


The Impact of COVID-19 on Mental Health in Medical Students: A Cross-Sectional Survey Study in Italy

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Abstract

Background: This study aimed to assess the impact of the COVID-19 pandemic in terms of the prevalence of anxiety, depression and stress symptoms in Italian medical students and to identify the associated factors.

Design and Methods: A cross-sectional online survey was administered to second-sixth year medical students of the University of Torino, collecting data on the students' sociodemographics, COVID-19 exposure, anxiety, depression and stress symptoms. Three hierarchical regressions adjusted for age, gender and year of study were executed.

Results: The sample size was 1359. The prevalence of anxiety, depression symptoms, moderate perceived stress and severe perceived stress was 47.8%, 52.1%, 56.2% and 28.4%, respectively. The factors associated with mental health symptoms were: being a woman, a family history of psychiatric disorders, living off-site, competitive/hostile climates and unsatisfying friendships among classmates, poor relationships with co-habitants, negative judgment of medical school choice, fear of COVID-19 infection, feelings of loneliness, distressing existential reflections, and a worsening psychological condition related to the pandemic. Being in the fourth or sixth year constituted a protective factor for depression symptoms.

Conclusions: Mental health in medical students was associated with both COVID-independent and COVID-related factors. Accessibility to effective interventions must be increased to counteract these changes.

Keywords

medical students, COVID-19 pandemic, mental health, anxiety, depression, stress

Introduction

In March 2020, the World Health Organization ([World Health Organization, 2020](#)) declared COVID-19 a global pandemic, causing unprecedented changes to all aspects of public, economic and social life. Research has highlighted the significant impact of the measures taken to restrict the virus's spread (lockdowns, quarantines and social distancing) on mental health, with anxiety, depression and stress increased in both the general population ([Brooks et al., 2020](#); [Bueno-Notivol et al., 2021](#); [Rossi et al., 2020](#); [Salari et al., 2020](#); [Vindegard & Benros, 2020](#); [Xiong et al., 2020](#)) and healthcare workers ([Cénat et al., 2021](#); [Li et al., 2021](#); [Marvaldi et al., 2021](#); [Pappa et al., 2020](#)). The mental health of medical students has also been impacted by the restrictions imposed by the COVID-19 pandemic ([Lasheras et al., 2020](#); [Rose, 2020](#)). Medical students are already considered a vulnerable population in terms of psychological well-being due to higher rates of anxiety, depression and stress symptoms compared with age-matched peers as well as the general population ([Dyrbye et al., 2006](#); [Maser et al., 2019](#); [Rotenstein et al., 2016](#)).

The COVID-19 pandemic has required university students to face new challenges caused by disruptions to their education, putting them at a heightened risk of mental health issues (Araújo et al., 2020; Komer, 2020; Zhai & Du, 2020). Universities were closed during the first wave of the pandemic, and in the case of medical students clinical rotations were indefinitely suspended and education continued through online lectures only. These actions were taken to prevent the spread of the virus, but were not without their consequences on the students' psychological wellbeing (Akers et al., 2020; Dedeilia et al., 2020; Harries et al., 2021).

Contemporaneously, students were exposed to other life stressors related to the pandemic, such as grief due to the loss of loved ones, fear about COVID-19 infection for themselves and their family, financial insecurity and uncertainty about their futures (Araújo et al., 2020; Cao et al., 2020; Lyons et al., 2020; Mertens et al., 2020; Mortazavi et al., 2020; O'Byrne et al., 2021). Moreover, the transition to online learning exacerbated social isolation (Akers et al., 2020; Meo et al., 2020; Rose, 2020; Usher et al., 2020), which may have increased anxiety and depression (Brooks et al., 2020; Hossain et al., 2020; Wang et al., 2017).

Review studies investigating the impact of the COVID-19 pandemic on mental health among medical students are divergent in their findings, probably reflecting the small number of studies involved. One meta-analysis (Lasheras et al., 2020) showed no change in the prevalence of anxiety in medical students, but found symptoms to correlate with several specific COVID-related stressors. The authors suggest that students' knowledge about the virus, high levels of resilience, a reduction in the academic load and increased perceived support within the family may have played a protective role with respect to anxiety symptoms (Lasheras et al., 2020). Similar findings were found by Magklara and collaborators (Magklara et al., 2021), who report that only a minority of medical students had to deal with stress/anxiety and depression (13% and 26.1%, respectively), although it also revealed that almost 60% of students feared infection, for themselves and their family. On the other hand, the analysis by Mittal and colleagues (Mittal et al., 2021) found an increase in medical students' anxiety and depression related to disruptions in their education and daily lives.

Few studies have addressed psychological distress in Italian medical students. Studies performed prior to the COVID-19 pandemic showed high rates of depression, anxiety and stress among medical students, but with conflicting results regarding the associated factors (Bert et al., 2020; Bertani et al., 2020; Carletto et al., 2021; Messina et al., 2016; Pighi et al., 2018; Volpe et al., 2019). To the best of our knowledge, the present is the first study to investigate the impact of the pandemic on the mental health of medical students in Italy, which was one of the first European countries severely affected by the pandemic and the first European country to enter a nationwide lockdown in March 2020.

The aims of the present study are: a) to investigate the effects of the COVID-19 pandemic on the prevalence and severity of anxiety, depression and stress in medical students within an Italian context; b) to identify the risk and protective factors that impact mental health in medical students the most.

Materials and Methods

Study Design and Participants

All students attending the second through to the sixth year of the School of Medicine at the University of Turin (Italy) ($n = 2403$) received an email, sent to their institutional email address, inviting them to participate in electronic survey, which was set on the Limesurvey (<https://www.limesurvey.org/>) platform. Data were collected from December 2020 to February 2021.

Exclusion criteria were: being in the first year of study, or failing to complete any of the questionnaire sections regarding mental health outcomes (i.e., anxiety, depression, perceived stress).

The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the University of Turin Bioethics Committee, Italy (Protocol no. 492685, dated December 4th, 2020). Informed consent was obtained from all participants. Participation was anonymous, voluntary and without compensation.

Instruments

The online survey was partially based on that developed in the multicentric study entitled “Psychosocial Report in Italian Medical Students (PRIMES)”, which investigated depressive symptoms and perceived stress among medical students prior to the onset of the COVID-19 pandemic (Bert et al., 2020; Leombruni et al., 2022). As explained by the authors (Bert et al., 2020; Leombruni et al., 2022), the questionnaire used in PRIMES was developed by the researchers after a detailed study of the literature on depression and stress-related factors in medical students. Overall, the prevalence of depressive symptoms, moderate perceived stress and high perceived stress was 29.5%, 55.2% and 16.9%, respectively. The variables found to be associated with depressive symptoms or stress in PRIMES were age, gender, sexual orientation, relationship status, living condition, being an off-site student, family cohesion, economic status, a family history of psychiatric disorders, judgment about school choice, friendships with classmates and the climate among classmates (Bert et al., 2020; Leombruni et al., 2022). Therefore, these items were considered in the present survey.

