Original Article

Competency-based medical education (CBME) curriculum and its effect on prevalence of anxiety, depression and stress amongst medical undergraduates

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Abstract:

BACKGROUND: A growing body of literature now identifies higher levels of anxiety, depression, and stress among medical students as a distinct mental health domain. The competency-based medical education (CBME) curriculum was introduced to revamp the existing curriculum with an aim to garner constructive impact on the mental health of undergraduate medical students. As such, we sought to draw comparisons between the mental health of medical students, studying the old (2018 batch) and the new (2019 batch) medical education systems in India.

MATERIALS AND METHODS: We designed a survey that contained structured questions pertained to anxiety (HAM-A, GAD-7), depression (HAM-D, BDI), and stress (PSS) amongst medical undergraduate students of 2018 and 2019 batches at the Government Doon Medical College (GDMC), Dehradun, India.

RESULTS: Contrasting the 2018 and 2019 batches, the introduction of CBME resulted in a significant two-fold decrease in moderate anxiety, as exhibited by both HAM-A (6.0 vs 3.0, P = 0.016) and GAD-7 (3.5 vs 1.0, P = 0.037) scales, although no significant change in mild and severe anxiety, and overall depression (BDI: P = 0.05, HAM-D: P = 0.05) or stress (PSS: P = 0.86) was found.

CONCLUSION: The CBME system has made a significant impact on the mental health of undergraduate medical students for anxiety, albeit its effect on depression and stress remains equivocal. Future studies are warranted to compare the effect of CBME in other undergraduate and postgraduate courses across the country to help predict the psychological impact of the newfangled CBME education system.

Keywords:

Anxiety, competency-based medical education (CBME), depression, medical students, stress

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Introduction

The Indian undergraduate medical degree, that is, Bachelor of Medicine and Bachelor of Surgery (MBBS) is one of the most challenging curricula globally, both in terms of syllabi volume and work intensity. Students who pursue this course feel challenged as they are expected to perform well throughout the course's duration—five years, which sometimes has a negative impact on their mental health, as evinced by 358 suicides amongst medical students between 2010 and 2019; approximately 7 out of 10 deceased were less than 30 years of age.[1] A growing body of literature now identifies higher levels of anxiety, depression and stress among

medical students as a distinct mental health domain. For instance, Alvi *et al*.[2] reported that 47.7% students suffered from anxiety, 35.1% depression, and 24.37% faced both, at some point of time during their MBBS tenure. A similarly high level of stress (49.9%) was reported by Oura *et al*.[3] amongst 475 medical students, with as many as 20.8% having severe stress irrespective of their age and gender. Altogether, MBBS students often have their work cut out when they find themselves in the vicious cycle of mood disturbances, peer pressure, cut-throat competition and fear of missing out at various junctures during their course.

To address the shortcomings related to the mental health of students in the current education system, the National Medical Commission (NMC), the governing body of the medical education system in India, has conceptualized the idea of a competency-based medical education (CBME) system. They define it as an outcome-based approach to design, implement, assess, and evaluate students based on organizing a framework of competencies rather than the existing traditional model where educational objectives rely profoundly on predetermined competencies. These competencies are framed with an intent to amass teaching and assessment methods which can facilitate progressive development.[4] Specifically, CBME introduced a one-month foundation course before MBBS to nurture students for the Indian health care system, medical ethics and to impart training in language, communication, and time management. CBME's novel attitude, ethics and communication (AETCOM) module is meant to inculcate the knowledge, attitudes, and values that are essential to function appropriately and effectively as a first-contact physician for the community and being relevant at the same time globally. They have integrated horizontal and vertical teachings to allow students to get a better understanding and application of theoretical knowledge, and introduced clinical learning from first year onwards to learn the implications of their acquired knowledge base. The revised course is offered in fifty-two months in lieu of fifty-four months, reducing the duration of the second year of MBBS to one year (previously it was one and a half), and thus shuffling forensic medicine and preventive and social medicine one year ahead, that is, to the third year–I and –II respectively. Together, the new system is aimed at improving medical education in terms of learning and assessment, clinical applicability, and mitigating academic burden.[5]

