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Perceived stress among undergraduate medical students and its association with learning strategies and academic performance in Medical College Kolkata, India

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Background: Stress is an inevitable and important part of being a medical student. Present study explores perceived stress among undergraduate medical students and the correlation of stress with learning strategies and academic performance.

Method: This descriptive cross-sectional study was carried out at Medical College Kolkata, India. The target population was undergraduate medical students from phase II and III. Participants' learning strategies was measured using the modified Approaches to Learning Medicine (mALM) questionnaire. The stress level of the students was determined by Perceived stress Scale (PSS 10). Academic performance was measured in terms of percentages scored in the last MBBS examination. Data were analysed using SPSS version 21. Frequencies and percentages were calculated for categorical variables and measures of central tendency and dispersion was calculated for continuous variables. Differences of mean were tested by independent samples t-test. Correlation was tested by Pearson correlation test.

Results: There were 136 students enrolled in the study; and 129 (94.8%) students scored above 60% in their last MBBS examination. Mean PSS score of the participants was 19.4± 4.17. One hundred and twenty-three (90.4%) students were found to have moderate stress. Deep learning approach was significantly more for MBBS Phase III students (p=0.003). However, perceived stress had no significant correlation with either learning strategy (p=0.916) or academic performance of students (p=0.309).

Conclusion: Perceived stress was found to be high among undergraduate medical students in the present study. However, any particular learning style or academic performance was not found to be associated with stress.

Keywords: Correlation of Data, Learning, Medical education

التوتر المدرك بين طلاب الطب الجامعيين وارتباطه باستراتيجيات التعلم والأداء الأكاديمي في كلية الطب كولكاتا، الهند

الخلفية: الإجهاد جزء لا مفر منه ومهم من كونك طالب طب. تستكشف الدراسة الحالية التوتر المتصور بين طلاب الطب الجامعيين وارتباط التوتر باستراتيجيات التعلم والأداء الأكاديمي.

الطريقة: أجريت هذه الدراسة الوصفية المقطعية في كلية الطب كولكاتا، الهند. كان السكان المستهدفون هم طلاب الطب الجامعيين من المرحلة الثانية والثالثة. تم قياس استراتيجيات التعلم للمشاركين باستخدام استبيان المناهج المعدلة لتعلم الطب (**mALM**). تم تحديد مستوى التوتر لدى الطلاب من خلال مقياس الإجهاد المدرك (**PSS 10**). تم قياس الأداء الأكاديمي من حيث النسب المئوية المسجلة في امتحان بكالوريوس الطب والجراحة الأخير. تم تحليل البيانات باستخدام **SPSS** الإصدار ٢١. وتم حساب التكرارات والنسب المئوية للمتغيرات الفئوية وتم حساب مقاييس النزعة المركزية والتشتت للمتغيرات المستمرة. تم اختبار فروق المتوسط بواسطة عينات مستقلة اختبار **t**. تم اختبار الارتباط عن طريق اختبار الارتباط بيرسون.

النتائج: كان هناك ١٣٦ طالبا مسجلين في الدراسة؛ وسجل ١٢٩ (٩٤,٨٪) طالبًا أعلى من ٦٠٪ في امتحان بكالوريوس الطب والجراحة الأخير. كان متوسط درجة **PSS** للمشاركين ١٩,٤ ± ٤,١٧. وُجد أن مائة وثلاثة وعشرون طالبًا (٩٠,٤%) يعانون من إجهاد معتدل. كان نهج التعلم العميق أكثر بكثير بالنسبة لطلاب المرحلة الثالثة من بكالوريوس الطب والجراحة (ع = ٠,٠٠٣). ومع ذلك، لم يكن للإجهاد المتصور علاقة ذات دلالة إحصائية مع استراتيجية التعلم (ع = ٠,٩١٦) أو الأداء الأكاديمي للطلاب (ع = ٠,٣٠٩).

الاستنتاجات: وجد أن التوتر المتصور مرتفع بين طلاب الطب الجامعيين في هذه الدراسة. ومع ذلك، لم يتم العثور على أي نمط معين للتعلم أو الأداء الأكاديمي مرتبطًا بالتوتر.