In 2020, a patient and public involvement (PPI) framework was then applied to modify and update the survey questions according to the specific context. The process involved a focus group made up of medical students from the University of Turin and the study’s researchers.

The online survey consisted of four parts. The first three sections were developed by the researchers mainly based on a study of the literature and on the outcomes of the focus group. Overall, the items were multiple-choice questions. The fourth section consisted of three validated tools. The first part collected sociodemographic information (gender, age, sexual orientation, nationality, year of study, economic status and living condition before and during lockdown) and data about other factors that might

influence their mental health (family and personal history of psychiatric illness, degree of cohesion in the family unit, economic conditions, and the degree of satisfaction with the experience of being a medical student before and after the pandemic). Participants were also asked whether they or their loved ones had tested positive for COVID-19, whether they were afraid of contagion (fear for their own health and the health of loved ones), and whether they or their loved ones had health conditions at a higher risk for COVID-19 consequences. The second section asked about the impact of the pandemic on their lifestyles, (perceived changes in smoking habits, alcohol consumption, eating habits, physical activity, hobbies, sexual activity and sleep), on their economic situation (participants were asked if the pandemic caused economic repercussions) and on their feelings. Specifically, students were asked if they felt more loneliness during the pandemic, if they felt their psychological condition was unvaried/improved/worsened due to the pandemic, and if they had had existential reflections during the pandemic (no reflections, positive and stimulating reflections, or deeply distressing reflections). The third part concerned the impact of the pandemic on the participants' academic careers. Students were asked to indicate the pros and cons of the changes introduced to the education process due to the pandemic and if these changes were favorable or not (5-item Likert-like scale: from totally disadvantageous to totally advantageous). In particular, their opinions on the following areas were explored: on-line lessons, on-line exams, their study practices, other on-line practices, their thesis, Erasmus project, and on-line communications. The fourth section comprised three validated self-report measures to investigate the psychological health status of the participants; they were: the Generalized Anxiety Disorder Scale (GAD-7; (Spitzer et al., 2006)); the Beck Depression Inventory-II (BDI-II) (Beck et al., 1996); and the Perceived Stress Scale (PSS) (Cohen et al., 1983) to assess anxiety, depression and perceived stress symptoms.

The GAD-7 is a self-report screening tool for assessing the presence and severity of anxiety symptoms: its total score ranges from 0 to 21, and cut-offs of 5, 10 and 15 were used to indicate mild, moderate and severe levels of anxiety, respectively (Spitzer et al., 2006). A score greater than 10, indicating probable clinical generalized anxiety disorder (Kroenke et al., 2007), was used as the binary outcome cut-off. The GAD-7 has been reported to be a reliable (Cronbach alpha of 0.92) and valid tool (Spitzer et al., 2006). In our sample, the Cronbach's alpha coefficient was 0.90 (95% CI 0.90–0.91).

The BDI-II is a 21-item self-report instrument used to measure the presence and severity of depressive symptoms: its total score ranges from 0 to 63, with higher scores indicating higher levels of depression. A score of 0–13 indicates no/minimal depression, 14–19 mild depression, 20–28 moderate depression, and 29–63 severe depression (Beck et al., 1996). A score greater than 13 has been used as the optimal cut-off to identify the presence of depressive symptoms (Rotenstein et al., 2016; Tam et al., 2019), and was applied here to define the second binary outcome. A review concluded the BDI-II to be a reliable (Cronbach alpha around 0.9) and valid instrument (Wang & Gorenstein, 2013). In our sample, the Cronbach's alpha coefficient was 0.92 (95% CI 0.91–0.93).

The PSS-10 is a 10-item self-report questionnaire that measures stress perception: its overall total score ranges from 0 to 40, with higher scores indicating greater perceived stress (Cohen et al., 1983). The PSS score was considered as a continuous outcome since no cut-offs have been reported (Cohen & Williamson, 1988). Scores ranging from 0–13 indicate low stress, 14–26 moderate stress, and 27–40 high perceived stress (State of New Hampshire Employee Assistance Program, 1983). The PSS-10 has been reported to be a reliable (Cronbach alpha of 0.89) and valid tool for the assessment of perceived stress in university students (Roberti et al., 2006). In our sample, the Cronbach's alpha coefficient was 0.87 (95% CI 0.86–0.88).

Statistical Analysis

Descriptive analyses were carried out for all the independent variables and outcomes. Categorical variables were expressed as frequencies and percentages, and continuous variables as medians and interquartile ranges (IQR) since the Shapiro-Wilk test showed non-normal distributions. Chi-squared tests (Mann-Whitney U tests and Kruskal Wallis tests for continuous variables) were performed to assess differences in the distribution of the outcomes across the independent variables. A Spearman's rho correlation table was calculated for GAD-7, BDI-II and PSS-10 scores.

Multivariable logistic regression models were used for anxiety and depression, and a multivariable linear regression model was used for perceived stress. All models were adjusted for age, gender and year of study. For each outcome, a three-step hierarchical regression approach was applied to add independent variables (Field et al., 2012). In the first model, socio-demographic items and variables that might influence mental health (Bert et al., 2020) were entered related to: family cohesion, relationship status, living condition, sexual orientation, a family history of psychiatric conditions, economic status, climate and friendships among classmates, and opinions on the choice of medical school. In the second model, pandemic-related variables were added, namely: changes in their opinion about the choice of medical school, testing positive for COVID-19, feeling vulnerable toward COVID-19, fear of COVID-19 contagion for oneself and for loved ones, and economic repercussions. In the third model, variables related to psychological aspects (feelings of loneliness during the pandemic, a changed overall psychological condition due to the COVID-19 pandemic, existential reflections related to COVID-19) and the other outcomes were added.

To produce the final models, a backward elimination method was used (a likelihood-ratio statistic greater than 0.10 was set as the main removal criterion). The results are expressed as adjusted odds ratios (adj. OR) in logistic regressions (coefficients in linear regressions) and 95% Confidence Intervals (CI). The analyses were performed using IBM SPSS Statistics software version 27.0 (IBM Corp., USA), and a two-tailed p -value $< .05$ was considered significant. Missing values were excluded by pairwise deletion in descriptive analyses and by listwise deletion in regressions.