Aims and hypothesis

The newly introduced CBME is expected to ameliorate mood symptoms amongst medical students. To the best of our knowledge, no previous study utilized psychiatric measurement scales to link mental health with the MBBS curriculum. As such, our study sought to draw comparisons between the mental health of medical students studying the old system (2018 batch) and the new system (2019 batch). Specifically, the aims were (1) to contrast the frequency distribution of mental health scales (HAM-A, GAD-7, BDI, HAM-D, and PSS) amongst students of 2018 and 2019 batches, and (2) to compare and analyze these scales using suitable statistical techniques.

Materials and Methods

Study design and setting

This cross-sectional study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement, that is, the guidelines for reporting observational studies.

We incorporated a cross-sectional, observational study design to carry out this survey. Data was collected by using a Google Form–based questionnaire which was administered through a WhatsApp invitation to complete an electronic survey. It contained structured questions pertaining to anxiety, depression, and stress among medical undergraduates at Government Doon Medical College (GDMC) in North India. It comprised of validated scales for anxiety, depression, and stress [Supplementary File 1].

Study participants and sampling

The students of 2018 batch studying as per the old system and 2019 batch studying as per the new CBME system at GDMC were included for the study. Out of an approximately 350 students attending the school, a total of 214 (61.14%) responded to the survey by the collection date of 30 May 2021. A purposive sampling technique was used and sample size was calculated using the G*Power software; the sample size for this study was calculated as 210–225 participants in order to reach the desired statistical power: $\beta > 0.80$; $\alpha < 0.05$ [Supplementary File 2]. Recruitment: MBBS students were recruited from the GDMC between 15 March 2021 and 25 March 2021. Inclusion Criteria: Both English- and Hindi-speaking students aged 17 to 25 years of both genders attending first- and second-professional classes at the GDMC were included. Exclusion Criteria: Students who habitually indulged in substance use and/or having bipolar disorders, severe conduct disorder and autism spectrum disorders were excluded from the study.

Data collection tools
1. Anxiety
a) The Hamilton Anxiety Rating Scale (HAM-A): It consists of 14 items assessing symptoms related to anxiety. Each item of HAM-A is scored between 0 (not present) to 4 (severe); the final score ranges from 0 to 56. A score of <17 indicates mild anxiety, 18–24 mild-to-moderate anxiety, and

25–30 moderate-to-severe anxiety. Total scores were employed in the final analysis with higher scores reflecting severe anxiety

b) Generalized Anxiety Disorder Assessment (GAD-7): The initial scale was developed as a thirteen-item scale but was subsequently reduced to a seven-item scale called the GAD-7. The seven-item scale reports scores from 0 to 3 on all the questions and investigates how often the patient gets into trouble as assessed by seven different anxiety symptoms during the last two weeks. The response options include "not at all," "several days," "more than half of the days," and "almost daily," scored as 0, 1, 2, and 3, respectively. Scores of 5, 10, and 15 are correspondingly taken as cut-off points for mild, moderate, and severe anxiety, respectively. GAD-7 assumes an excellent sensitivity of 89% and a specificity of 82% for generalized anxiety disorders.

2. Depression

a) Hamilton Depression Rating Scale (HAM-D): It was used to identify and facilitate the measurement of the depth of depression. HAM-D consists of twenty-one items (seventeen of them used in this study) to assess symptoms related to depression. Nine items in HAM-D are scored between 0 and 4, and the other eight are scored between 0 and 2, with a total score range between 0 and 52. The severity of depression is classified as per the patient score result into normal (0–7), mild depression (8–13), moderate depression (14–18), severe depression (19–22), and very severe depression ($\geq$23). The total scores were used in the final analysis with higher scores suggesting severe depression.

b) Beck Depression Inventory (BDI): To measure the degree of depression, we used the 21-item Beck Depression Inventory scale. Each question inquires the respondent's particular symptoms and changes in mood in the past week on a four-point scale (from 0 to 3), with a total range of 0 to 63. Scores of 1–10 are interpreted normal, 11–16 as mild mood disturbance, 17–20 as borderline clinical depression, 21–30 as moderate depression, 31–40 as severe depression), and above 40 as extreme depression.

