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RESEARCH ARTICLE

Severe Psychological Distress Among Medical Students During the COVID-19 Pandemic: Toward a Safer Mental Health

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ABSTRACT

Objective: As we learn how to live with the COVID pandemic, understanding this psychological impact of the coronavirus outbreak and its determinants is the first step towards finding solutions. The aim of the study is to examine the status of medical students' mental health and assess psychological distress determinants and pathways in order to suggest adapted strategies to help them.

Methods: We performed a convergent parallel mixed-methods analysis of an online survey administered to medical students from March 23 to March 28, 2020. Psychological distress was assessed through the Kessler 6 (K6) questionnaire. Factors associated with severe psychological distress (SPD, K6>13) were identified by multivariable logistic regression. The qualitative part analyzed responses to open-ended questions addressing medical students' perspectives on the impact of the pandemic and relieving factors.

Results: 808 medical students completed the survey. Severe psychological distress was reported by 234(28.96%) respondents and was independently associated with: Female sex (OR,2.8;[95%CI ,1.791-4.363];P<0.001), clinical study level (OR,0.621;[95%CI,0.437-0.881];P=0.008), Tobacco use (OR, 3.664;[95% CI,1.9 - 7.07];P=0.001), history of psychiatric meds (OR, 2.454 ;[95%CI,1.384 - 4.454];P=0.001) and quarantine (OR, 1.5 ;[95%CI, 1.015 - 2.337];P=0.04). Students submitted a total of 2424 concerns about ways the pandemic affected different areas of their lives and redundant determinants were summarized.

Conclusion: During the COVID crisis, 28% of our students experienced severe mental distress due to multifactorial determinants including social and individual psychological and behavioral contributors. This crisis is an opportunity to address the well known mental health morbidities of future physicians and increase the awareness about the important role that medical schools could have as a safety net and support system.

Keywords: COVID-19, Medical student, Mental health, Psychological distress, lifting lockdown measures

1. Introduction

Psychological distress (PD) in medical students and their predisposition to higher rates of depression, stress, anxiety, suicidal ideation and burnout are long-known facts demonstrated by many studies over the past decade¹⁻⁴. The mental health damage medical students endure has always been perceived as a negative and unintended, yet unavoidable, adverse effect of engaging in medical school and the price to pay in order to achieve or enhance academic accomplishment⁴⁻⁷.

Ever since the onset of the COVID-19 pandemic, health, economy and everyday lives have been disrupted.⁸⁻¹¹ In the in fear of being faced with an insurmountable situation, implemented containment measures such as quarantine.^{4,8,9} The uncertainty of these unprecedented times bore daunting challenges especially for the continuation of medical education as faculties were forced to close, interrupting clinical rotations and transitioning to online teaching and simulation¹²⁻¹⁵. Medical students faced the switch to an unfamiliar model of learning¹⁶, the conflict between taking part in clinical activities or not¹⁷ and the strain of uncertainty, anxiety and the psychological impact of quarantine^{18,19}. All together, these stressors inevitably affected the mental wellbeing of a whole generation of future physicians and if left unattended, medical students distress today may evolve into long term mental health illnesses, burnout or suicide and even jeopardize future healthcare^{4,20,21}.

In this mindset, medical schools and faculty members attempted to respond in the most urgent way to students' vulnerability and prevent, to the greatest extent possible, this psychological impact.²² However, apart from making available psychological support^{23,24}, the magnitude of the damage on medical students' mental health and its causative and supportive conditions are unknown. With the world learning how to live with COVID, damage assessment is crucial to implement more adapted measures and mitigate the looming mental health crisis.

The aim of the study is to examine the status of medical students' mental health and assess PD determinants and pathways in order to suggest adapted strategies to help these future physicians.

