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Research paper

Mental health and working conditions among French medical students: A nationwide study

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ABSTRACT

Background: Medical students' mental health is a public health problem that has worsened with COVID 19's pandemic. There is a lack of French data. The principal aim was to assess French medical students' mental health.
Methods: An online cross-sectional survey was performed between May 27 and June 27, 2021. An anonymous questionnaire was sent via academic email addresses by medical faculties and secondly on social media. We assessed 7-day anxiety and depressive symptoms were evaluated with the Hospitalization Anxiety and Depression scale, 12-month major depressive episode (MDE) with the Composite International Diagnostic Interview-Short Form, burnout with the Maslach Burnout Inventory, 12-month suicidal ideation, humiliation, sexual harassment, and sexual aggression during their curriculum. Multivariable logistic regression was performed to identify main MDE associated factors.
Outcomes: 11,754 participants (response rate: 15.3%) were included. Prevalence of 7-day anxiety symptoms, 7-day depressive symptoms, 12-month MDE, and 12-month suicidal thoughts were 52%, 18%, 25%, and 19% respectively. Burnout syndrome concerned 67% of clinical students and residents and 39% of preclinical students. Prevalence of humiliation, sexual harassment, and sexual abuse during their curriculum were 23%, 25%, and 4%, respectively. Having important (OR = 1.44, IC 95 [1.31–1.58], $p < 0.001$) or very important financial issues (OR = 2.47, IC 95 [2.15–2.85], $p < 0.001$), experienced humiliation (OR = 1.63, IC 95 [1.46–1.81], $p < 0.001$), sexual harassment (OR = 1.43, IC 95 [1.28–1.59], $p < 0.001$) and sexual abuse (OR = 1.52, IC 95 [1.24–1.85], $p < 0.001$) were associated with an increased risk of MDE.
Interpretation: This is the largest study on French medical students' mental health. These results point to very particular conditions in French students environment that need to be addressed to improve their mental health.

1. Introduction

Medical students' mental health was already a public health issue before COVID19's pandemic. In 2016, a meta-analysis found that 27.2% of medical students experienced depression or depressive symptoms and 11.1% suicidal ideation. Prevalence did not differ between *preclinical* and *clinical* students [1]. Among the 183 studies included, only one was French.

In 2016 in France, a national study on students included 19,000 students, of which 2400 medical students. Prevalence in medical

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students was 15% for 12-month major depressive episode (MDE), assessed by Composite International Diagnostic Interview-Short Form (CIDI-SF) [2], and 9% for suicidal thoughts [3]. In the general population, the prevalence in 2017 was 10% and 5%, respectively, according to the National French health barometer (FHB) using the same questionnaire [4,5]. In 2017, a survey was conducted by medical students associations to measure anxiety and depressive symptoms prevalence among medical students and young doctors using the Hospital Anxiety and Depressive scale (HAD). They found 66.2% of subjects presented a high level of anxiety symptoms and 27.7% a high level of depressive symptoms during the last week (with a >7 cut-off). Furthermore, the study also sought suicidal thoughts in the previous month reported for 23.7% of participants [6]. However, this survey wasn't published. More recently, in 2019, a study on 2000 medical students and young medical doctors using HAD (cut-off >10) found high levels of anxiety and depressive symptoms: 32.3% and 8.7%, respectively [7].

Both studies [6,7] used the same scale (HAD) but with a different cut-off, rendering difficult the comparison of prevalence without access to the data. Cut-off variability was a problem highlighted by Rotenstein's meta-analysis as well as scales variability [1]. Indeed, there are more than 200 scales to assess depression and even restraining to the 7 common rating scales for depression evaluating 52 different symptoms, only 12% of symptoms are common in all 7 scales [8]. This is why it is important to distinguish between diagnostic questionnaires, using DSM (Diagnostic and Statistical Manual of Mental Disorders) or ICD (International Classification of Diseases) criteria, from scales. In the systematic review on the global prevalence and burden of depressive and anxiety disorders in 2020 (Supplementary data Section 4), the authors found only 3 studies using diagnostic instruments: 2 the CIDI and 1 the Mini International Neuropsychiatric Interview (MINI) [9]. However, even if such tools use the same set of symptoms criteria to determine the presence or the absence of MDE, symptoms heterogeneity can be significant [8]. Other variables can also impact prevalence results such as considering the impairment criteria or not, the period of study, the response rate, handling of missing data (prevalence calculated based on the respondent or the whole sample of participants)… [10].