Results

In total, 1481 questionnaires were collected (response rate: $1481/2403 = 61.6\%$), of which 152 were excluded as they contained uncompleted GAD-7, BDI-II or PSS-10 sections. Of note, these 152 participants did not differ from the other students with regard to the responses provided for other sections. No missing values were found for GAD-7 and PSS-10, while three students failed to complete the BDI-II. Therefore, the final sample consisted of 1329 questionnaires for GAD-7 and PSS-10 outcomes, and 1326 for the BDI-II results.

The median age was 23 years (IQR = 21–25), and women accounted for 65.4% of the sample. The large majority were of Italian nationality (98.2%), and 57.6% declared to be involved in a relationship. [Table 1](#) reports the general characteristics of the sample, stratified by GAD-7, BDI-II and PSS-10 scores.

The median GAD-7 score was 9 (IQR = 5–14). The prevalence of anxiety symptoms was 47.8% ($n = 635$): 34% ($n = 452$) of the students reported mild symptoms, 24.5% ($n = 326$) moderate levels, and 23.3% ($n = 309$) severe symptoms. The median BDI-II score was 14 (IQR = 8–22). Symptoms of depression were present in 52.1% ($n = 692$), with 21.9% ($n = 291$) showing mild symptoms, 16.4% ($n = 218$) moderate symptoms, and 13.8% ($n = 183$) severe depression levels. The median PSS-10 score was 22 (IQR = 16–27). Perceived stress was reported as moderate in 56.2% ($n = 747$) of the students, and 28.4% ($n = 378$) reported severe levels of stress. [Supplementary Table S1](#) shows the correlations between the GAD-7, BDI-II and PSS-10 scores. Overall, Spearman's rho was above 0.700 ($p < .001$) in each relationship studied.

Factors Associated With Anxiety

[Table 2](#) reports the summary of hierarchical regressions showing the factors and adjusted ORs associated with anxiety symptoms. In the final model, BDI-II and PSS-10 scores were significantly associated with risk of anxiety symptoms (adj. OR: 1.94, 95% CI [1.1.359–2.782] and adj. OR: 1.23, 95% CI [1.192–1.277], respectively). Similarly, distressing existential reflections and a worsening overall psychological condition related to the COVID-19 pandemic were associated with an increased risk of anxiety symptoms (adj. OR: 1.56, 95% CI [1.035–2.361] and adj. OR: 1.16, 95% CI [1.163–2.386], respectively). Moreover, fear of COVID-19 infection for oneself was a risk factor for anxiety (adj. OR: 1.49, 95% CI [1.052–2.119]). Lastly, an improved opinion about choice of medical school since the onset of the pandemic was associated with an increased risk of anxiety (adj. OR: 1.61, 95% CI [1.031–2.524]).

Factors Associated With Depression

[Table 3](#) presents the variables with relative adjusted ORs associated with the presence of depressive symptoms. The final model shows being in the fourth or sixth year of medical school to be a protective factor (adj. OR: 0.34, 95% CI [0.182–0.643] and

Table 1. Sample Characteristics: Overall and According to GAD-7, BDI-II and PSS scores.

	Overall		GAD-7 <10		GAD-7 ≥ 10		BDI-II <14		BDI-II ≥ 14		PSS		p ^a
	N	n	N (%)	n	N (%)	n	N (%)	n	N (%)	n	N (%)		
Age (median, IQR)	23	694	23 (4)	23	437	23 (3)	23 (4)	692 ^b	23	4	393	—	
	N (%)	n	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	Median (IQR)	p	
Gender					<.001								<.001
Women	869 (65.4)	413 (59.5)	137 (19.7)	456 (71.8)	370 (58.4)	496 (71.7)	24 (18–28)						
Men	455 (34.2)	280 (40.3)	105 (15.1)	175 (27.6)	100 (15.8)	117 (16.9)	19 (14–24)						
Non-binary	5 (0.4)	1 (0.1)	4 (0.6)	4 (0.6)	1 (0.2)	4 (0.6)	26 (23–29)						
Year of course					.582								.632
Second	270 (20.3)	137 (19.7)	133 (20.9)	133 (20.9)	123 (19.4)	146 (21.1)	22 (16–27)						
Third	217 (16.3)	105 (15.1)	112 (17.6)	112 (17.6)	108 (17.0)	93 (13.4)	23 (17–29)						
Fourth	201 (15.1)	106 (15.3)	95 (15.0)	95 (15.0)	101 (15.9)	96 (13.9)	23 (17–27)						
Fifth	197 (14.8)	113 (16.3)	84 (13.2)	84 (13.2)	117 (18.5)	103 (14.9)	22 (17–26)						
Sixth	221 (16.6)	114 (16.4)	107 (16.9)	107 (16.9)	85 (13.4)	137 (19.8)	22 (16–27)						
Over sixth	223 (16.8)	119 (17.1)	104 (16.4)	104 (16.4)			23 (17–27)						
Nationality					.544								.062
Italian	1305 (98.2)	683 (98.4)	622 (98.0)	622 (98.0)	628 (99.1)	674 (97.4)	22 (16–27)						
Other	24 (1.8)	11 (1.6)	13 (2.0)	13 (2.0)	6 (0.9)	18 (2.6)	25 (21.5–28.5)						
Relationship status					.506								.841
Single	563 (42.4)	300 (43.2)	263 (41.4)	263 (41.4)	261 (41.2)	301 (43.5)	23 (17–27)						
Involved	766 (57.6)	394 (56.8)	372 (58.6)	372 (58.6)	373 (58.8)	391 (56.5)	22 (16–27)						
Sexual orientation					.042								<.001
Heterosexual	958 (72.1)	518 (74.7)	440 (69.6)	440 (69.6)	489 (77.1)	467 (67.9)	22 (16–27)						
LGBA	367 (27.6)	175 (25.3)	192 (30.4)	192 (30.4)	145 (22.9)	221 (32.1)	24 (18–29)						

(continued)

Table 1. (continued)