3. Stress

a. Perceived Stress Scale (PSS): To measure stress, we used the Perceived Stress Scale (PSS). It is a measure of the "degree to which situations in one's life appraised as stressful". It taps on how unpredictable, uncontrollable, and overloaded respondents find their lives, and also queries about current level of experienced stress. The questions in this scale ask about the feelings and thoughts during the last month. Each item on the PSS is rated on a five-point scale, ranging from never stressful (0) to almost always stressful (4).

PSS-10 scores are obtained by reversing the scores on the four positive items; for example, 0 = 4, 1 = 3, 2 = 2, etc., and then summing across all 10 items. Scores around 13 are considered average whereas scores of 20 or higher are considered as high stress.

Ethical consideration and consent to participate

A self-explanatory invitation to participate was presented electronically to each of the participants. All of the participants gave their informed consent to participate in the research outlined in the consent form with full knowledge of possible benefits and risks of participation. Participants consented by ticking "Agree", indicating their agreement to provide their feedback for this research study. The study was done within the regulations codified by the Declaration of Helsinki and was approved by the Institutional Review Board (IRB) of Government Doon Medical College, Dehradun, Uttarakhand, India (IRB# IEC/GDMC/2020/76).

Statistical analysis

Statistical Package for the Social Sciences (SPSS) version 27.0 version for Windows was used for these analyses. The data of sample size 214 were first qualitatively assessed using demographic analysis and normality assumptions (Kolmogorov–Smirnov and Shapiro–Wilk tests) and then analyzed quantitatively using Mann–Whitney U test contrasting the overall median scores of the implicated mental health scales.

Results

Demographic analysis

A dataset of 214 students of 2018 and 2019 batches was analyzed (49.5% male and 50.5% female). Overall, the sample consisted mostly of students in the age group of 19–22 years.

Normality assumptions

The statistical results for the normality for both groups (2018 and 2019 batches) showed significant departures from normality for all five measured mental health scales as the results of the Kolmogorov–Smirnov (P) and Shapiro–Wilk (P) tests were significant ($P < 0.001$). However, as the sample size in each group was more than 30, according to the central limit theorem, instead of relying on the Kolmogorov–Smirnov and Shapiro–Wilk tests, we used advanced quantification methods such as histogram and probability plots to confirm normality. Together, the data was found to be skewed to the left side and was thus handled using the Mann–Whitney U test (median scores).

Anxiety

Between the 2018 and 2019 batches, we found that the 2019 batch had a higher prevalence of mild anxiety on

both HAM-A (87.87 vs 91.21) and GAD-7 (54.54 vs 72.97), but a significant two-fold reduced prevalence for moderate anxiety, again both on HAM-A (10.60 vs 5.40) and GAD-7 (43.93 vs 22.97) scales [Table 1]. To further explore its potential effect, a non-parametric analysis was performed, which revealed that the 2019 batch exhibited an overall reduced anxiety than the 2018 batch, as exhibited by the significant decrease in median scores (HAM-A: 6.0 vs 3.0, $P = 0.016$ and GAD-7: 3.5 vs 1.0, $P = 0.037$) [Figure 1].

Depression
Contrasting the 2018 and 2019 batches, there was no change in mild, moderate, and severe depression on BDI, but a slight, non-significant increase in both mild (92.42 vs 94.59) and moderate depression (3.03 vs 3.37) using HAM-D scale in both the batches [Table 1]. However, the non-parametric analysis using Mann–Whitney U test revealed similar median scores for 2018 and 2019 batches both on the BDI (1.0 vs 1.0, $P = 0.05$) and HAM-D scales (2.0 vs 2.0, $P = 0.05$) [Figure 1].

