ORIGINAL RESEARCH

# Learning Environment Quality for Medical Students at Umm Al-Qura University: A Comprehensive Study on Stressors, Sources, and Solutions After Introduction of a New Bachelor of Medicine and Bachelor of Surgery (MBBS) Curriculum

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**Objective:** Due to introduction of a new curriculum and the related stressors that medical students might encounter, we aimed to assess the quality of the students' learning environment across academic years at Umm Al-Qura University (UQU), by evaluating stress levels, their sources, and impacts on students, to help improve the quality of learning environment and protect students from personal and academic burnout.

**Methods:** We conducted a descriptive cross-sectional study in August and September of 2020 on 572 students enrolled in the new Bachelor of Medicine and Bachelor of Surgery (MBBS) curriculum at UQU. All statistical analyses were performed using SPSS software and two-tailed tests.

**Results:** In total, 46.5% of participants encountered severe stress levels during their studies at UQU. In term of stressor sources, the highest prevalence of severe stress was found among students who lacked learning resources (68.8%), followed by those who complained of ambiguity in teaching, learning, and assessment strategies (64.1%). Self-study strategy issues (58.4%) and difficulty in reading textbooks (58.2%) also ranked high. Anxiety was often reported by the students as an impact of stress (62.9%), followed by mood swings (60%). Severe stress levels showed a statistically significant relationship to gender, being highest among females (P = 0.001). For a solution to manage the stress, 79% of the students suggested a supportive learning environment and identification of students' struggles at early stages.

**Conclusion:** Almost half the medical students were severely stressed after the new curriculum was introduced. Therefore, professors and universities should look out for potential stressors and help students overcome them. Universities can also help by offering counseling services to students, improving the student tutoring system, providing appropriate learning environment and resources, and including stress management courses as a part of the overall curriculum.

**Keywords:** medical students, stress, curriculum change, learning environment, teaching styles, medical school

## Introduction

Stress is a mental, emotional, or physical response to environmental challenges and threats that cause mental or physical tension.[1] In particular, the educational environment may impose stress challenges. Slight stress is normal and may increase productivity in certain individuals. However, extremely high levels of stress experienced over a long period can cause significant mental and physical issues, such as

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poor academic performance, reduced commitment, stress-related anxiety, depression, drug usage, and even suicidal thoughts.[2,3]

Tertiary education has always been considered a stressful environment for students. Medical education adds to an already stressful environment.[4,5] Medical students encounter many stressors during their journey to achieve their goals;[5] these include an extensive medical curriculum, information overload, long study hours, high academic and family expectations, competition, and frequent and varied examinations.[3] Several studies have reported moderate to high levels of stress among medical students in different countries worldwide, including 91.1% in India,[6] 84.5% in Pakistan,[7] 83.5% in Thailand,[8] and 49% in Malaysia.[9] In Saudi Arabia, stress was reported in Imam Abdulrahman Bin Faisal University, Dammam, at 67.9% in 2018,[5] in Rabigh Medical College, Jeddah, at 59.2% in 2015,[3] in Umm Al-Qura University (UQU), Makkah, at 70.9% in 2015,[10] and in King Saud University, Riyadh, at 63% in 2011.[11] A previous study performed at UQU suggests the causes of distress to be the following factors: large volumes of information that must be retained, students' academic competition, grade point average (GPA), and fear of failure. These factors may be accentuated in the preclinical years, when coursework units are more theoretical.[10] Another study at UQU medical school found that the majority of students were dissatisfied with the passive, lecture-based method of teaching and wanted to see introduction of the concepts of active learning and effective studying habits.[10,12]

Therefore, in 2016, the Medicine and Bachelor of Surgery program (MBBS) at UQU was updated. The new curriculum was written in association with the University College London, which has one of the highest-ranking medical schools in the United Kingdom. The MBBS program was updated in content, learning style, and teaching and assessment methods.[13] This update revolutionized the educational experience for the entire staff, as well as students and lecturers. It also bought a new set of challenges to the medical education experience.

After this curriculum update, it became particularly important to detect stress and stressors among medical students. Our understanding of the matter helps us to implement strategies to reduce the incidence of stress and prevent its adverse effects on the students' health, their academic performance, and their subsequent careers. Our theory suggests that, with the new curriculum, students have more responsibilities and thereby more stress.

Studies mentioned earlier covered stress and depression in medical students, but such studies were conducted in the context of the traditional educational system.[6–11] The present study is different, having been conducted to evaluate the learning environment quality after the updated MBBS curriculum was introduced. The aim of the present study was to fill in the gap regarding the effect of the curriculum change on the stress of medical students, as well as identifying the source of that stress and its impact on their quality of life.