Another issue in medical students' health is burnout, a syndrome usually defined by the combination of three categories of symptoms: Emotional Exhaustion (EE), Depersonalization (DP), and Personal Accomplishment (PA) [11]. In medical students before residency [12], a meta-analysis estimated burnout's prevalence to 44.2%. In residents, burnout was estimated between 18 and 82% [13]. COVID19's pandemic has considerably impacted mental health, especially for medical students (increased workload, exposition to death, …) [14]. French medical students' associations decided to conduct a new national study. The principal aim was to evaluate French medical students' mental health. Secondary aims were to assess workload, humiliation, and sexual violence (harassment and aggression) elements.

2. Methods

2.1. Overview of the survey and participants

The study was conducted between May 27 and June 27, 2021, using the Qualtrics© platform. An invitation to an anonymous online questionnaire was sent via academic email addresses by medical faculties to all their students. Inclusion criteria were medical students second and the third medical year (*preclinical*); between the fourth year and the sixth year of medicine (*clinical*); and medical residents; over 18 years old, registered in a French medical faculty.

A reminder email was sent to all French medical students once a week for three weeks. Because some faculties didn't send at least one email after 2 weeks, a different survey link was also put on social media (Twitter, Facebook, Instagram) by medical students' associations.

According to public data, 76,500 French medical students were eligible for the survey. Among them, 15,221 answered the survey, and 14,583 were included. We removed from the statistical analysis 2829 participants who did not fulfill HAD (e.g., who stopped answering the questionnaire before completing the HAD). A total of 11,754 participants (response rate: 15.3%) were included for statistical analysis. Concerning the participants, 9159 answers to the questionnaire were obtained from email links and 2595 from social media links. This study was conducted according to the STROBE guidelines and presented as a flowchart (Fig. 1).

2.2. Questionnaire

The survey was designed to ensure comparisons with previous French national surveys on the general population [4] or student population [15], and the survey questions were derived from these studies. The questionnaire was structured in 4 specific sections. Items answering were mandatory to progress to the following questions ("*I don't know*" or "*refuse to answer*" were considered as an answer). The first section was related to socio-demographic characteristics (gender, age, familial situation, subjective financial difficulties). The second section concerned the medical curriculum (year of study, work conditions). The third section examined mental health. HAD was used to assess anxiety and depressive symptoms in the last 7 days (cut-off: >10 to compare with general population survey [16] and cut-off>7 to compare with previous national survey on medical students [6]). The Maslach Burnout Inventory (MBI) was used to measure burnout. Two different versions of MBI were proposed to answer: the MBI Student Survey "SS" [17] for students in the preclinical stage (years 2 and 3) and MBI Human Service Survey "HSS" [11] for clinical students (years 4 to 6) or residents (years 7 and more). The CIDI-SF [2] was used to assess MDE with a similar algorithm used in FHB. Suicidal thoughts were also measured. The fourth section contained questions about humiliation, sexual harassment, and aggression during the curriculum. Finally, medical students could write free comments.

CIDI-SF is relatively commonly used as a diagnostic instrument to detect the presence of depression according to ICD criteria [2]. See Supplementary data 1 for details.

2.3. Statistics analysis

Data analysis was performed using R4.0 software. According to our knowledge, there is no agreement for a clear cut-off for HAD nor MBI scales [1,18] since they were primarily designed as dimensional measurement tools. HAD is commonly used with 2 subscales: (i) for depression (HAD-D) and (ii) anxiety (HAD-A) measures. A recent individual participant data meta-analysis compared HAD-D scores to odds of major depression classification and concluded that compared to CIDI, the HAD-D may misclassify MDE cases and be less sensitive to increases in depressive symptoms. When the CIDI was used as a reference diagnostic tool of MDE, a HAD-D cut off >7 detected 60% of all cases and only 25% with a cut-off >10 [19]. For MBI-HSS, burnout is defined as subscales scores EE > 26 and DP > 9, which is one of the most used in previous surveys according to Rotenstein's meta-analysis [18]. For MBI-SS, burnout is defined as subscales scores EE >14 and CY > 6 and professional/academic efficacy (the equivalent of PA) <23 [20].