الكلمات المفتاحية: ارتباط البيانات، التعلم، التعليم الطبي

استرس ادراک شده در دانشجویان پزشکی در مقطع کارشناسی و ارتباط آن با استراتژی‌های یادگیری و عملکرد تحصیلی در کالج پزشکی کلکته، هند

زمینه و هدف: استرس بخش اجتناب ناپذیر و مهم دانشجوی پزشکی است. مطالعه حاضر استرس ادراک شده را در بین دانشجویان پزشکی در مقطع کارشناسی و ارتباط استرس با راهبردهای یادگیری و عملکرد تحصیلی را بررسی می کند.

روش: این مطالعه توصیفی – مقطعی در دانشکده پزشکی کلکته هند انجام شد. جامعه هدف، دانشجویان مقطع کارشناسی پزشکی سال دوم و سوم بودند. راهبردهای یادگیری شرکت کنندگان با استفاده از پرسشنامه اصلاح شده رویکردهای یادگیری پزشکی (mALM)اندازه گیری شد. میزان استرس دانشجویان با مقیاس استرس ادراک شده (PSS 10)تعیین شد. عملکرد تحصیلی بر حسب درصدهای کسب شده در آخرین آزمون MBBS اندازه گیری شد. تجزیه و تحلیل داده ها با استفاده از نرم افزار SPSS نسخه ۲۱ انجام شد. برای متغیرهای طبقه بندی فراوانی و درصد و برای متغیرهای پیوسته اندازه گیری گرایش مرکزی و پراکندگی محاسبه شد. تفاوت میانگین ها با استفاده از آزمون t نمونه های مستقل مورد بررسی قرار گرفت. همبستگی با آزمون همبستگی پیرسون مورد آزمون قرار گرفت.

یافته‌ها: ۱۳۶ دانشجو در این مطالعه ثبت نام کردند. از این میان ۱۲۹ دانشجو (۹۴٫۸٪) در آخرین امتحان MBBS خود بیش از ۶۰٪ امتیاز کسب کردند. میانگین نمره PSS شرکت کنندگان ۴/۱۷ ± ۱۹/۴ بود. ۱۲۳ نفر (۹۰/۴٪) از دانشجویان دارای استرس متوسط بودند. رویکرد یادگیری عمیق برای دانشجویان سال سوم پزشکی به طور معنی‌داری (p=0.003) بیشتر بود اما استرس ادراک شده با استراتژی یادگیری (p=0.916) و عملکرد تحصیلی دانشجویان(p=0.309) ارتباط معنی‌داری نداشت.

نتیجه گیری: در مطالعه حاضر استرس ادراک شده در بین دانشجویان پزشکی در مقطع کارشناسی بالا بود. با این حال هیچ سبک یادگیری یا عملکرد تحصیلی خاصی با استرس مرتبط نبود.

واژه‌های کلیدی: همبستگی داده‌ها، یادگیری، آموزش پزشکی

میڈیکل کالج کولکتہ، انڈیا میں انڈرگریجویٹ میڈیکل طلباء اور سیکھنے کی حکمت عملیوں اور تعلیمی کارکردگی کے ساتھ اس کی وابستگی کے درمیان تناؤ کا احساس

پس منظر: تناؤ میڈیکل کے طالب علم ہونے کا ایک ناگزیر اور اہم حصہ ہے۔ موجودہ مطالعہ انڈرگریجویٹ میڈیکل طلباء کے درمیان سمجھے جانے والے تناؤ اور سیکھنے کی حکمت عملیوں اور تعلیمی کارکردگی کے ساتھ تناؤ کے باہمی تعلق کو تلاش کرتا ہے۔

طریقہ: یہ وضاحتی کراس سیکشنل مطالعہ میڈیکل کالج کولکتہ، انڈیا میں کیا گیا تھا۔ ہدف آبادی فیز II اور III کے انڈرگریجویٹ میڈیکل طلباء تھے۔ شرکاء کی سیکھنے کی حکمت عملیوں کو سیکھنے کی میڈیسن (mALM) کے سوالنامے میں ترمیم شدہ نقطہ نظر کا استعمال کرتے ہوئے ماپا گیا۔ طلباء کے تناؤ کی سطح کا تعین پرسیوئڈ اسٹریس اسکیل (PSS 10) سے کیا گیا تھا۔ تعلیمی کارکردگی کی پیمائش ایم بی بی ایس کے آخری امتحان میں حاصل کردہ فیصد کے حساب سے کی گئی۔ SPSS ورژن ۲۱ کا استعمال کرتے ہوئے ڈیٹا کا تجزیہ کیا گیا۔ متغیر متغیرات کے لیے تعداد اور فیصد کا حساب لگایا گیا اور مسلسل متغیرات کے لیے مرکزی رجحان اور بازی کے اقدامات کا حساب لگایا گیا۔ اوسط کے فرق کو آزاد نمونوں کے ٹی ٹیسٹ کے ذریعے جانچا گیا۔ پیئرسن ارتباط ٹیسٹ کے ذریعہ ارتباط کا تجربہ کیا گیا۔

