM Corp., Armonk, NY, USA).⁵ An all-possible subset regression procedure was applied to establish the best fitting model with the pain difference before and after the COVID-19 lockdown as a dependent variable.

A total of 719 people participated in the survey: 135 (18.8%) respondents were excluded because of data incompleteness, and 5 (0.7%) because of completion in <3 min, resulting in a completion rate of 80.5%. These included 138 men and 441 women (mean age, 42.4 [standard deviation 17.4] yr) were included, 56.0% from Germany, 32.6% from Austria, and 11.4% from Switzerland. The principal pain diagnoses were related to visceral (35.7%), musculoskeletal (27.5%), and chronic widespread pain (12.7%). Pain worsened in 53.5% of people during the COVID-19 period, remained unchanged (plus or minus 5%) in 16.7%, and improved in 29.8%. The linear prediction model revealed seven factors that predicted the aggravation of pain during the COVID-19 lockdown (Table 1).

Although a recent review speculated that the biological, psychological, and social factors that contribute to pain chronification may be associated with deterioration of pain during the COVID-19 pandemic,⁶ no studies have been published to date to substantiate these considerations with evidence; our study presented herein provides the first data.

On a biological level, only parameters related to pharmacological therapy were independent predictors for pain worsening. Those participants who reported higher usage of on-demand medication and a prescription of co-analgetics (i.e. anticonvulsants, antidepressants, cannabinoids, or both) before the COVID-19 lockdown had a higher risk of pain aggravation.

Past global health crises have had widespread negative consequences on mental health. However, major catastrophic events do not necessarily result in an increase of chronic pain symptoms on an individual level.⁷ This is also reflected in our data, which prove that personal traits are independent predictors of pain worsening. We observed a clear correlation of pain catastrophising and lower levels of resilience with pain worsening during the COVID-19 lockdown.

On a social level, quarantine has been consistently associated with negative psychological implications. In our population, the perceived restriction through social isolation was an influential variable of pain aggravation. The independent correlation of a poorer relationship between parents and children and a worsening of pain during the lockdown may be attributable to issues that may previously have been without relevance, such as use of common areas, forced close-proximity living, or more contact within families.

An international expert panel warned that if the continuity of pain treatment for patients is not ensured, it could potentially lead to withdrawal symptoms and aggravation of pain.⁸ The supply shortage has had various causes: global medication shortage as a result of constraints in production lines,⁹ local misdistribution favouring emergency care, limited access to medications because of reduced prescribing, and to pain management procedures considered to be of lesser importance than the care of patients with more urgent illnesses.⁷ Unfortunately, in our population the unavailability of prescribed medications was an independent predictor of pain worsening.

Some of our findings showed a close correlation with aggravation of pain, although they were not identified as influential variables in our linear predictive model. However, it is still worth discussing them. A reduced extent of physical activity (correlation coefficient: 0.448) and a reduction in the activities of daily living (correlation coefficient: 0.541) were shown to be related to worsening pain. There was also a moderate correlation between quality of partnership and pain aggravation (correlation coefficient 0.454); however, in contrast to the relationship between parents and children, this was not a predictive contributor. However, the causality could also be in the opposite direction: expressing more pain was shown to be related to lower levels of partnership quality.¹⁰

Limitations of our study include the over-representation of young women, single individuals, and people with higher educational levels, and retrospective self-reporting. Generalisation of the data and their interpretation is of course not possible, as the questionnaire was distributed only in German-speaking countries.

In conclusion, we identified biological, psychological, and social factors associated with pain worsening during the first wave of COVID-19. Focusing on patients with complex pharmacological therapies, decreased resilience, increased pain catastrophising, high burden through social isolation, and increased intra-family conflicts, and avoiding problems in receiving prescribed medications, are essential to minimising disadvantageous outcomes and for providing appropriate treatment to people with chronic pain during lockdown scenarios.

Declarations of interest

The authors declare that they have no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.bja.2021.04.010>.

References

1. El-Tallawy SN, Nalamasu R, Pergolizzi JV, Gharibo C. Pain management during the COVID-19 pandemic. *Pain Ther* 2020; **9**: 453–66
2. Kemp HI, Corner E, Colvin LA. Chronic pain after COVID-19: implications for rehabilitation. *Br J Anaesth* 2020; **125**: 436–40
3. Holmes EA, O'Connor RC, Perry VH, et al. Multidisciplinary research priorities for the COVID-19 pandemic: a call for action for mental health science. *Lancet Psychiatry* 2020; **7**: 547–60
4. Karos K, McParland JL, Bunzli S, et al. The social threats of COVID-19 for people with chronic pain. *Pain* 2020; **161**: 2229–35
5. Janssen J, Laatz W. *Statistische Datenanalyse mit SPSS: eine anwendungsorientierte Einführung in das Basissystem und das Modul Exakte Tests*. Berlin: Springer-Verlag; 2016
6. Eccleston C, Blyth FM, Dear BF, et al. Managing patients with chronic pain during the COVID-19 outbreak: considerations for the rapid introduction of remotely supported (eHealth) pain management services. *Pain* 2020; **161**: 889
7. Clauw DJ, Häuser W, Cohen SP, Fitzcharles M-A. Considering the potential for an increase in chronic pain after the COVID-19 pandemic. *Pain* 2020; **161**: 1694–7
8. Shanthanna H, Strand NH, Provenzano DA, et al. Caring for patients with pain during the COVID-19 pandemic: consensus recommendations from an international expert panel. *Anaesthesia* 2020; **75**: 935–44
9. Shuman AG, Fox ER, Unguru Y. COVID-19 and drug shortages: a call to action. *J Manag Care Spec Pharm* 2020; **26**: 945–7
10. Mohammadi S, Chambers CT, Rosen NO. Expression of pain behaviors and perceived partner responses in individuals with chronic pain. *Clin J Pain* 2018; **34**: 927–35

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