Data analysis was performed, including missing responses on MDE, Burnout, suicidal thoughts, humiliation, sexual harassment, and abuse outcome, by recoding them as zero. Missing data were mainly due to participants included in the panel that didn't fully complete the survey. Considering CIDI-SF as a skip structure questionnaire (if screening questions criteria are not met, further questions on secondary symptoms are not asked), all panel members were considered with no condition before applying CIDI-SF algorithm. For predictors variables, answers *I don't know*, *refuse to answer*, or *missing* were included as an unknown response category.

According to the categorical nature of the variables, analyses were presented as a frequency distribution. Specificity, sensitivity, positive

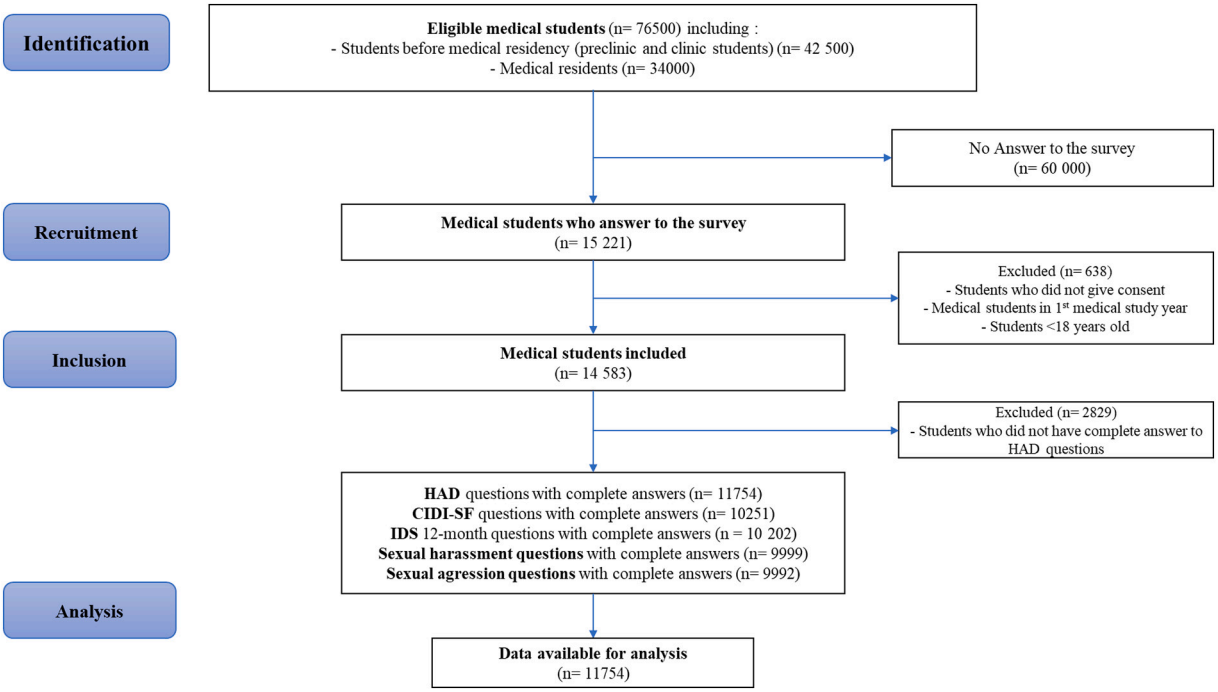

Fig. 1. Flowchart of the study according to STROBE guidelines.

predictive value, and negative predictive value for HAD-depression were computed using CIDI-SF as a reference for 12-month MDE cases. Lastly, univariate and multivariate binary logistic regressions were performed with 12-month MDE as the dependent variable and gender, age, familial status, level of study, financial issues, humiliation, sexual harassment, and sexual aggression as explicative variables. Material, code and synthetic data based on original data are available at https://osf.io/9qvb8/.

2.4. Ethics

This study ensures patient information and informed consent regarding the different approved studies through a transparency portal following European Regulation on data protection (GDPR) and was registered to National Commission for Information Technology and Civil Liberties (CNIL) (no. 2220683). The project was accepted by University Paris Saclay's ethics committee: CER-Paris-Saclay-2021-022.

3. Results

3.1. Population

Medical students were mainly women (71%), in a relationship (54%), and having no subjective financial difficulties (54%). There were more men in medical residents (32%) than in preclinical (27%) or clinical (28%) students. They were less single (32% versus 63% and 46%) and had fewer financial issues (62% had very low economic issues versus 50% and 51%), $p < 0.001$ for all (Table 1). There was significant heterogeneity regarding the number of respondents by faculty (17 to 1599) and repartition between official email and social networks (0 to 94%) answers (Supplementary data 2). Social network responders were older, more in a relationship, had more anxiety and depression symptoms, experienced more humiliation and sexual harassment than official email respondents (Supplementary data 3).