2. Materials and methods

2.1. Study design

We conducted a prospective, observational cohort study using a convergent mixed-method approach, as this method gives a voice to study participants and ensures that the results are grounded in their experiences²⁵. The cross sectional online survey aimed to examine PD and its determinant factors alongside analyzing medical students' perspectives on the impact of the pandemic. The survey was conducted on a 5 day period from March 23 to March 28, 2020 and at these dates, Morocco had two consecutive peaks with 571 and 1624 excluded cases, 134 and 437 confirmed cases, 26 deceases and 12 cases of remission.²⁶

We followed the American Association for Public Opinion Research (AAPOR) reporting guidelines for survey studies²⁷ and the STROBE (Strengthening the Reporting of Observational studies in Epidemiology) directive guidelines for observational studies^{28,29}

2.2. Participants and sampling

We promoted the survey through social media channels, student board pages and institutional emails. The target population was medical students from the five main medical schools, representative of the 12 regions in the administrative division of Morocco with an estimated total of 13550 students. The target sample size of participants was estimated according to the formula $n = [z^2 * p * (1 - p) / e^2] / [1 + (z^2 * p * (1 - p) / (e^2 * N))]$ with $e = 99.5$ and $Z = 2.807$ ³⁰. As a result, the minimum required number of responses was 745. The survey was addressed to students either at a preclinical (first and second year) or clinical level (third to seventh year), alongside graduates before the beginning of their residency. According to national regulations, as responses were anonymous and all participants consented to participate in the survey, the ethical approval was waived.

2.3. Survey

In order to better understand the key components of medical students' mental wellbeing during the COVID 19 pandemic, we reviewed all available concepts in literature on medical students' self identity, distress and coping alongside other frameworks such

psychosocial pathways^{6,31-33}. The survey consisted of a general section with demographic and mental health history, a PD validated tool and an open-ended questions section. As Moroccan medical students are fluent in French, which is the language of medical teaching, we used the validated French version of the K6 questionnaire³⁴ and the survey language was French.

2.4. Quantitative phase

The quantitative part was devoted to first assessing the presence of severe PD. We also used the Kessler 6 (K6) non specific PDscale, as a widely validated tool with high discriminative properties in order to screen and quantify the level of PD. The instrument asks: "During the past 30 days, how often did you feel (a) nervous? (b) hopeless? (c) restless or fidgety? (d) so depressed that nothing could cheer you up? (e) that everything was an effort? (f) worthless?". Possible responses are "none of the time," "a little of the time," "some of the time," "most of the time," and "all of the time." and the scoring is on a 5-point Likert scale. The generated total symptom score (0-24) with scores of 7 or more indicative of high PD and scores of 13 or greater meeting the criteria of severe psychological distress (SPD).³⁵

Following, personal factors known to affect mental wellbeing such as age, gender, smoking habits, psychiatric history, marital status and/or having children, have been assessed. Participants were also asked about whether or not they were home confined as some still continue their clinical duties.

2.5. Statistical analysis

Continuous variables are presented as mean values \pm standard deviations or as medians with interquartile ranges, and categorical variables are expressed as frequencies and percentages. The age of participants was categorized into two age groups according to a mean value of 23 years.

Univariate analysis was conducted between each likely risk factor and the occurrence of SPD (kessler score at 13) using univariate binary logistic regression analysis and a P value of no greater than 0.10 was required for entry into multivariate analysis. A stepwise binary logistic regression model was built to identify the predictive factors of PD. The odds ratios (ORs) and 95% CIs were determined for each variable. Statistical significance was set at $P < 0.05$. Statistical analysis was performed using the SPSS software, version 25.0.0 (SPSS Inc, Chicago, IL).

2.6. Qualitative analysis

We sought to examine the effect of the COVID 19 pandemic through an open ended questions section consisting of questions about the effect of the current situation on students' mental health, education and factors they thought made their mental wellbeing worse or better. The initial analysis of data conducted by [AS] and [HE] yielded a coding framework of themes which was generated inductively and the relations and meaning of the themes were analyzed and discussed in the team in order to develop an adapted conceptual framework.

3. Results

In total, 808 medical students participated in this survey from the 5 faculties of medicine in Morocco. Six hundred and five (74.87%) participants were female and only 20 (2.47%) had children. Four hundred and sixty (56.93%) students were at an early stage of enrollment in medical studies, namely preclinical level and only 52 (6.43%) were smokers. As regards psychiatric history, 153(18.93%) have previously consulted for mental health issues with 65 (8.04%) being on prescribed medication. Six hundred and forty six (79.95%) participants were in quarantine.

The mean Kessler score in the overall period was 8.42 ± 4.99 . Four hundred and ninety five (61.3%) participants had a total kessler score superior to 7, indicating high PD. SPD defined as a score superior to 13 was reported in 234 (28.96%) of the respondents. Details of the quantitative analysis results are presented in **Table 1**.