نتائج: مطالعہ میں ١٣٦ طلباء نے داخلہ لیا تھا۔ اور ١٢٩ (٩٤,٨%) طلباء نے اپنے آخری MBBS امتحان میں ٦٠% سے زیادہ نمبر حاصل کیے تھے۔ شرکاء کا اوسط PSS سکور ١٩,٤ ± ٤,١٧ تھا۔ ایک سو تئیس (٩٠,٤%) طلباء کو درمیانے درجے کا تناؤ پایا گیا۔ ایم بی بی ایس فیز III کے طلباء کے لیے گہری سیکھنے کا طریقہ نمایاں طور پر زیادہ تھا (p=0.003)۔ تاہم، سمجھے جانے والے تناؤ کا سیکھنے کی حکمت عملی (p=0.916) یا طلباء کی تعلیمی کارکردگی (p=0.309) سے کوئی خاص تعلق نہیں تھا۔

نتیجہ: موجودہ مطالعہ میں انڈر گریجویٹ میڈیکل طلباء کے درمیان ذہنی تناؤ زیادہ پایا گیا۔ تاہم، کوئی خاص سیکھنے کا انداز یا تعلیمی کارکردگی تناؤ سے وابستہ نہیں پائی گئی۔

مطلوبہ الفاظ: ڈیٹا، لرننگ، میڈیکل ایجوکیشن کا ارتباط

INTRODUCTION

Stress is an inevitable part of being a student; it motivates and stimulates learning. However, chronic, intense stress can arouse feelings of fear, uselessness, anger, incompetence and guilt. If not managed correctly, stress can lead to depression, substance abuse, relationship problems, anxiety, and suicide (1). High levels of stress have been reported among medical students which can obstruct their learning by impairing their concentration, problem-solving and decision-making skills (2, 3). Dyrbye et al. proposed a literature-based interactive model of perceived stress among medical students that identified personal and medical factors as determinants of student distress. Personality traits or coping strategies, setbacks in personal life, workload, curriculum, ethical conflicts, impaired academic performance, a decline in empathy or medical errors as well as their interaction were viewed as determinants and consequences of the stress level (4). Among curriculum-related factors, Burger and Scholz have reported an association between medical students' learning styles and emotional well-being; however, a study from Thailand reports no association between learning style and perceived stress (5,6).

Exploring the association between learning style and stress becomes complicated in absence of any consensus to measure learning styles. Different instruments have been used to assess the learning styles of medical students, the common ones being Kolb's experiential learning theory, visual-aural-read/write-kinesthetic (VARK) questionnaire, Honey and Mumford questionnaire, standard approaches and study skills inventory for students (ASSIST) questionnaire, index of learning styles questionnaire, Biggs's Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) and modified approaches to learning questionnaire (mALM) (5-11).

Conflicting result is reported for the association between perceived stress and academic performance as well. While a higher level of stress was found to be associated with poor academic performance among medical students of Lahore, another study from Sri Lanka reports no such association (12,13).

The interplay between perceived stress, learning approaches and academic performance remains unclear. The use of too many complex research instruments makes it difficult to draw a conclusion from similar studies. The present researchers aimed to further explore stress, learning and percentage of marks with validated, simplified, and sensitive questionnaires with results that can be compared.

At the institutional level, studies like ours can help to identify problem learners and establish intervention programs for medical students. This may also help to modify teaching methodology to enhance students' learning abilities.

The primary objective of this research was to identify the level of perceived stress and to find the correlation between perceived stress with learning strategies and the academic performance of the respondents. The secondary objective was to find the association between subscales of learning styles with the gender, academic phase, medium of education in school and board of schooling and academic performance.

METHODS

Participants and procedures

This descriptive cross-sectional online survey was carried out at Medical College Kolkata, India. The study inclusion criterion was undergraduate medical students of phases II and III studying at this college. As this study was an online survey, students with unavailable or erroneous email IDs were excluded.