3.2. Prevalence of psychiatric symptoms

Prevalence of 7-day anxiety and depressive symptoms, 12-month MDE, and 12-month suicidal thoughts were 52%, 18%, 25%, and 19% respectively. Residents showed less anxiety and depressive symptoms and less MDE than younger medical students. Burnout concerned 67% of clinical students and residents and 39% of preclinical students (Table 1).

3.3. HAD-D properties compare to CIDI-SF

With >10 cut-off for HAD-D had worse sensitivity (37,8% vs. 64,5%) and better specificity (89,3% vs. 70,6%) than with >7 cut-off to detect MDE cases measured with CIDI-SF. Using >10 cut-off gave better positive predictive value (57,9% vs. 46,1%) and similar negative predictive value (79,0% vs. 83,7%) (Supplementary data 4).

3.4. Prevalence of humiliation, sexual harassment, and sexual aggression during the curriculum

Prevalence of humiliation, sexual harassment, and sexual abuse were 23%, 25%, and 4.4%, respectively, and increased as students advanced with their curricula (Table 1). Students' mistreatments occurred mainly at the hospital (76%). Aggressors were mostly men (95%) and graduate doctors (60%) but also residents (13%), non-doctor caregivers (12%), and medical students (10%). Student victims mainly told relatives about their situation (51%), fewer to student's union (14%). Less than 10% shared with hospital/university staff, and 18% didn't speak to anyone about those events (Supplementary data 5 to 7).

3.5. Major depressive episode's associated variables

In univariate binary logistic regression, female gender, being single, financial issues, preclinical level, having experienced humiliation, sexual harassment, and sexual abuse were associated with an increased risk of MDE (Table 2).

Multivariate binary logistic regression identified the same associations. Being a woman (OR = 1.14, IC 95 [1.04;1.26], $p = 0.007$), single (OR = 1.20, IC 95 [1.10–1.32], $p < 0.001$), preclinical level (OR = 1.43, IC 95 [1.19–1.72] $p < 0.001$), having important (OR = 1.44, IC 95 [1.31–1.58], $p < 0.001$) or very important financial issues (OR = 2.47, IC 95 [2.15–2.85], $p < 0.001$), having experienced humiliation (OR = 1.63, IC 95 [1.46–1.81], $p < 0.001$), sexual harassment (OR = 1.43, IC

Table 1
Demographic characteristics of the study population.

Characteristics	Overall (N = 11,754[a])	Preclinical level (N = 3167)	Clinical level (N = 4785)	Medical residents (N = 3764)	p-Value[b]
Gender					<0.001
Male	3387 (29%)	855 (27%)	1345 (28%)	1187 (32%)	
Female	8268 (71%)	2292 (73%)	3418 (72%)	2558 (68%)	
Unknown	61	20	22	19	
Age (years)					<0.001
18–20	1638 (14%)	1590 (50%)	47 (1.0%)	1 (<0.1%)	
21–23	4178 (36%)	1398 (44%)	2752 (58%)	28 (0.7%)	
24–26	3502 (30%)	88 (2.8%)	1709 (36%)	1705 (45%)	
≥27	2371 (20%)	82 (2.6%)	267 (5.6%)	2022 (54%)	
Unknown	27	9	10	8	
Familial situation					<0.001
Single	5340 (46%)	1956 (63%)	2199 (46%)	1185 (32%)	
In a relationship	6226 (54%)	1167 (37%)	2533 (54%)	2526 (68%)	
Unknown	150	44	53	53	
Financial difficulties					<0.001
Very low	6289 (54%)	1555 (50%)	2400 (51%)	2334 (62%)	
Moderate	4164 (36%)	1197 (39%)	1780 (38%)	1187 (32%)	
Serious	1126 (9.7%)	351 (11%)	561 (12%)	214 (5.7%)	
Unknown	137	64	44	29	
Anxiety on the last 7 days (HAD > 10)					<0.001
Yes	6092 (52%)	1637 (52%)	2920 (61%)	1535 (41%)	
Depressive symptoms on the last 7 days (HAD > 10)					<0.001
Yes	2100 (18%)	531 (17%)	1058 (22%)	511 (14%)	
MDE on the last 12 months (CIDI-SF)					<0.001
Yes	2909 (25%)	835 (26%)	1272 (27%)	802 (21%)	
Suicidal thoughts on the last 12 months					<0.001
Yes	2229 (19%)	523 (17%)	991 (21%)	715 (19%)	
Burnout on the last 12 months (MBI-HSS)					<0.001
Yes	5749 (49%)	0 (0%)	3277 (68%)	2472 (66%)	
Humiliation during studies					<0.001
Yes	2652 (23%)	288 (9.1%)	1289 (27%)	1075 (29%)	
Sexual harassment during studies					<0.001
Yes	2901 (25%)	334 (11%)	1344 (28%)	1223 (32%)	
Sexual aggression during studies					<0.001
Yes	515 (4.4%)	88 (2.8%)	205 (4.3%)	222 (5.9%)	