Table 1: Demographics of overall population and predictive factors of severe psychological distress (kessler 6 > 13). Univariate and multivariate analysis.

Variable	Overall group		Severe psychological distress								
			Univariate analysis						Multivariate analysis		
	n	%	n	%	OR	95% CI for OR	P value	OR	95% CI for OR	P value	
Age										0.25	
<23y	414	51.6	128	30.9	1						
>23y	389	48.4	106	27.2	0.837	0.617 - 1.136					
Sex										<0.001	
Male	203	25	37	18.2	1			1			
Female	605	75	197	32.6	2.166	1.460 - 3.215		2.8	1.791 - 4.363	<0.001	
Status										0.452	
Single	639	79	189	29.6	1						
In relationship/ Married	169	21	45	26.6	0.864	0.590 - 1.265					
Kids										0.11	
No	788	97.5	225	28.6	1						
Yes	20	2.5	9	45	2.05	0.837 - 5					
Study level										0.065	
Preclinical	460	57	145	31.5				1			
Clinical	348	43	89	25.6	0.747	0.547 - 1.019		0.621	0.437 - 0.881	0.008	
Tobacco use										0.002	
No	756	93.3	209	27.6	1			1			
Yes	52	6.7	25	48.1	2.423	1.375 - 4.272		3.664	1.9 - 7.07	0.001	
History of psychiatric consult										0.001	
No	655	81	172	26.3	1			1			
Yes	153	19	62	40.5	1.913	1.326 - 2.761		1.368	0.905 - 2.067	0.137	
History of psychiatric meds										<0.001	
No	743	92	199	26.8	1			1			
Yes	65	8	35	53.8	3.189	1.908 - 5.332		2.454	1.384 - 4.454	0.001	
Confinement										0.078	
No	162	10	56	34.6	1			1			
Yes	646	80	178	27.6	1.389	0.962 - 2.		1.5	1.015 - 2.337	0.04	

As regards the multivariate logistic regression analysis, SPD was independently associated with : Female sex (odds ratio 2.8 ; [95% CI,1.791 - 4.363] ; $P < 0.001$), clinical study level (odds ratio, 0.621; [95% CI,0.437 - 0.881] ; $P = 0.008$), tobacco use (odds ratio, 3.664; [95% CI,1.9 - 7.07] ; $P = 0.001$), history of psychiatric meds (odds ratio, 2.454 ; [95% CI,1.384 - 4.454] ; $P = 0.001$) and quarantine (odds ratio, 1.5 ; [95% CI, 1.015 - 2.337] ; $P = 0.04$).

Students submitted a total of 2424 concerns about ways the pandemic affected different areas of their lives and redundant determinants were summarized. Examples of the range of submissions assigned to each determinant are presented each in turn :

3.1. Medical student psychosocial factors

Respondents expressed the impact of the pandemic in connection with their early stage of medical studies as well as confusion, uncertainty and difficulty adapting to both the situation and the curriculum.

"I'm a first year medical student who has absolutely no idea how to handle the courses. It's all very complicated and we have no one to turn to"

" I wish i could have lived my first year differently "

In addition, as 90% of participants are quarantined with their families, female

students particularly describe experiencing more pressure as they have to contribute to household responsibilities and may not have some freedoms (eg: smoking).

"Now that we're in lockdown I have to participate in household chores everyday and am really not used to these new responsibilities "

"I'm stuck at home and can't even smoke out of respect for my family "

For some students, past psychological morbidities, the preexisting burnout state and the worsening of these symptoms for them or their entourage were notable repercussions of the current situation, while others referred to financial difficulties especially as they rely on the financial support of their parents.

"The situation is just anxiogenic, it's really hard to keep calm especially that I've struggled with anxiety before "

"I've had major depressive disorders, with quarantine i can barely get out of bed "

" My sister had depression for two years now and with the pandemic it's coming to suicidal thoughts "

" I still depend financially on my parents and their income was affected by lockdown "

In addition, the pandemic and quarantine has brought up old conflict or made relationships between family members and/or partners difficult and stressful, while for some, these circumstances are accompanied by isolation, loneliness and lack of psychological support, especially for those with hospital duties.