	Overall		GAD-7 < 10		GAD-7 ≥ 10		p	BDI-II < 14		BDI-II ≥ 14		p	PSS	p ^a
	N = 1329	n = 694	n = 635	n = 634 ^b	n = 692 ^b	n = 1329								
Living condition						.520			.458					.563
Alone	58 (4.4)	33 (4.8)	25 (3.9)	26 (4.1)	32 (4.6)								22.5 (17–31)	
With parents/relatives	1046 (78.7)	538 (77.5)	508 (80.0)	508 (80.1)	535 (77.3)								22 (16–27)	
With partner/ housemates	225 (16.9)	123 (17.7)	102 (16.1)	100 (15.8)	125 (18.1)								23 (17–27)	
Off-site student ^c						.699			.507					.118
Yes	742 (55.8)	391 (56.3)	351 (55.3)	348 (54.9)	393 (56.8)								23 (17–28)	
Family cohesion						<.001			<.001					<.001
Very poor/poor/ excessive	208 (15.7)	84 (12.1)	124 (19.5)	64 (10.1)	143 (20.7)								25 (20–31)	
Good	547 (41.2)	267 (38.5)	280 (44.1)	249 (39.3)	298 (43.1)								23 (18–28)	
Excellent	574 (43.2)	343 (49.4)	231 (36.4)	321 (50.6)	251 (36.3)								20 (14–26)	
Availability of common spaces in the house ^c	1253 (94.3)	665 (95.8)	588 (92.6)	605 (95.4)	645 (93.2)	.013			.097				22 (16–27)	.005
Availability of common spaces in the house during lockdown ^c	1233 (92.8)	657 (94.7)	576 (90.7)	602 (95.0)	628 (90.8)	.006			.004				22 (16–27)	<.001
Quality of relations with house cohabitants						<.001			<.001					<.001
Very poor/poor	131 (9.9)	38 (5.5)	93 (14.6)	34 (5.4)	96 (13.9)								28 (21–32)	
Good/excellent	1198 (90.1)	656 (94.5)	542 (85.4)	600 (94.6)	596 (86.1)								22 (16–27)	
Quality of relations with house cohabitants during lockdown						<.001			<.001					<.001

(continued)

Table 1. (continued)

Overall	GAD-7 <10	GAD-7 ≥ 10	p	BDI-II <14	BDI ≥14	p	PSS	p ^a
N = 1329	n = 694	n = 635		n = 634 ^b	n = 692 ^b		n = 1329	
Very poor/poor	153 (11.5)	43 (6.2)	110 (17.3)	33 (5.2)	119 (17.2)		27 (22-31)	
Good/excellent	1176 (88.5)	651 (93.8)	525 (82.7)	601 (94.8)	573 (82.8)		22 (16-27)	
First/second degree relatives with psychiatric disorder ^c	319 (24)	148 (21.3)	171 (26.9)	118 (18.6)	199 (28.8)	<.001	24 (18-29)	.002
Economic status								
Good status	1250 (94.1)	664 (95.7)	586 (92.3)	615 (97.0)	632 (91.3)	<.001	22 (16-27)	<.001
Poor status	79 (5.9)	30 (4.3)	49 (7.7)	19 (3.0)	60 (8.7)		25 (22-30)	
Working status								
Not working	962 (72.4)	500 (72.0)	462 (72.8)	455 (71.8)	504 (72.8)	.806	23 (17-27)	.285
Working	367 (27.6)	194 (28.0)	173 (27.3)	179 (28.2)	188 (26.2)	<.001	22 (16-27)	<.001
Judging the choice of medical school								
Positively	898 (67.6)	541 (78.0)	357 (56.2)	533 (84.1)	363 (52.5)		20 (15-25)	
Negatively/no opinion	431 (32.4)	153 (22.0)	278 (43.8)	101 (15.9)	329 (47.5)	<.001	26 (21-30)	<.001
Change of opinion about the choice of medical school after COVID-19								
No change	860 (64.7)	502 (72.3)	358 (56.4)	461 (72.7)	397 (57.4)		21 (15.25-26)	
Yes, opinion improved	175 (13.2)	98 (14.1)	77 (12.1)	107 (16.9)	67 (9.7)		20 (15-25)	
Yes, opinion worsened	294 (22.1)	94 (13.5)	200 (31.5)	66 (10.4)	228 (32.9)	.049	26 (22-30.25)	<.001
Satisfying friendships with classmates								

(continued)

Table 1. (continued)

Overall	GAD-7 <10	GAD-7 ≥ 10	p	BDI-II <14	BDI ≥ 14	p	PSS	p ^a
N = 1329	n = 694	n = 635		n = 634 ^b	n = 692 ^b		n = 1329	
Yes/not yet	1142 (85.9)	606 (89.8)		577 (93.4)	562 (83.1)		22 (16–27)	
No	155 (11.7)	69 (10.2)		41 (6.6)	114 (16.9)		25 (19–30)	
Missing	32 (2.4)							
Climate among classmates			.001			<.001		<.001
Friendly/competitive but stimulating/no opinion	1057 (79.5)	576 (83.0)		547 (86.3)	508 (73.4)		22 (16–27)	
Competitive and hostile	272 (20.5)	118 (17.0)		87 (13.7)	184 (26.6)		25 (19–30)	
Positive COVID-19 swab ^c	135 (10.2)	64 (9.2)	.239	59 (9.3)	75 (10.8)	.363	24 (16–29)	.029
Positive COVID-19 swab in relative/loved ones ^c	767 (57.7)	405 (52.8)	.657	373 (58.8)	393 (56.8)	.470	23 (17–27)	.393
Being vulnerable/at risk for COVID-19 ^c	49 (3.7)	23 (3.3)	.470	21 (3.3)	28 (4.0)	.561	22 (16–29)	.925
Relative/loved ones vulnerable/at risk for COVID-19 ^c	1056 (79.5)	548 (79.0)	.683	488 (77.0)	566 (81.8)	.035	23 (17–27)	.138
Fear of COVID-19 contagion for oneself ^c	356 (26.8)	166 (24.0)	.016	166 (26.2)	189 (27.3)	.664	22 (17–27)	.401
Fear of COVID-19 contagion for relative/loved ones ^c	1079 (81.2)	549 (72.9)	.049	506 (79.9)	571 (82.5)	.232	23 (17–27)	.010

(continued)

Table 1. (continued)