[a] Overall include 38 subjects for whom the level of education is not specified.
[b] Characteristic chi-square test of independence. For psychiatrics symptoms, humiliation and sexual violence, statistical tests performed between variables "yes" (presence of the symptom) and "no" (absence of the symptom).

95 [1.28–1.59], p < 0.001) or sexual abuse (OR = 1.52, IC 95 [1.24–1.85], p < 0.001) during the curriculum were associated with an increased risk of MDE (Table 2).

4. Discussion

Our study found high levels of prevalence of psychiatric symptoms and violence. In the last year, 1 in 4 students suffered from MDE, and 1 in 5 had suicidal thoughts. In agreement with previous data, having financial difficulties [21] and being confronted with humiliation and sexual violence [22] were associated with an increased risk of MDE.

4.1. Comparison with other French studies

Prevalence of 12-month MDE and suicidal thoughts were higher in our study than in medical students in 2016 (15% and 9%, respectively) [3]. In 2016, the prevalence was also more important in younger students: 18% in premed (not included in our study), 14% in preclinical, 13.5% in clinical, and 13% in residents [3]. Prevalence of 7 day depressive and anxiety symptoms were higher in 2021 than in 2017 (75% vs. 66.2% and 39% vs. 27.2% with a 7 cut-off score) [6]. In the French general population, 18–24 years prevalence of anxiety and depressive symptoms (with a 10 cut-off score) were estimated between 33,9% (May 2021) and 28,5% (June 2021) for anxiety and between 26,1% (May 2021) and 22,6% (June 2021) for depressive symptoms [16]. So medical students have more anxiety symptoms but fewer depressive symptoms.

In the French general population aged 18–24, the 12-month prevalence of suicidal thoughts was estimated between 15,7% (May 2021) and 20,1% (June 2021), which was in range with health students (19%) [16].

Prevalence of burnout in preclinical students is consistent with a previous French study conducted at the University of Caen [23]. There is no French data available for clinical students. Before the pandemic, studies found 52% of burnout for digestive surgery residents [24], and 40% for anesthesia and intensive care residents [25].

Humiliation and sexual violence (harassment or abuse) in French medical students were previously described [26]. A study on clinical students, residents, and young doctors found a 16% prevalence of sexual harassment [26]. More recently, a survey on preclinical and clinical students has found a 30% prevalence of sexual harassment [27], slightly higher than us.

4.2. COVID 19 and depression assessment: comparison between studies methodological considerations

A French public organization has assessed a panel of 2000 French adults every few weeks since the first lockdown using the HAD scale. Data for 18–24 year old subjects show huge variations for 7-day depressive symptoms prevalence: from 29% in 28–30 April 2020 to 6% in 24–26 August 2020 and an increase to 32% in 23–25 November

Table 2
Binary logistic regression model for a major depressive episode (MDE).