Considering a-priori perceived stress level of 46.3% among undergraduate medical students as reported in a study by Chowdhury et al, (14) α of 0.05% and absolute error of 10%, the sample size was calculated as 96. Considering 25% non-response for online survey, the sample size was corrected to 121. Data about participants' demographics and educational backgrounds were collected using a self-reported online questionnaire using google forms ®. Link to the form was mailed to 160 randomly selected students from a list of eligible students, using computer-generated random numbers. Responses were accepted from the dates 27.04.22 to 15.05.22. Reminders were sent twice to improve the response rate. The form asked for information on demographic variables, learning strategy, academic performance, and perceived stress.

According to the new Graduate Medical Education Regulations (GMER) implemented in India since 2019, the Bachelor of medicine and surgery (MBBS) program comprises of three phases viz phase I, II, III with a summative MBBS exam at the end of each phase. Phase II students had passed 1st MBBS exam in anatomy, biochemistry and physiology; while phase III students had passed 2nd MBBS exam in pathology, pharmacology, microbiology and forensic medicine and toxicology. The pass marks for these exams are 50%, 75% or higher is excellent performance and recognised as honours. The exams are conducted by the West Bengal University of Health Sciences (WBUHS) (15).

Measurement

Learning strategy was measured using the 19-item mALM questionnaire. The mALM questionnaire composed of eight items related to deep strategies (DS) – (four items for "Relating Ideas" and four items for "Understanding") and 11 items related to surface strategies (SS)- (seven items for "Minimizing Scope of Study" and four items for "Memorization"). All the items were scored using a Likert scale ranging from one to five, representing "strongly disagree" to "strongly agree," respectively. The score for each deep and superficial strategy was calculated separately by taking the average score of all items included under the strategy.

Confirmatory factor analysis (CFA) gave a two-factor model of items related to deep strategies and surface strategies. The factor loading values ranged from 0.59 to 0.92, suggesting suitable factor loadings. The values of average variance explained (AVE) and composite reliability (CR) for two factors of mALM ranged from 0.52 to 0.79 and 0.77 to 0.95, respectively, demonstrating acceptable construct validity and reliability (11).

The stress level of the students was determined by the 10-item perceived stress scale (PSS) which is a global measure

of stress that individuals experience in their daily lives. Student's response was coded and scored on a Likert scale ranging from zero to four, representing "never" to "very often". Scores ranging from 0-13 were considered low stress, scores ranging from 14-26 moderate stress, and scores ranging from 27-40 were high perceived stress (16). Validation study on PSS has shown this instrument to be valid among medical students with Cronbach's alpha of 0.865 indicating good internal consistency (18).

Academic performance was measured in terms of the percentage of marks scored in the last MBBS examination conducted by WBUHS.

Variables included in the study were:

Outcome variables- Three categories based on perceived stress- low stress, moderate stress and high stress and 2 categories based on learning strategy- deep learning strategy and superficial learning strategy, for which co-variability was tested with academic performance;

Predictor variables- Age, sex, academic performance, year of MBBS study, residence, living arrangement, medium of schooling, academic board of schooling, parental education, and occupation.

Data analysis

Data were analysed using SPSS version 21. Missing data were excluded from the analysis. Frequencies and percentages were calculated for categorical variables and mean and standard deviation (SD) was calculated for PSS and mALM scores. Differences of means across subgroups for DS and SS were tested by independent samples t-test. Correlation between learning approach, stress and academic performance was tested by Pearson correlation test.

RESULTS

A total of 136 students were included in the final analysis which was a response rate of 85%. The socio-demographic characteristics of the participants have been described in table 1. The age group of the students ranged between 19 and 28 with a mean age of 21.26 and a standard deviation of 1.67.

In this study 123 (90.4%) students were found to have moderate stress, 9 (6.6%) had low stress, and 4 (2.9%) students had high stress (Figure 1).