Overall	GAD-7 < 10	GAD-7 ≥ 10	p	BDI-II < 14	BDI-II ≥ 14	p	PSS	p ^a	
N = 1329	n = 694	n = 635		n = 634 ^b	n = 692 ^b		n = 1329		
Economic repercussions due to COVID-19 ^c	292 (22.0)	134 (19.3)	158 (24.9)	.017	100 (15.8)	192 (27.7)	<.001	24 (18–29)	<.001
Feelings of loneliness during pandemic				<.001			<.001		<.001
No	370 (27.8)	272 (39.2)	98 (15.4)		266 (42.0)	104 (15.0)		17 (13–23)	
Yes, more than usual	790 (59.4)	347 (50.0)	443 (69.8)		319 (50.3)	469 (67.8)		24 (18–29)	
Yes, but no more than usual	169 (12.7)	75 (10.8)	94 (14.8)		49 (7.7)	119 (17.2)		25 (20–30)	
Overall psychological condition changed due to COVID-19				<.001			<.001		<.001
No	445 (33.5)	331 (47.7)	114 (18.0)		316 (49.8)	127 (18.4)		18 (12–23)	
Yes, improved	87 (6.5)	65 (9.4)	22 (3.5)		58 (9.1)	29 (4.2)		18 (13–23)	
Yes, worsened	797 (60.0)	298 (42.9)	499 (78.6)		260 (41)	536 (77.5)		25 (20–29)	
Existential reflections related to COVID-19				<.001			<.001		<.001
No	323 (24.3)	204 (29.4)	119 (18.7)		185 (29.2)	137 (19.8)		19 (14–25)	
Yes, positively stimulating	501 (37.7)	352 (50.7)	149 (23.5)		330 (52.1)	169 (24.4)		19 (14–24)	
Yes, deeply distressing	505 (38.0)	138 (19.9)	367 (57.8)		119 (18.8)	386 (55.8)		26 (22–31)	

Note. GAD-7 denotes Generalized Anxiety Disorder scale, BDI-II Beck Depression Inventory-II.

^aLevel of significance related to the difference between categories of the variable.

^bTotal sample for BDI-II is 1326.

^cPossible options: "No" and "Yes". "Yes" reported in table.

Table 2. Summary of Hierarchical Regressions for Variables Associated With Medical Students' Anxiety Symptoms (GAD-7≥10).

Variable	Model 1			Model 2			Model 3		
	Adj. OR	95% CI	p	Adj. OR	95% CI	p	Adj. OR	95% CI	p
Gender	1.819	1.422; 2.328	<.001	1.768	1.375; 2.273	<.001	0.805	0.579; 1.120	.198
Age	0.993	0.930; 1.060	.825	0.990	0.928; 1.057	.772	1.041	0.938; 1.155	.447
Year of course									
Second	Ref			Ref			Ref		
Third	0.972	0.659; 1.433	.887	1.010	0.681; 1.498	.960	1.059	0.631; 1.775	.829
Fourth	0.833	0.550; 1.261	.388	0.769	0.503; 1.176	.225	0.751	0.427; 1.322	.321
Fifth	0.634	0.405; 0.993	.046	0.651	0.413; 1.026	.064	0.636	0.346; 1.168	.145
Sixth	0.762	0.478; 1.212	.251	0.769	0.480; 1.230	.273	0.905	0.470; 1.743	.766
Over sixth	0.637	0.353; 1.149	.134	0.671	0.370; 1.215	.188	0.607	0.257; 1.434	.255
Judgement of choice of medical school	2.995	2.307; 3.886	<.001	2.415	1.813; 3.216	<.001	0.986	0.680; 1.429	.940
1st/2nd degree relatives with psychiatric disorder	1.309	0.997; 1.719	.053	1.266	0.959; 1.670	.096	1.032	0.724; 1.473	.860
Availability of common spaces in the house	0.621	0.369; 1.044	.072	0.630	0.371; 1.070	.087	0.773	0.398; 1.502	.448
Quality of relations with house cohabitants	2.846	1.866; 4.343	<.001	1.468	0.746; 2.889	.267	1.175	0.538; 2.565	.686
Change of opinion about the choice of medical school after COVID-19									
No change	Ref			Ref			Ref		
Yes, opinion improved	1.228	0.868; 1.737	.246	1.614	1.031; 2.524	.036	1.614	1.031; 2.524	.036
Yes, opinion worsened	2.059	1.492; 2.842	<.001	1.142	0.761; 1.714	.520	1.142	0.761; 1.714	.520
Fear of COVID-19 infection for oneself	1.308	0.996; 1.718	.053	1.493	1.052; 2.119	.025	1.493	1.052; 2.119	.025
Fear of COVID-19 contagion for relative/loved ones	1.330	0.966; 1.831	.080	1.044	0.691; 1.579	.837	1.044	0.691; 1.579	.837
Quality of relations with house cohabitants during lockdown	2.192	1.163; 4.132	.015	1.131	0.549; 2.330	.738	1.131	0.549; 2.330	.738

(continued)

Table 2. (continued)

Variable	Model 1			Model 2			Model 3		
	Adj. OR	95% CI	p	Adj. OR	95% CI	p	Adj. OR	95% CI	p
Overall psychological condition changed due to COVID-19									
No	Ref								
Yes, improved	0.802	0.399; 1.613	.535						
Yes, worsened	1.163	1.163; 2.386	.005						
Existential reflections related to COVID-19									
No	Ref								
Yes, positively stimulating	0.841	0.563; 1.259	.401						
Yes, deeply distressing	1.563	1.035; 2.361	.034						
BDI-II ≥ 14	1.944	1.359; 2.782	<.001						
PSS-10 score	1.234	1.192; 1.277	<.001						

Note. Gender: 0 = man, 1 = woman; Judging the choice of medical school: 0 = positively, 1 = negatively/no opinion; first/second degree relatives with psychiatric disorder: 0 = no, 1 = yes; Availability of common spaces in the house: 0 = no, 1 = yes; Quality of relations with house cohabitants: 0 = good/very good; 1 = poor/very poor; Fear of COVID-19 infection for oneself: 0 = no, 1 = yes; Fear of COVID-19 infection for relative/loved ones: 0 = no, 1 = yes; Quality of relations with house cohabitants during lockdown: 0 = good/very good; 1 = poor/very poor; BDI-II: Beck Depression Inventory-II; PSS-10: Perceived Stress Scale.

Table 3. Summary of Hierarchical Regressions for Variables Associated with Medical Students' Depressive Symptoms (BDI-II ≥ 14).