Stress
As presented in Table 1, comparing the 2018 and 2019 batches, there was a small increase in both

Table 1: Analysis of scores of scales of anxiety (HAM-A, GAD-7), depression (HAM-D, BDI), and stress (PSS) for batches 2018 and 2019

Mental Health Scales	Batch - 2018 (Frequency %)	Batch - 2019 (Frequency %)
HAM-A		
Mild	87.87	91.21
Moderate	10.60	5.40
Severe	1.51	3.37
GAD-7		
Mild	54.54	72.97
Moderate	43.93	22.97
Severe	01.51	01.51
BDI		
No	100	100
Mild/Moderate	0	0
Severe	0	0
HAM-D		
Mild	92.42	94.59
Moderate	3.03	3.37
Severe	4.54	2.02
PSS		
Low	12.12	16.89
Moderate	83.33	79.05
High	4.54	3.05

HAM-A (mild anxiety=8-14; moderate=15-23; severe = ≥24); GAD-7 (Cutoff points of 5, 10, and 15 might be interpreted as representing mild, moderate, and severe levels of anxiety on the GAD-7, respectively); BDI (measures of 0-9 indicates that a person is not depressed, 10-18 indicates mild-to-moderate depression, 19-29 indicates moderate-to-severe depression and 30-63 indicates severe depression.); HAM-D (10-13 indicates mild anxiety; 14-17 mild-to-moderate; >17 moderate-to-severe); PSS (0-13 indicates low stress; 14-26 moderate stress; 27-40 high perceived stress)

low (12.12 vs 16.89) and moderate (83.33 vs 79.05) PSS scores in contrast to a decrease in high PSS scores (4.54 vs 3.05). However, follow-up, non-parametric Mann–Whitney U test analysis found these differences to be non-significant ($P = 0.86$).

Discussion

In our study, we observed that the CBME system made a significant impact on the mental health of undergraduate medical students for anxiety, albeit its effect on depression and stress remained equivocal.

Anxiety
We observed that both HAM-A and GAD-7 scales reported that symptoms of anxiety were more prevalent in the 2018 batch than in the 2019 batch, with most students perceiving these symptoms in the mild-to-moderate range [Table 1]. Our findings are in line with those of Junaid *et al*.[6] and Alvi *et al*.[2] who observed that anxiety prevailed amongst 40% and 47.7% medical students respectively. Also, a point to note is that higher year of study and lower academic grades were found to be associated with elevated perception of anxiety. In a recent systematic review of 44 observational studies examining anxiety, depression and stress among Indian medical students, it was found that pooled prevalence rate of anxiety as 34.5%.[7] The recently designed CBME, introduced from 2019, presumably altered the examination criteria to reduce the overall burden, and thus resulted in mitigating anxiety levels [Table 1].
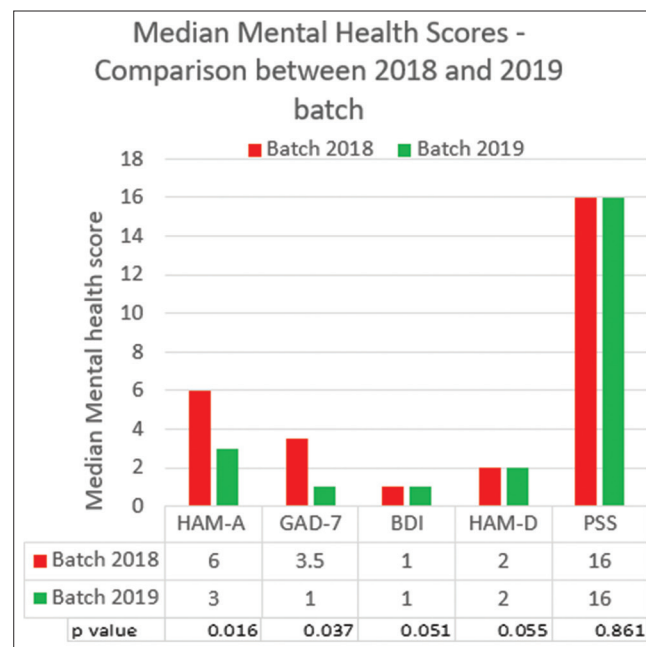