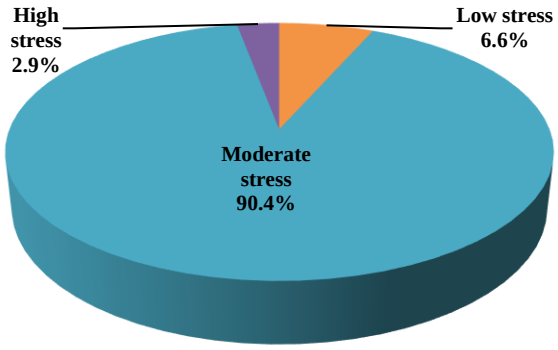

Figure 1. Distribution of study participants according to their perceived stress level (n=136)

Table 1. Socio-demographic profile of respondents (n=136)

Characteristics		Frequency (Percentage)
Gender	Male	93 (68.4)
	Female	43 (31.6)
Year of MBBS study	Phase II	99 (72.8)
	Phase III	37 (27.2)
Religion	Hindu	116 (85.3)
	Muslim	17 (12.5)
	Christian	3 (2.2)
Category	General	91 (66.9)
	OBC	19 (14.0)
	SC	20 (14.7)
	ST	6 (4.4)
State of origin	West Bengal	132 (97.1)
	Outside West Bengal	4 (2.9)
Residence	Urban	87 (64.0)
	Rural	49 (36.0)
Living accommodation	Living with parents	50 (36.8)
	Hostel	77 (56.6)
	Rental	9 (6.6)
Type of family	Nuclear family	118 (86.8)
	Joint family	18 (13.2)
Father's education	Graduation and above	106 (77.9)
	Below Graduation	30 (22.1)
Mother's education	Graduation and above	78 (57.4)
	Below Graduation	58 (42.6)
Choice of medicine	By own interest	100 (73.5)
	Parental influence	16 (11.8)
	Random choice	20 (14.7)
Medium of education in school	English	84 (61.8)
	Bengali	51 (37.5)
	Hindi	1 (0.7)
Board of schooling	State board	59 (43.4)
	CBSE	46 (33.8)
	CISCE	30 (22.1)
	International board	1 (0.7)
Parents in medical profession	Yes	22 (16.2)
	No	114 (83.8)
Relationship status	Single	130 (95.6)
	Engaged	6 (4.4)

MBBS-Bachelor of Medicine and Surgery
OBC- Other backward caste, SC-Schedule Caste, ST- Schedule tribe
CBSE-Central Board of Secondary education
CISCE-Council for Indian School Certificate Exam

The mALM and PSS scale variables were tested for normality of distribution by Kolmogorov-Smirnov test and the variables were found to be normally distributed. This allowed the present researchers to conduct further parametric analysis. The mean LS score of the participants on the mALM scale was 64.58± 5.74. The mean and SD of PSS score was 19.4 and 4.17. The internal consistency of DS, SS, LS and perceived stress scale (PSS) as measured by Cronbach's alpha were 0.81, 0.65, 0.57, and 0.67 respectively.

Regarding academic performance, out of 136 students, 128 (94.8%) scored above 60 % in their last MBBS examination, while 7 (5.2%) students reported having obtained ≥75% marks. In this study perceived stress had no significant correlation with either LS (Pearson Correlation= -.009, p=0.916) or academic performance of students (Pearson Correlation= -.088, p=0.309) (Table-2).

The independent sample t-test for difference of mean of DS and SS with phases of MBBS, gender and academic factors is shown in Table 2. MBBS Phase II students were less likely to have a deep learning approach with a significantly lower item mean (p=0. 003). Surface learning on the other hand was higher for students coming from state boards (as opposed to pan-Indian boards) and lower for those with English medium schooling. However, either DS or SS means did not differ significantly with participants' gender or academic performance (Table-3).

Table 2. Correlation between perceived stress of MBBS students with their learning approaches and academic performance (n=136)

Characteristics	Correlation statistics	Overall learning style	Deep learning approach	Surface learning approach	Academic performance
Perceived stress	Pearson Correlation	-0.009	-0.119	0.079	-0.088
	Sig. (2-tailed)	0.916	0.169	0.362	0.309

Table 3. Difference of mean for subscales of learning approaches between gender, phases of MBBS , board and medium of education in school and academic performance subgroups (n=136)