Variable	Model 1				Model 2				Model 3			
	Adj. OR	95% CI	p		Adj. OR	95% CI	p		Adj. OR	95% CI	p	
Gender	1.961	1.508; 2.550	<.001		1.998	1.527; 2.613	<.001		0.905	0.625; 1.312	.599	
Age	0.970	0.897; 1.048	.441		0.971	0.895; 1.054	.483		0.998	0.881; 1.130	.976	
Year of course												
Second	Ref				Ref				Ref			
Third	0.804	0.533; 1.211	.296		0.794	0.521; 1.209	.282		0.723	0.404; 1.294	.275	
Fourth	0.600	0.385; 0.933	.023		0.496	0.313; 0.787	.003		0.342	0.182; 0.643	.001	
Fifth	0.662	0.408; 1.076	.096		0.648	0.393; 1.068	.089		0.628	0.317; 1.244	.182	
Sixth	0.491	0.293; 0.820	.007		0.473	0.278; 0.804	.006		0.380	0.179; 0.806	.012	
Over sixth	0.780	0.401; 1.521	.466		0.789	0.395; 1.575	.501		1.092	0.404; 2.948	.862	
Judgement of choice of medical school	4.877	3.634; 6.546	<.001		3.595	2.618; 4.936	<.001		1.985	1.308; 3.012	.001	
First/second degree relatives with psychiatric disorder	1.685	1.252; 2.268	.001		1.621	1.196; 2.198	.002		1.987	1.316; 3.001	.001	
Family cohesion												
Very poor/poor/excessive	Ref				Ref				Ref			
Good	0.701	0.465; 1.059	.091		0.764	0.499; 1.172	.218		0.757	0.427; 1.342	.341	
Excellent	0.589	0.386; 0.897	.014		0.670	0.432; 1.039	.074		0.890	0.490; 1.617	.702	
Sexual orientation	1.272	0.958; 1.688	.096		1.224	0.915; 1.637	.173		1.092	0.743; 1.605	.655	
Economic status	2.413	1.345; 4.329	.003		2.177	1.194; 3.969	.011		1.791	0.830; 3.861	.137	
Satisfying friendships with classmates	1.813	1.188; 2.768	.006		1.949	1.264; 3.006	.003		2.482	1.395; 4.419	.002	
Climate among classmates	1.648	1.179; 2.303	.003		1.510	1.072; 2.128	.018		1.331	0.853; 2.078	.208	
Quality of relations with house cohabitants	1.947	1.165; 3.252	.011		0.818	0.370; 1.808	.619		0.517	0.185; 1.443	.208	
Change of opinion about the choice of medical school after COVID-19												
No change	Ref				Ref				Ref			
Yes, opinion improved					0.882	0.609; 1.276	.505		0.697	0.426; 1.141	0.151	
Yes, opinion worsened					2.489	1.732; 3.577	<.001		1.336	0.828; 2.156	.235	

(continued)

Table 3. (continued)

Variable	Model 1			Model 2			Model 3		
	Adj. OR	95% CI	p	Adj. OR	95% CI	p	Adj. OR	95% CI	p
Relative/loved one vulnerable/at risk for COVID-19		1.336	0.969; 1.841	.077	1.355	0.877; 2.095	.172		
Economic repercussions due to COVID-19		1.700	1.232; 2.347	.001	1.534	0.992; 2.371	.054		
Quality of relations with house cohabitants during lockdown		3.093	1.462; 6.543	.003	1.730	0.671; 4.461	.256		
Feelings of loneliness during pandemic									
No	Ref								
Yes, more than usual	1.219	0.797; 1.866	.362						
Yes, as usual	2.441	1.344; 4.430	.003						
Overall psychological condition changed due to COVID-19									
No	Ref								
Yes, improved	1.791	0.868; 3.695	.115						
Yes, worsened	2.138	1.409; 3.243	<.001						
Existential reflections related to COVID-19									
No	Ref								
Yes, positively stimulating	0.794	0.510; 1.236	.307						
Yes, deeply distressing	1.425	0.886; 2.293	.145						
GAD-7 \geq 10	2.369	1.644; 3.413	<.001						
PSS-10 score	1.273	1.224; 1.324	<.001						

Note: Gender: 0 = man, 1 = woman; Judging the choice of medical school: 0 = positively, 1 = negatively/no opinion; first/second degree relatives with psychiatric disorder: 0 = no, 1 = yes; Sexual orientation: 0 = heterosexual, 1 = LGBA; Economic status: 0 = adequate/excellent, 1 = insufficient/poor; Satisfying friendships with classmates: 0 = yes; 1 = no; Climate among classmates: 0 = friendly and stimulating; 1 = competitive and hostile; Quality of relations with house cohabitants: 0 = good/very good; 1 = poor/very poor; Relative/loved one vulnerable/at risk for COVID-19: 0 = no, 1 = yes; Economic repercussions due to COVID-19: 0 = no, 1 = yes; Quality of relations with house cohabitants during lockdown: 0 = good/very good; 1 = poor/very poor; GAD-7: Generalized Anxiety Scale; PSS: Perceived Stress Scale.

adj. OR: 0.38, 95% CI [0.179–0.806], respectively), whereas a negative judgment of medical school choice constituted a risk factor (adj. OR: 1.98, 95% CI [1.308–3.012]), as was having first- or second-degree relatives with a psychiatric disorder (adj. OR: 1.99, 95% CI [1.316–3.001]). Unsatisfactory relationships with classmates more than doubled the risk of depressive symptoms (adj. OR: 2.48, 95% CI [1.395–4.419]).

Feelings of loneliness experienced during the pandemic, but which were not any worse than those felt before the pandemic, were associated with an increased risk of depression (adj. OR: 2.44, 95% CI [1.344–4.430]). A worsening of the overall psychological condition due to the pandemic increased the occurrence of depressive syndromes by more than twofold (adj. OR: 2.14, 95% CI [1.409–3.243]). Finally, the risk of depressive symptoms was significantly associated with GAD-7 and PSS-10 scores (adj. OR: 2.37, 95% CI [1.644–3.413] and adj. OR: 1.27, 95% CI [1.224–1.324], respectively).

Factors Associated With Stress

Table 4 reports the summary of hierarchical regressions showing the variables associated with stress symptoms. The final model showed that being a woman and judging the choice of medical school negatively were associated with stress symptoms (B : 1.81, 95% CI [1.232–2.385] and B : 1.58, 95% CI [0.901–2.264], respectively). A competitive and hostile relational climate with classmates (B : 0.74, 95% CI [0.054–1.427]), being an off-site student (B : 0.70, 95% CI [0.166–1.238]) and a poor quality of relationships with cohabitants (B : 1.85, 95% CI [0.377–3.316]) were also associated with higher levels of stress. Feelings of loneliness experienced during the pandemic similar to or exceeding those felt before the pandemic were also associated with stress levels (B : 1.24, 95% CI [0.548–1.933] and B : 1.79, 95% CI [0.838–2.738], respectively).

Of the COVID-19-related variables, a worsening of the overall psychological condition and distressing existential reflections about the pandemic were significantly associated with stress levels (B : 0.81, 95% CI [0.107–1.511] and B : 1.21, 95% CI [0.433–1.986], respectively).

Finally, stress symptoms were significantly associated with GAD-7 and BDI-II scores (B : 4.71, 95% CI [4.054–5.366] and B : 5.34, 95% CI [4.642–6.030], respectively).