	Presence of a MDE during the last 12-months		Univariate binary logistic regression				Multivariate binary logistic regression			
	No	Yes	OR	95% CI		p-Value	OR	95% CI		p-Value
				Lower	Upper			Lower	Upper	
Variables										
Model 0: Only socio demographics variables										
Gender										
Male	2601 (76.5%)	797 (23.5%)	–	–	–	–	–	–	–	–
Female	6195 (74.7%)	2100 (25.3%)	1.11	1.01	1.22	0.034	1.14	1.04	1.26	0.007
Medical course										
Preclinical level	2332 (73.6%)	835 (26.4%)	–	–	–	–	–	–	–	–
Clinical level	3513 (73.4%)	1272 (26.6%)	1.01	0.91	1.12	0.830	1.03	0.90	1.18	0.637
Medical resident	2962 (78.7%)	802 (21.3%)	0.76	0.68	0.85	0.001	0.83	0.69	1.00	0.045
Age (years)										
18–20	1217 (74.3%)	422 (25.7%)	–	–	–	–	–	–	–	–
21–23	3092 (74.0%)	1087 (26.0%)	1.01	0.89	1.16	0.837	0.97	0.83	1.14	0.704
24–26	2669 (76.1%)	839 (23.9%)	0.91	0.79	1.04	0.155	1.01	0.83	1.23	0.915
≤27	1835 (76.4%)	566 (23.6%)	0.89	0.77	1.03	0.115	1.07	0.86	1.33	0.560
Familial situation										
Single	3928 (73.4%)	1423 (26.6%)	–	–	–	–	–	–	–	–
In a relationship	4789 (76.6%)	1464 (23.4%)	0.84	0.78	0.92	<0.001	0.84	0.76	0.91	<0.001
Financial difficulties										
Very low	5029 (79.7%)	1280 (20.3%)	–	–	–	–	–	–	–	–
Moderate	3028 (72.4%)	1152 (27.6%)	1.49	1.36	1.64	0.001	1.49	1.36	1.63	<0.001
Serious	667 (59.1%)	461 (40.9%)	2.72	2.38	3.10	0.001	2.73	2.37	3.13	<0.001
Model 1 (M0 + humiliation)										
No	7089 (78.0%)	1998 (22.0%)	–	–	–	–	–	–	–	–
Yes	1746 (65.5%)	921 (34.5%)	1.87	1.70	2.06	<0.001	1.86	1.68	2.06	<0.001
Model 2 (M0 + sexual harassment)										
No	6878 (77.8%)	1964 (22.2%)	–	–	–	–	–	–	–	–
Yes	1957 (67.2%)	955 (32.8%)	1.71	1.56	1.87	<0.001	1.75	1.58	1.94	<0.001
Model 3 (M0 + sexual aggression)										
No	8526 (75.9%)	2712 (24.1%)	–	–	–	–	–	–	–	–
Yes	309 (59.9%)	207 (40.1%)	2.11	1.75	2.52	<0.001	2.06	1.70	2.49	<0.001

2020 [16]. It highlights HAD's potential utility to monitor for mental health with repetitive measures in an idiographic perspective. However, with a nomothetic consideration of monitoring depression and anxiety in the general population, prevalence could be highly dependent on a short-term context (here, the evolution of pandemic and restraining measures) combined with possible variability induced by different panel participants at each assessment. Furthermore, as observed in a previous study [28], we have found low sensitivity and specificity for last week's depression measured with HAD compared to last year's depression measured with CIDI-SF.

Since the pandemic beginning, students' mental health has been of concern for many countries [29] and has made some headlines in the press. A meta-analysis that included studies published only in 2020 found a prevalence of depressive and anxiety symptoms to be 34% and 32%, respectively [30]. These results should be interpreted with caution. For instance, many studies used Patient Health Questionnaire 9 (PHQ9) [31]: 15 studies used a cut-off ≥5 with a mean prevalence of 49% IC 95 [39–58], whereas 7 studies used a cut-off ≥10 with a mean prevalence of 28% IC 95 [13–46] [30]. Different observed prevalence depends on different chosen cut-off to delineate between normal and pathologic cases. This leads sometimes to a false impression of deterioration or improvement between two studies that could otherwise be explained by different used cut-offs.

4.3. Improving medical student's health

If we cannot rule out that the pandemic has played a part in a higher declaration of symptoms by the study participants, medical students' working conditions are still a matter of concern. The 2017 study [6] was a wake-up call, and several reforms of French medical studies were initiated. French government created in 2019 a dedicated national institution: the National Support Center for health students (and canceled it only two years later). But our results have highlighted the insufficiency of the measures currently in place. Some recommendations have been proposed to improve medical students' mental health [32].