Figure 1: Bar chart comparing median mean scores of HMA-A, GAD-7, BDI, HAM-D, and PSS

Depression

The current study found that the prevalence of moderate-to-severe depression decreased from about 7% to 5% after introduction of CBME; however, HAM-D showed that depression was still common in the milder form. Surprisingly, BDI scoring reported no evidence of change in moderate or severe depression, which hints at the differential interpretation of measurement scales. Utilizing the BDI, a meta-analysis of 16 studies on depression percentage, reported a wide range of variation, 11.7%–71.3%, in medical students with almost 2/5th of them harboring mild-to-moderate depression. Depression has been seen to be more prevalent in the first year of MBBS as stated in study by Pandey *et al*.[8] who reported higher HAM-D scores in first year MBBS students than second and third year students. Likewise, Puthran *et al*.[9] found that first year students had the highest rate of depression (33.5%) which gradually reduced to approximately 20% in the subsequent years. Interestingly, the current study reported contradictory findings of elevated depression in second year students than the first year students. The improvement in depression score could be attributed to better student involvement and increased interest toward studies in the new system due to integrated and applied teaching and introduction of clinical and case-based material from the first year itself.

Stress

Our study, utilizing PSS, showed that stress was widely prevalent among medical students. Interestingly, we found a minor fall in moderate stress in the 2019 batch. Previous studies have shown a progressive increase of stress symptoms during the first two years of study. Also, stress was found to be greater during the second and third year of study, with academic factors being the major contributor in instigating stress. Supe *et al*.,[10] utilizing the Zung depression scale, reported 73% perceived stress whereas Brahmbhatt *et al*.,[11] using the PSS scale, showed 42.5% stress among medical students. This difference in the perceived stress percentage between the two scales, although in different student groups, could potentially be explained on the basis of perception of significant life events. For instance, two individuals could have the exact same experiences in their lives during a certain time period; however, depending upon their stress perception, the total score could put one of them in the low stress category and the other in the high stress category. The most common sources of stress were related to academic and psychosocial concerns with the standout sources of stress being identified as staying in a hostel, high parental expectations, vastness of syllabus, tests and exams, lack of time, and facilities for entertainment.[12] The recently introduced CBME system aims at improving the academic involvement of medical students and offering a calm assessment environment. Still, we found some ambiguity and equivocalness in the mental health parameters of these students. However, in the long-term once the students and the faculty members get acquainted with the changes and imbibe the novel curriculum well results will get more defined.

Consortium between medical education and mental health

Although medical schools are perceived to have a relaxed and enjoyable environment, in reality they are extremely hectic and competitive, with students experiencing massive stress most of the time; for example, the stress of a long course duration, academic accolades, and consistent performance expectation in clinics. For instance, almost one-third of the medical student fraternity suffers from depression, with a noticeable prevalence of around 30.6%.[13,14] The same paradigm applies for high stress levels as well, which may have negative impact on the cognitive functioning and learning ability of medical school students.[15] This significant rise in depression and stress together over the past two decades often went unnoticed. The MBBS students face a higher toll on mental health compared to their peers.[16] The medical school, which may be thought to have relaxed and enjoyable environment, actually misses that and medical students experience immense pressure, such as the stress of the long duration of schooling, academic pressure and the stress of clinics.[17] A meta-analysis of 167 cross-sectional and 16 longitudinal studies from 43 countries examining the association between medical education and mental health reported 27.2% prevalence of either depressive symptoms or clinically diagnosed depression amongst medical students with almost 11.1% having suicidal ideation and 15.7% seeking psychiatric treatment. Although, prevalence of these symptoms vary as per the country,[18,19] the core determinants of these mood disorders such as age, gender,[14,20] class or grade,[14] ethnicity,[21,22] stage of learning,[23,24] length of schooling,[25] attitude toward future career,[26,27] academic pressure,[28] addictions like smoking and alcoholism,[29] financial pressure and loans remain overly constant across all of these studies.