Discussion

The aims of this study were to assess the impact of the COVID-19 pandemic in terms of the prevalence of anxiety, depression and stress symptoms in medical students, and to identify the associated factors. We found a high prevalence of anxiety (47.8%), depression (52.1%) and moderate perceived stress (56.2%), all of which were higher compared with those reported by meta-analyses performed prior to COVID-19: 21–33.8% for anxiety (Quek et al., 2019; Zeng et al., 2019); 27–29% for depression

Table 4. Summary of Hierarchical Regressions for Variables Associated with Medical Students' Perceived Stress Symptoms.

Variable	Model 1			Model 2			Model 3		
	B	95% CI	p	B	95% CI	p	B	95% CI	p
Gender	3.627	2.853; 4.401	<.001	3.471	2.708; 4.235	<.001	1.808	1.232; 2.385	<.001
Age	-0.237	-0.419; 1.443	.011	-0.254	-0.433; -0.075	.006	-0.113	-0.247; 0.020	.095
Year of course									
Second	Ref			Ref			Ref		
Third	0.291	-0.948; 1.531	.645	0.396	-0.822; 1.613	.524	0.585	-0.315; 1.486	.202
Fourth	0.142	-1.158; 1.443	.830	-0.178	-1.459; 1.103	.785	0.518	-0.433; 1.470	.285
Fifth	-0.277	-1.659; 1.105	.694	-0.172	-1.534; 1.189	.804	0.451	-0.558; 1.461	.381
Sixth	-0.575	-1.993; 0.843	.427	-0.487	-1.880; 0.907	.493	0.333	-0.700; 1.366	.527
Over sixth	-0.205	-1.961; 1.551	.819	0.109	-1.621; 1.839	.902	0.505	-0.774; 1.784	.438
Judgement of choice of medical school	5.218	4.394; 6.043	<.001	4.194	3.305; 5.084	<.001	1.583	0.901; 2.264	<.001
Family cohesion									
Very poor/poor/excessive	Ref			Ref			Ref		
Good	-0.599	-1.808; 0.610	.331	-0.601	-1.802; 0.599	.326	-0.162	-1.052; 0.727	.720
Excellent	-1.797	-3.043; -0.551	.005	-1.682	-2.926; -0.438	.008	-0.540	-1.465; 0.385	.252
Sexual orientation	0.7178	-0.114; 1.550	.091	0.592	-0.225; 1.409	.155	0.287	-0.320; 0.895	.353
Economic status	2.398	0.831; 3.966	.003	1.790	0.222; 3.359	.025	0.488	-0.678; 1.653	.412
Climate among classmates	1.823	0.885; 2.761	<.001	1.557	0.633; 2.482	.001	0.740	0.054; 1.427	.035
Off-site student	0.795	0.057; 1.534	.035	0.827	0.103; 1.552	.025	0.702	0.166; 1.238	.010
Quality of relations with house cohabitants	3.372	1.958; 4.786	<.001	1.783	-0.202; 3.768	.078	1.847	0.377; 3.316	.014
Change of opinion about the choice of medical school after COVID-19									
No change	Ref			Ref			Ref		
Yes, opinion improved				-0.202	-1.295; 0.890	.716	-0.311	-1.127; 0.505	.455
Yes, opinion worsened				2.490	1.511; 3.470	<.001	0.345	-0.397; 1.087	.362

(continued)

Table 4. (continued)

Variable	Model 1			Model 2			Model 3		
	B	95% CI	p	B	95% CI	p	B	95% CI	p
Economic repercussions due to COVID-19 (yes)				1.255	0.361; 2.149	.006	0.349	-0.315; 1.014	.303
Fear of COVID-19 contagion for relative/loved ones				1.458	0.526; 2.389	.002	0.626	-0.071; 1.323	.078
Availability of common spaces in the house during lockdown				-1.832	-3.253; -0.412	.011	-0.972	-2.022; 0.079	.070
Quality of relations with house cohabitants during lockdown				1.809	-0.046; 3.664	.056	-0.299	-1.675; 1.077	.670
Feelings of loneliness during pandemic									
No									
Yes, more than usual							Ref		
Yes, but no more than usual							1.241	0.548; 1.933	<.001
Overall psychological condition changed due to COVID-19							1.788	0.838; 2.738	<.001
No									
Yes, improved							Ref		
Yes, worsened							0.050	-1.105; 1.206	.932
Existential reflections related to COVID-19							0.809	0.107; 1.511	.024
No									
Yes, positively stimulating							Ref		
Yes, deeply distressing							-0.068	-0.784; 0.649	.853
GAD-7 ≥ 10							1.210	0.433; 1.986	.002
BDI-II ≥ 14							4.710	4.054; 5.366	<.001
							5.336	4.642; 6.030	<.001

Note. Gender: 0 = man, 1 = woman; Judging the choice of medical school: 0 = positively, 1 = negatively/no opinion; Sexual orientation: 0 = heterosexual, 1 = LGBA; Economic status: 0 = adequate/excellent, 1 = insufficient/poor; Climate among classmates: 0 = friendly and stimulating, 1 = competitive and hostile; Off-site student: 0 = no, 1 = yes; Quality of relations with house cohabitants: 0 = good/very good, 1 = poor/very poor; Economic repercussions due to COVID-19: 0 = no, 1 = yes; Fear of COVID-19 infection for relative/loved ones: 0 = no, 1 = yes; Availability of common spaces in the house during lockdown: 0 = no, 1 = yes; Quality of relations with house cohabitants during lockdown: 0 = good/very good, 1 = poor/very poor; BDI-II: Beck Depression Scale; PSS: Perceived Stress Scale.

(Puthran et al., 2016; Rotenstein et al., 2016; Tam et al., 2019; Zeng et al., 2019); and 12.2–96.7% for stress (Hope & Henderson, 2014). These values were also greater than those found in previous observational studies conducted in Italy before the onset of COVID-19 (Bert et al., 2020; Bertani et al., 2020; Volpe et al., 2019). While our findings are consistent with those from a recent review looking at the mental health consequences of COVID-19 on medical students worldwide (Mittal et al., 2021), other COVID-related reviews (Lasheras et al., 2020; Magklara et al., 2021) have reported lower rates of overall psychological distress. Differences in prevalence rates between studies may be due to the high heterogeneity of the studies considered in terms of: the instruments used to assess psychological distress, sociocultural backgrounds, and the extent of the pandemic's impact in different countries. Therefore, the present study provides an additional contribution to the existing literature on the impact of COVID-19 in medical students, which should be considered in future meta-analyses.