Furthermore, some factors associated with mental health status such as financial difficulties, humiliation, sexual harassment, and sexual abuse could be potential targets to improve the situation. A recent meta-analysis included 84 studies only on psychological interventions for the prevention and treatment of mental health disorders in university students [33]. But institutional interventions are also important [32]. This pandemic is an opportunity to change things. A narrative review on student support systems for undergraduate medical students during the COVID-19 pandemic found 10 studies: the two main themes were academic support and mental health support [34]. French medical universities had a critical gap compared to some countries. In Canada, they created a "National Standard for Mental Health and Well-Being for Post-Secondary Students". The Quebec government announced a $60 million plan over 5 years for student mental health. As a recent psychiatrist said: it's time to "Creating Space for Well-Being in Medical School and Beyond" [35].

4.4. Limitations and strength

The response rate was under 20%, similar to the previous national study OVE [3] but much higher than a recent national student survey (4.3%) [36]. A few suggestions can be made to improve response rate: financial incentive, better involvement of university staff and reducing number of studies to avoid student's over-solicitation. We did not explore the impact of COVID-19 on the prevalence of anxiety and depression. However, the association between COVID-19 diagnosis and depression and anxiety disorder incidence is not clear [37,38]. Burnout assessment was made with two different scales to be adapted to students' reality, but it limits the ability to compare preclinical and other medical students. Including missing data and recoding them at 0 could underestimate prevalence. Using both emails and social networks

reduces bias linked to one-way diffusion [39]; however, we cannot exclude that some participated more than once. Using CIDI-SF allows a 12-month prevalence, which is better if we want to reproduce the survey in the future and compare the prevalence, especially with the French general population [4]. Using both HAD and CIDI-SF allows us to assess sensibility and specificity but only for HAD depression. Lastly, to avoid the Table 2 fallacy [40,41] (e.g. suggesting implicitly that all of the risk factor estimates can be interpreted similarly), it's important to consider factors identified in this study only as factors associated with medical student mental health that we suppose are involved in a broader complex system.

5. Conclusion

Four years after the first national study about medical students' mental health and one year after COVID19's pandemic beginning, we found an increased prevalence of anxiety and depressive symptoms compared to previous studies. In the last year, 1 student in 4 has had a major depressive episode, and 1 in 5 has had suicidal thoughts. Prevalence of humiliation and sexual harassment are also high, with 1 in 4 medical student victims of such behaviors. Because we used CIDI-SF and the 2 versions of MBI, our study could allow more reliable comparisons and serve as a baseline for future studies. Our study results highlight the urgent need for targeted political actions against violence in hospitals but more broadly to improve student mental health on many different levels of intervention of its complex system.

Research in context

Evidence before this study: Medical students' mental health was already a public health problem [1] that might have worsened with COVID 19's pandemic. COVID19's pandemic has considerably impacted mental health, especially for medical students [14]. Only few studies really assessed the presence of a major depressive episode (MDE) [9].

Added value of this study: This is the first nationwide study to assess MDE in medical students and to seek for associated factors. Depression scale, 12-month major depressive episode (MDE) with the Composite International Diagnostic Interview-Short Form, burnout with the Maslach Burnout Inventory, 12-month suicidal ideation, humiliation, sexual harassment, and sexual aggression during their curriculum. Multivariable logistic regression was performed to identify main MDE associated factors. We found elevated level of MDE, burnout and mistreatment among students. Having important or very important financial issues, experiencing humiliation, sexual harassment, and sexual abuse were associated with an increased risk of MDE.

Implications of all the available evidence: Many medical students had a MDE on the last year. Some risk factors are modifiable. These results highlight the importance of important institutional actions to improve the mental health of medical students. This study can be used as a reference to evaluate the effectiveness of the actions undertaken.

Information on author access to data

Yannick Morvan and Ariel Frajerman had full access to the data.

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CRediT authorship contribution statement

Franck Rolland and Nawale Hadouiri did the ethic submission (French regulator and ethic committee), they contributed to the non psychiatric questions of the survey, the distribution of the questionnaire and the redaction of the manuscript.

Adrien Haas-Jordache, Evan Gouy, Loona Mathieu and Anne Goulard contributed to the non psychiatric questions of the survey, the distribution of the questionnaire and the redaction of the manuscript.

Yannick Morvan and Ariel Frajerman selected the psychiatric tools, programmed the questionnaire, did the statistical analysis and contributed to the redaction of the manuscript. They had access to all the data.

Conflict of interest

F.R., N.H. and E.G. are members of the ISNI's board. A.H. and A.G. are members of the ISNAR-IMG's board. L.M. is a member of the ANEMF board's.

Y.M. is a member of the scientific committee of the "*Observatoire de la Vie Etudiante*".

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2022.03.001.

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