Study limitations and recommendations

The limitations of our study need to be addressed to best conceptualize our results. Firstly, our findings were generalized to only the first and second year undergraduate medical students and could not be extended to other students. Secondly, the use of online questionnaire to collect data creates both a response bias and a recall bias. Finally, we did not stratify our data based on gender which can potentially skew our results. Also, our study lacked a suitable comparison control group, which may misconstrue our findings, and we considered this limitation whilst

contextualizing our interpretation. Since CBME was implemented nationwide at the same time, we didn't have any other choice than to purposely recruit the 2018 batch as our control group. Our reasoning was that this recruitment was our best possible bet, both in terms of study design methodology and being generalizable across gender and different age groups and batches.

Conclusion

The purpose of this study was to draw comparisons about the mood disorders of MBBS students between the old and new competency-based MCI curriculum comparing data in batches of 2018 (studying per the old system) and 2019 (studying per the new system). Noticeably, we found that the CBME system has been successful in decreasing prevalence of anxiety among early career undergraduate medical students, although ambiguity persists for depression and stress mental health scales that could probably improve with time when both the faculty members and the students adapt better to the revised system. In conclusion, considering the significant outcomes of our study, we believe that we are adequately powered to conclude that the CBME system has had a significant and positive impact on the mental health of undergraduate medical students, at least for anxiety, although we recommend future studies to include more robust comparison group as control. Moreover, the future studies are warranted to compare the effect of CBME in other undergraduate and postgraduate courses across the country to help predict the psychological impact of the newfangled CBME education system.

Ethical consideration

The study was done within the regulations codified by the Declaration of Helsinki and was approved by the Institutional Review Board (IRB) of Government Doon Medical College, Dehradun, Uttarakhand, India (IRB# IEC/GDMC/2020/76).

Availability of data and material

The datasets or any other necessary material can be made available by the corresponding author upon reasonable request.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Conflicts of interest

There are no conflicts of interest.

References

1. Chahal S, Nadda A, Govil N, Gupta N, Nadda D, Goel K, *et al*. Suicide deaths among medical students, residents and physicians in India spanning a decade (2010–2019): An exploratory study using on line news portals and Google database. Int J Soc Psychiatry 2022;68:718-28.
2. Alvi T, Assad A, Ramzan M, Khan FA. Depression and anxiety among medical students. J Coll Physicians Surg Pak 2010;20:122-6.
3. Oura MJ, Moreira AR, Santos P. Stress among Portuguese medical students: A national cross-sectional study. J Environ Public Health 2020;2020:6183757.
4. Frank JR, Snell LS, Cate OT, Holmboe ES, Carraccio C, Swing SR *et al*. Competency-based medical education: Theory to practice. Med Teach. 2010;32 (8):638-45. doi: 10.3109/0142159X.2010.501190. PMID: 20662574.
5. NMC. Competency Based Assessment. 2019. Available from: https://www.nmc.org.in/wp-content/uploads/2020/01/UG-Curriculum-Vol-I.pdf. [Last accessed on 2022 Apr 18].
6. Junaid MA, Auf AI, Shaikh K, Khan N, Abdelrahim SA. Correlation between academic performance and anxiety in medical students of Majmaah university-KSA. J Pak Med Assoc 2020;70:865-8.
7. Sarkar S, Gupta R, Menon V. A systematic review of depression, anxiety, and stress among medical students in India. J Mental Health Hum Behav 2017;22:88-96.
8. Pandey A, Pandey AK, Sureka P, Singh A, Gupta S. Stress and depressive symptoms among undergraduate medical students of different professional years at a Medical College in Northern India- A cross-sectional study. J Clin Diagnostic Res 2021:15:VC01-5.
9. Puthran R, Zhang MW, Tam WW, Ho RC. Prevalence of depression amongst medical students: A meta-analysis. Med Educ 2016;50:456-68.
10. Supe AN. A study of stress in medical students at Seth G.S. Medical College. J Postgrad Med 1998;44:1-6.
11. Brahmbhatt KR, Nadeera VP, Prasanna KS, Jayram S. Perceived stress and sources of stress among medical undergraduates in a private medical college in Mangalore, India. International Journal of Biomedical and Advance Research 2013;4:128-36. Available from: https://doi.org/10.7439/ijbar.v4i2.299.
12. Sreeramareddy CT, Shankar PR, Binu VS, Mukhopadhyay C, Ray B, Menezes RG. Psychological morbidity, sources of stress and coping strategies among undergraduate medical students of Nepal. BMC Med Educ 2007;7:26.
13. Ibrahim AK, Kelly SJ, Adams CE, Glazebrook C. A systematic review of studies of depression prevalence in university students. J Psychiatr Res 2013;47:391-400.
14. Vos T, Allen C, Arora M, Barber RM, Bhutta ZA, Brown A, *et al*. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: A systematic analysis for the Global Burden of Disease Study 2015. Lancet 2016;388:1545-602.
15. Ross S, Cleland J, Macleod MJ. Stress, debt and undergraduate medical student performance. Med Educ 2006;40:584-9.
16. Mao Y, Zhang N, Liu J, Zhu B, He R, Wang X. A systematic review of depression and anxiety in medical students in China. BMC Med Educ 2019;19:327.