"The pandemic brought anxiety and irritability and since we're together 24/7 we're all at each other's throats. Of course conflicts are emerging."

"It's really hard to cohabitate sometimes and days are becoming unbearable"

"I already have a family conflict so it's really tense with quarantine"

" As long as I go to the hospital, I choose to isolate myself but still, people look at me badly as if I was the virus. "

Some students however described not having as much difficulty adapting due to past experiences or reported finding ways to cope.

"I had to confine at home for the past three months to pass my specialty exam so now i don't mind quarantine, i learned to cope and it doesn't bother me much "

"First i suffered from anxiety, irritability and insomnia but i made a routine, dedicated relaxation time and i think now am managing the situation better "

3.2. Medical student health related behaviors

Excessive social media use, binge watching and eating were repeatedly reported as a way to cope with the current situation as a great number of students can no longer practice their hobbies or have the motivation to study.

"Before, I used to exercise 3 times a week and have hobbies but now I barely do anything. I only watch series and scroll my day away through social media"

Participants also described sleeping disturbances either in the form of excessive sleeping or insomnia. Physical activity is also affected by the pandemic with exercise facilities being closed due to lock down and going out being restricted to necessary situations. Weight gain was also a redundant impact.

" It's boring to spend all day at home and I really don't see the point of waking up so I try to sleep throughout the day to make time go faster "

"For a few days now I eat a lot throughout the day, it's helping me stay calm"

" I've never gained as much weight as during this period especially with all the junk food we stocked up "

3.3. Medical school factors

Studies were a very significant determinant that is affected by the pandemic, and anxiety

related to one or many aspects of medical education was repeatedly described by participants. Sources of worry were related to difficulties keeping up with the curriculum, the risk of a canceled academic year and consequent prolongation of study years.

“ I’m afraid our second year curriculum and education might be affected. Professors during class explain a lot of things, share clinical experience which we’re missing on now ”

“ During quarantine our mood is not the best and so is the motivation to study”

“ I’m scared this uncertainty will last longer, I already failed last year and I have no idea how we will be able to save the academic year ”

Online learning difficulties and lack of communication with the faculty were also reported.

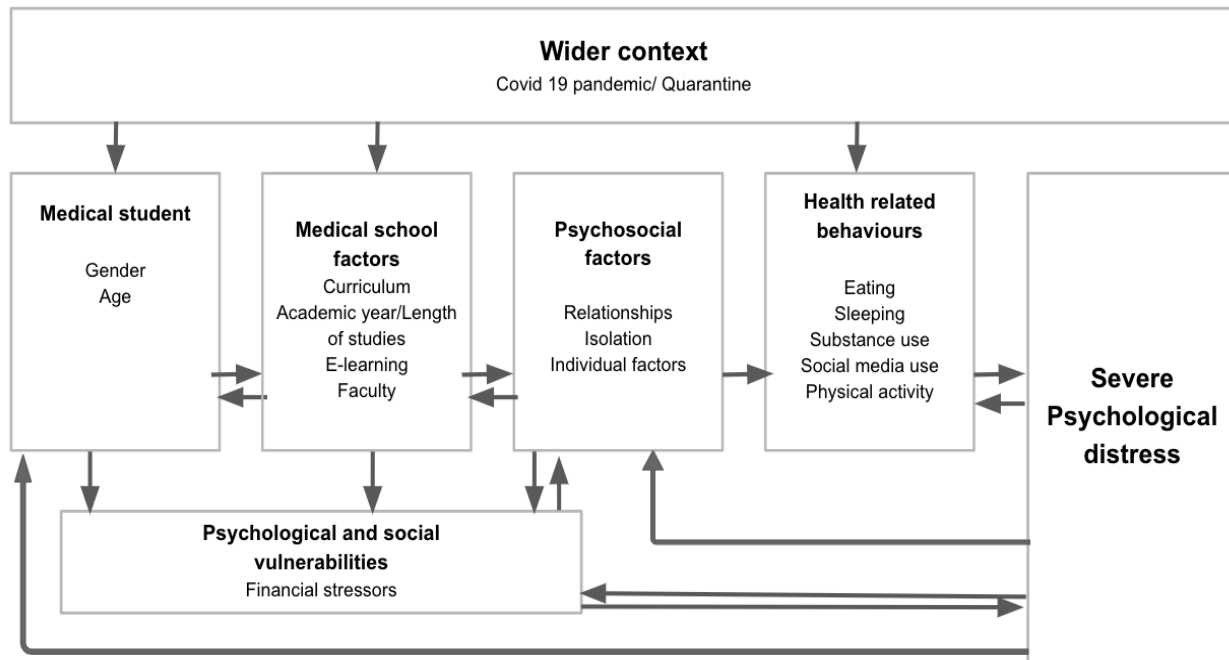
“ I can’t even understand the online lectures and it’s even more complicated to have the will to study ”