The second objective of this study was to identify the factors associated with the presence of symptoms of anxiety, depression and stress in our sample. This permits us to identify potential risk and protective factors, and to plan and implement strategies and interventions that promote good mental health.

The factors associated with anxiety symptoms were primarily COVID-19-related. Fear of contracting the virus was associated with anxiety. Magklara and colleagues, in their recent review, showed that almost 60% of medical students are afraid of contracting the virus (Magklara et al., 2021). This may be related to the fear of being exposed to the virus without adequate personal protection equipment, the availability of which was insufficient during the first wave of the pandemic, even among health workers.

The presence of depressive symptoms in our sample was significantly associated with a family history of mental health problems and unsatisfactory relationships with classmates, confirming the results of similar studies conducted prior to COVID-19 (Bert et al., 2020; Meng et al., 2017). Being a fourth- or sixth-year student was revealed to be a protective factor against depressive symptoms – in line with the results of Puthran and colleagues (Puthran et al., 2016), who showed a negative trend in depressive symptoms according to the number of years of medical school training.

With regard to perceived stress, being a woman and living off-site were found to be significantly associated with higher stress levels, in line with a study demonstrating similar stress levels in medical students due to COVID-19 (O'Byrne et al., 2021). In our sample, we also found a poor relational climate among classmates and poor relations with cohabitants to be associated with higher levels of stress, highlighting the role of meaningful and enriching social relationships in promoting the mental health of students, particularly during periods of imposed social isolation as a means to restricting the virus's spread.

As expected, a worsened overall psychological condition involved all three mental health outcomes (anxiety, depression and perceived stress), whereas deeply distressing existential reflections related to COVID-19 were associated with anxiety and stress only. The pandemic and its numerous high-impact consequences were completely

unexpected, and may have generated a “sense of alertness” responsible for increasing anxiety and stress levels. The long-term effects of these existential reflections should be investigated further. Also, the association between anxiety and stress levels and distressing existential reflections may be due to the students’ need for more reliable information about the virus and/or the extent to which they feel they can trust the medical school and government’s management of the pandemic. In fact, O’Byrne and colleagues found that students who were less confident in the management of the crisis by the medical school and their government and who considered the information about the current crisis to be insufficient reported higher levels of stress (O’Byrne et al., 2021).

Experiencing feelings of loneliness during the pandemic was associated with symptoms of depression and stress. In particular, experiencing such feelings, but not to any greater degree than before the pandemic, was associated with depressive symptoms, suggesting that depressive tendencies were probably already present in these individuals before the pandemic. In contrast, higher levels of stress were associated with feelings of loneliness that had increased due to the pandemic and its imposed restrictions.

Moreover, in line with the observations made by Bert et al. (2020), published prior to COVID-19, medical students with a negative judgement of their choice of medical school had a higher risk of depression and stress independently of the pandemic’s impact on their education. This result highlights the relationship between medical students’ judgments and expectations about a career in medicine and the presence of psychological distress, one that deserves further investigation in future studies.

Interestingly, students who reported an improved opinion about choice of medical school were more prone to anxiety. One possible explanation may be that the pandemic had reinforced the students’ decision about becoming doctors, but they may be feeling anxious about becoming adequately prepared to handle complex clinical situations such as those related to COVID-19 infection (O’Byrne et al., 2020). Future studies could investigate this possibility.

Lastly, symptoms of anxiety, depression and stress were strongly associated with each other, in line with previous clinical literature (Jacobson & Newman, 2017; Kalin, 2020; Lamers et al., 2011; Sartorius et al., 1996). Their combined presence is often associated with more severe functional impairment (Jacobson & Newman, 2017; Kessler et al., 2003; Lamers et al., 2011), indicating the need for transdiagnostic approaches to treatment, with the aim of targeting the common underlying psychological mechanism(s) of anxiety, depression and stress (Spijker et al., 2020).

These results have important clinical and pedagogical implications as they demonstrate, once again, the importance of developing counselling services for medical students in universities. These services must be easily accessible and capable of ameliorating the effects of the stressors students are exposed to (Jacob et al., 2020). They must also address the specific needs related to unforeseen and highly stressful situations such as those occurring during the pandemic, which in many cases add to the previous ones. Furthermore, it is important to consider specific risk factors, such as

gender, in order to tailor counselling services and psychological interventions. Moreover, these data show the importance of faculty staff fostering a relational climate that is not highly competitive but instead characterized by mutual support and which enhances student engagement and motivational aspects related to medical school choice (Peters et al., 2019). In this sense, introducing seminars aimed at fostering soft skills and promoting both formal and informal peer support practices may prove to be crucial.

Strengths and Limitations

The major strength of this work is that it is the first to evaluate the impact of the COVID-19 pandemic on the mental health of medical students in Italy – one of the countries most affected by the COVID-19 emergency. The study's high response rate is also an important strength.

The main limitations are the use of convenience sampling and its cross-sectional design, which restricts causal interpretations. The study's lack of pre-pandemic information regarding the students' mental health statuses limits the possibility to know whether the individual participants had improved or worsened since COVID-19 in terms of mental health. Therefore, the survey data could only be compared against previously published data. Another limitation concerns the fact that the questions in section 2 and 3 of the survey and the specific questions on COVID-19 were developed by the researchers for the purpose of this study without specific reference to previously validated questionnaires. Moreover, no data were collected about the students who refused to participate. The use of self-reported measures of mental health outcomes rather than structured interviews and clinical diagnoses constitutes a study weakness. That said, all the tools used are validated and commonly used to screen for psychological distress. Lastly, as the study was conducted in a single university, the sample should not be considered representative of the Italian medical student population.

Conclusion

Medical students are considered a vulnerable population due to the high levels of psychological distress previously detected in these individuals. The impact of the COVID-19 pandemic and its restrictions appears to have had a negative impact on their mental health. Psychological distress was associated with both COVID-independent and COVID-related factors. Medical schools should plan and provide counselling and mental health services, both at preventive and at intervention levels, to help students manage the difficulties inherent to their medical training, especially at times of increased stress such as those related to the COVID-19 pandemic-imposed restrictions. Future studies should focus on identifying characteristics that maximize the use of such services by reducing the fear of stigma.

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Author Contributions

SC, and PL conceived the study idea. All authors contributed to the study design. GLM and GS implemented the online survey. GLM performed the statistical analyses, with the supervision of FB and RS. SC, GLM, and VZL drafted the first version of the manuscript. All authors have discussed the results and revised this manuscript critically for important intellectual content. All authors have read and approved the final version.

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Data Availability

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

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Supplemental Material

Supplemental material for this article is available online.

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