	Number	Item mean	SD	t	p	95%CI	SE
Deep learning approach score							
Male	93	4.0	0.472	-.216	.829	-.195,.157	.089
Female	43	4.02	0.503				
Surface learning approach score							
Male	93	2.98	0.478	1.028	.306	-.081,.258	0.086
Female	43	2.89	0.434				
Deep learning approach score							
MBBS phase II	99	3.94	0.476	-3.051	.003**	-.451, -.096	0.09
MBBS phase III	37	4.21	0.437				
Surface learning approach score							
MBBS phase II	99	3.00	0.435	1.65	0.101	-.029,.323	0.089
MBBS phase III	37	2.85	0.528				
Deep learning approach score							
State board	59	3.96	0.464	-1.026	0.307	.249,.079	0.083
Others(CBSE/ CISCE)	77	4.05	0.491				
Surface learning approach score							
State board	59	3.06	0.431	2.357	.02*	.029,.343	.079
Others(CBSE/ CISCE)	77	2.87	0.476				
Deep learning approach score							
English medium	84	4.06	0.484	1.393	0.166	-.049,.285	.084
Others	52	3.94	0.469				
Surface learning approach score							
English medium	84	2.87	0.479	-2.645	.009**	-.371, -.053	.080
Others	52	3.09	0.412				

Table 3. Continued

	Number	Item mean	SD	t	p	95%CI	SE
Deep learning approach score							
Low performer	72	3.94	0.52	-1.750	.082	-.305,.019	.082
High performer	64	4.09	0.422				
Surface learning approach score							
Low performer	72	3.00	0.459	1.246	0.215	-.058,.257	.08
High performer	64	2.90	0.47				

* $p < 0.05$; ** $p < 0.01$ level (2-tailed). SD- Standard deviation, CI- Confidence interval, SE-Standard error

DISCUSSION

This study reports a higher inclination of undergraduate medical students toward a deep learning approach which was significantly more pronounced among phase III MBBS students. Most of the students also had moderate stress on the PSS10 scale. However, stress was neither correlated with their learning approach nor with students' academic performance.

The present study had a higher proportion of male respondents (68.4% versus 54%) compared to a study conducted in Nepal (10). In this study contrary to the present study findings deep approach was lower for higher MBBS levels. The difference could be due to the comparison of 1st and second-year medical students, whereas in the present study the researchers compared 2nd and 4rth year medical students (phase II and phase III in the Indian scenario).

The mean PSS score in this study compared favourably (19.4 versus 19.51) with a study by Behzadnia et al. and also the median stress score of 17 among undergraduate students of UK. (17, 18) Higher perceived stress was reported for health science students compared to agricultural or business streams in an Ethiopian study (19). In the study by Behzadnia et al. deep learning approach was lower among the 2nd year undergraduate medical students compared to the 1st year students but it again increased among the 5th-year undergraduate medical students. In agreement with our study findings, perceived stress was unrelated to learning approaches. Further, they identified social stressors including teaching and learning environment stressors being related to surface learning. Another study among medical students on learning preferences using visual-aural-read/write-kinaesthetic mode (VARK) questionnaire too had no association with PSS score (6). Similar to the present study, learning styles did not differ across gender in a study by Bin Eid A et al. and it was also not related to academic achievement in a study by Taheri M et al. (20, 21).

Instead of PSS, when an instrument perceived medical school stress scale (PMSS), specific for medical students was used; age, gender and PMSS scores emerged as predictors for grades. Nevertheless, PMSS scores had a weak correlation with exam grades (22).

Other than academic pressure at the medical schools the COVID-19 pandemic might have contributed to increased distress among medical students as reported in an Australian study, where 81% of students were concerned about the impact of the pandemic on their study (23).

Limitations of our study were cross-sectional design, inclusion of students from a single medical college and self-reported responses. An entry-level ranking system followed by Indian medical colleges can result in the pooling of meritorious students in the preferred colleges. The present study site was a top-ranked state college and hence could have reported higher adoption of deep learning approach by the respondents.

Even though there is a high prevalence of stress among medical students, which specific factors that contribute to this finding remain unclear. However, it can be concluded from this study that any particular learning approach was not associated with stress. Academic performance was not associated with stress either. Whether a high level of background distress related to the pandemic scenario acts as a confounder needs to be explored by further studies.

Ethical considerations

Ethical issues including plagiarism, informed consent, misconduct, data fabrication and /or falsification, double publication and/ or submission, redundancy, etc. have been completely observed by the authors. The study was approved by the institutional ethics committee with approval number MCH/KOL/IEC/NON-SPON/1300/04/22 dated 06/04/2022. Informed consent was taken from all the participants under the study. Participation was voluntary and participants had every right to refuse or revoke consent without affecting their rights. Confidentiality and anonymity were maintained. This study is solely intended for academic purposes. All tenets of Helsinki declaration on bioethics policy were adhered to.

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