“I like studying in paper, writing my own notes and reading from books, plus no one ever prepared us to this ... so imagine how I’m struggling with the online classes”

“We’re still waiting to know if, when and how we will have our exams but no one is responding”

Our framework is the result of the exploration of above-mentioned frameworks and PD determinants concluded from the quantitative and qualitative analysis as demonstrated in **figure 1**. The social identity of medical students is a great determinant in the psychosocial pathway, as gender and age related stressors result in distinct experiences and unequally act on psychological and social vulnerabilities (eg: financial stressors, psychological morbidities , relationships and isolation). Female sexe and young age (reflected by the early level of enrollment) are, alongside psychological history and quarantine, independent determinants of PD. Health related behaviors also mirror these influences as people may resort to substance use and excessive eating and social media, or experience sleeping disturbances and lack of physical activity. Beyond personal factors, medical school is a key element in medical students' lives and a major determinant of distress, especially as the pandemic and quarantine challenge the curriculums, examination and the course of the academic year. This worldwide pandemic affected medical students and subjected them to medical school and wider context stressors which subsequently triggered psychosocial factors, health related behaviors and the interaction between them resulting in SPD. On the other hand, distress reinforces the negative effect of these determinants in a vicious cycle impacting medical students.

Figure 1: Determinant factors of medical students' psychological distress during the COVID pandemic.



4. Discussion

During the COVID 19 crisis, medical students experienced high levels of PD which doesn't appear to be necessarily connected to the number of infected cases by country, but rather takes its origins from the complex interaction of myriad factors. Determinants of this distress and their different interactions could be categorized according to the psychosocial pathway which connects the social environment to experiences, psychobiological states and health behaviors as they all interact to shape physical and mental health³¹. To our knowledge, this is the first overview of medical students' PD during the COVID 19 outbreak which, based on the determinants and pathways to distress, suggests adapted strategies to undo the harm caused by the pandemic.

Conceptual frameworks can represent and help understand complex constructs while illustrating the interaction between different components³⁶. Previous frameworks addressing medical students' wellbeing or distress all had in common the perception that during medical school, students are directly subjected to causes and consequences of distress related to their medical school training and interacting with professional and personal consequences and factors⁶. While some perceive students' wellbeing as a reservoir which is depleted and replenished by positive and negative factors³². In addition, qualities such as self complexity, social identity and norms and behaviors were also suggested to interfere with students' risk of negative reaction to stressors. However, none

included medical school influence within the interchangeable impact of wider contextual factors, which can also act directly on the students themselves³¹. Accordingly, none of these existing frameworks alone was sufficient to represent students' PD during a health crisis such as the COVID 19 pandemic.

The COVID 19 outbreak has induced an epidemic of fear, anxiety and depression affecting those with preexisting psychiatric morbidities and causing the new emergence of psychological disorders^{37-40,41}. This psychological impact is mediated by factors such as uncertainty⁴², fear, preexisting psychological morbidities⁴³ and social contributors such as poverty, physical environment and even race⁴⁴⁻⁴⁶.

The COVID 19 pandemic placed medical students' individual characteristics, behaviors and psychosocial vulnerabilities both at the center of PD determinants and as an important factor which shapes the way they undergo and react to different stressors. Aside from the direct impact on medical students, medical education can also be an important contributor to students' unfavorable experiences. Acknowledging these determinants could be acted upon to mitigate the mental distress of medical students and come up with strategic solutions.