17. Fawzy M, Hamed SA. Prevalence of psychological stress, depression and anxiety among medical students in Egypt. Psychiatry Res 2017;255:186-94.

18. Brokalaki H, Matziou V, Thanou J, Zirogiannis P, Dafni U, Papadatou D. Job-related stress among nursing personnel in Greek dialysis units. EDTNA ERCA J 2001;27:181-6.

19. Antoniou AS, Cooper CL, Davidson MJ. Levels of job dissatisfaction and work-related stressors experienced by medical doctors in Greek hospitals. J Compassionate Health Care 2016;3:4.

20. Hori D, Tsujiguchi H, Kambayashi Y, Hamagishi T, Kitaoka M, Mitoma J, *et al*. The associations between lifestyles and mental health using the General Health Questionnaire 12-items are different dependently on age and sex: A population-based cross-sectional study in Kanazawa, Japan. Environ Health Prev Med 2016;21:410-21.

21. Wang YH, Shi ZT, Luo QY. Association of depressive symptoms and suicidal ideation among university students in China. Medicine 2017r; 96:e6476.

22. Bore M, Kelly B, Nair B. Potential predictors of psychological distress and well-being in medical students: A cross-sectional pilot study. Adv Med Educ Pract 2016;7:125-35.

23. Moutinho IL, Maddalena N de CP, Roland RK, Lucchetti AL, Tibiriçá SH, Ezequiel O da S, *et al*. Depression, stress and anxiety in medical students: A cross-sectional comparison between students from different semesters. Rev Assoc Med Bras (1992) 2017;63:21-8.

24. Shi M, Liu L, Wang ZY, Wang L. The mediating role of resilience in the relationship between big five personality and anxiety among Chinese medical students: A cross-sectional study. PLoS One 2015;10:e0119916.

25. Kumar SG, Kattimani S, Sarkar S, Kar S. Prevalence of depression and its relation to stress level among medical students in Puducherry, India. Ind Psychiatry J 2017;26:86-90.

26. Waqas A, Rehman A, Malik A, Muhammad U, Khan S, Mahmood N. Association of Ego defense mechanisms with academic performance, anxiety and depression in medical students: A mixed methods study. Cureus 2015;7:e337.

27. van Venrooij LT, Barnhoorn PC, Giltay EJ, van Noorden MS. Burnout, depression and anxiety in preclinical medical students: A cross-sectional survey. Int J Adolesc Med Health 2015;29:/j/ijamh. 2017.29.issue-3/ijamh-2015-0077/ijamh-2015-0077.xml. doi: 10.1515/ijamh-2015-0077.

28. Romo-Nava F, Tafoya SA, Gutiérrez-Soriano J, Osorio Y, Carriedo P, Ocampo B, *et al*. The association between chronotype and perceived academic stress to depression in medical students. Chronobiol Int 2016;33:1359-68.

29. Piumatti G. Motivation, health-related lifestyles and depression among university students: A longitudinal analysis. Psychiatry Res 2018;260:412-7.