Several initiatives were taken by medical educators and faculties to overcome the challenges of these unprecedented times^{12,47} beginning with the transition to online classes

and examination for the remainder of the academic year^{12,48}, peer teaching and videoconferencing^{49,50}, active learning as well as curriculum adaptation to avoid poor quality learning experiences. Nonetheless, faculty were faced with numerous hurdles manifesting in the lack of preparedness to this rapid transition particularly in middle and low income countries⁵¹, the difficulty of achieving quality online learning⁴⁷, reproducing the benefits of patient and clinical interaction and the challenges of remotely teaching students while being aware of the psychological impact of quarantine¹⁸. As regards students mental health and wellbeing, although psychological support initiatives were initiated^{24,52}, most of these interventions act on the current psychological impact of the pandemic rather consider PD as the complex interaction of a multitude of determinants. Past the acute phase, mental health sequela in the form of depression, PTSD⁵³, and chronic substance use are expected and if neglected, PD could even lead to severe issues such as suicide. Although one-size-fits-all solutions can't be achieved, targeting the modifiable determinants of PD could prevent long term damage and ease the life of students following what could be the health crisis of the millenium.

Accordingly, administrations should validate and take into account students' psychological vulnerability and take that into consideration in academic activities. Students are exposed to financial, health and social pandemic repercussions which could trigger previously described psychosocial factors in a vicious

cycle, unless the transition to the next stage is cautiously accompanied by psychological interventions. Monitoring students with higher risks such as those at early enrollment levels or with known financial and mental and physical vulnerabilities should be implemented. The sequential screening for mental health issues will not only enable the identification of students in need of interventions, but also enable long term follow up and recognize improvement of their wellbeing. On the other hand, optimizing medical education and curriculums, developing student-faculty communication and fostering academic activities which could nurture students' sense of achievement will exert a positive influence and be a starting point to alleviate medical schools' known negative culture. Lastly, coping skills and healthy behaviors should be promoted and peer support initiatives encouraged to promote mental health as medical students are the future generation of physicians and healthcare.

There are several limitations to this study. Firstly, the data collection and sampling method which relies on the use of institutional emails and social media platforms to approach students from five different medical faculties. Nevertheless, this was remedied by ensuring we have an adequate representation and a sufficient sample size. Responses were collected over a 5 days period as the number of diagnosed cases continued to increase, the resulting level of PD and anxiety could change accordingly. Female participants represented around 2/3 thirds of the respondents, which is

explained by the high presence of female gender in medical education and health care. Finally, the responsiveness to the qualitative section was not mandatory which may have generated a lower number of answers, however, data saturation was reached and all possible responses were captured. Notwithstanding these limitations, this is the first study analyzing the impact of the COVID-19 outbreak on medical students.

During the COVID crisis, 28% of our students experienced severe mental distress. The determinants of mental distress are multifactorial including social and individual psychological/behavioral contributors. This crisis is an opportunity to increase the awareness about the important role that medical schools could have in supporting students by targeting the psychosocial determinants and pathways of their distress. Nurturing communication with students is also a step towards unraveling medical students' known predisposition to psychological morbidities and building long term solutions.

5. Conclusions :

The covid pandemic greatly influenced the lives and mental health of populations worldwide. Medical students experienced severe psychological consequences with severe mental distress being higher in some more than others. We performed an online survey assessing psychological distress in medical students during the first wave of the covid pandemic using a psychological distress questionnaire. We also used open ended questions to allow participants to share their

own perspectives on the way the pandemic impacted their lives and the factors they think help relieve their symptoms. The analysis of our results showed that female sex, early clinical study level, tobacco use, history of psychiatric meds and quarantine all increase predisposition to psychological distress. Looking at the concerns students expressed in the open ended questions section allowed us to develop a framework, whereby individual, social and behavioral factors interchangeably play a role in the mental health of students. Knowing these factors can allow for tailored and targeted solutions, which medical schools should be aware of in order to provide a safety net and improve the mental health of future physicians.

Conflict of Interest:

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Authors contributions:

AS and HE designed the study, collected and analyzed data, and wrote the draft of the manuscript. , NEB,AB and AM participated in writing the draft of the manuscript, NEB,AB, MAM, BL, and RM critically reviewed the protocol and reviewed the manuscript. All the authors agreed on the final version of the manuscript.

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Data availability statement:

The datasets that support the findings of this study are available from the corresponding author, [A.S], upon reasonable request.

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