## Methods
### Research Design, Population, and Sample Size Determination
We designed this as a descriptive cross-sectional study, performed using a self-administered online questionnaire from August 22, 2020, to September 6, 2020. Ethical approval was obtained from the Biomedical Ethics Committee of the Faculty of Medicine at UQU, Makkah, Saudi Arabia (approval number HAPO-02-K-012-2020-08-430), and we conducted it in accordance with the Declaration of Helsinki. The targeted population is medical students in years 2 to 5 (batch of 2019–2016) who passed the first academic year and are following the updated MBBS curriculum. The first academic year is the foundation year, designed to prepare students for the MBBS program (including intensive English language course and basic sciences). We excluded students who studied at another university before studying at UQU and sixth-year students, who are still studying the traditional MBBS curriculum. The required sample size was calculated, using OpenEpi version 3.0,[14] by considering a population size of approximately 1300 students, confidence interval (CI) level of 95%, anticipated frequency percentage of 50%, and took the design effect of 1. These factors gave us a sample size of 297 participants. In case of any possible data loss, the total sample size required was 340 participants. However, the final collected data comprised 572 students.

### Questionnaire Structure
We designed an online questionnaire using Google Forms and distributed it in English via different platforms on social media. The questionnaire was modified in accordance with previously published studies.[10,12,15–18] The format and content of the questionnaire were reviewed by three experts in the field of family medicine, medical education, and public health to evaluate the relevance, clarity, and adequacy of the questions. There are five main parts. The first part asks participants to

describe their demographic characteristics, including gender, age, year of study, and financial status. The second part is the Kessler Psychological Distress Scale (K10), which assesses the students' stress levels.[16;] It involves 10 questions on emotional states, each with a five-level response scale (from one being "never" to 5 being "always"). The third part assesses the sources of stress, including academic, psychological, health-related, and environmental stress. The fourth part assesses the impact of this stress. Finally, the fifth part discusses students' suggestions and solutions for stress. The questions in the third, fourth and fifth parts consisted of different statements that were inspired by previous studies[10,12,15–18] and revised for appropriateness, relevance, clarity, and adequacy by a panel of experts consisting of three assistant professors: one in family medicine, one in medical education, and one in public health. The participants' opinions of these questions for each section were measured using a 3-point Likert scale ("disagree," "natural," and "agree"). The reliability of the questionnaire items was tested using Cronbach's test and they were observed to be reliable, with a minimum reliability score of 0.68 for "(nominate a question)" and a maximum of 0.82 for "(nominate another question)."

## Statistical Analysis

After data collection from participants who met the eligibility criteria of the study, we coded the data and fed it into the statistical software IBM SPSS version 22. We constructed graphs using Microsoft Excel software. All statistical analyses were performed using two-tailed tests, with an alpha error of 0.05. Statistical significance was set at $P < 0.05$. Frequency and percentages were used to describe the frequency distribution of students' demographic data, stressors, stress levels, impacts, and suggestions to minimize stress. The K10 score was used to assess the level of stress. The scores of the 10 items were summed, yielding a minimum score of 10 and a maximum of 50. Low scores indicate low levels of psychological distress, and vice versa. The overall score is categorized as normal (10–19 points), mild stress (20–24), moderate stress (25–29), and severe stress (30–50). We performed cross-tabulation between different student-related factors and stress levels, to detect the most significant stress determinants based on the Pearson chi-square test or exact probability test (for small frequencies).

## Results
### Participant Characteristics

Table 1 shows participant characteristics. The survey included 572 medical students who completed the questionnaire. Their

**Table 1** General Characteristics for Undergraduate Medical School Students in Saudi Arabia

| Personal Characteristics | | No. | % |
|---|---|---|---|
| **Gender** | Male | 274 | 47.9% |
| | Female | 298 | 52.1% |
| **Age (years)** | 18–21 | 326 | 57.0% |
| | 22–23 | 223 | 39.0% |
| | 24–25 | 23 | 4.0% |
| **Academic year/ batch** | Second year (batch 2019) | 206 | 36.0% |
| | Third year (batch 2018) | 141 | 24.7% |
| | Fourth year (batch 2017) | 168 | 29.4% |
| | Fifth year (batch 2016) | 57 | 10.0% |
| **Income level** | Low | 19 | 3.3% |
| | Average | 482 | 84.3% |
| | High | 71 | 12.4% |

ages ranged from 18 to 25, with a mean age of $21.9 \pm 3.5$ years. Females accounted for 52.1% of respondents. Additionally, 36% of the students were in their second year, 24.7% in the third year, 29.4% in the fourth year, and 10% in the fifth year. The average monthly income was recorded by 84.3% of participants.

## K10 Questionnaire and the Presence of Stress

We carried out the stress assessment (Table 2) using the Kessler10 Psychological Distress instrument. Of the students, 98.6% felt nervous during MBBS courses; 108 students reported this feeling as "always" occurring, 191 students reported it as occurring "most" of the time, and only 80 students reported it "seldomly." Of the students, 94.8% felt tired for no good reason, including 57 students who reported this fatigue as "always" occurring, 180 students who reported it "most" of the time, and 109 students who reported it "seldomly." Of the participants, 93.7% felt that everything was an effort, 90.4% felt restless or fidgety, 88.3% felt depressed, 81.5% felt so sad that nothing could cheer them up, 79.2% felt so nervous that nothing could calm them down, and 68.7% felt worthless. In total, 18.9% of the students had mild stress, 17.1% had moderate stress, and 46.5% had severe stress.

**Table 2** Stress Level Assessment for Students in Bachelor of Medicine and Bachelor of Surgery Program

| Kessler 10 Psychological Distress Instrument | Never | | Seldom | | Sometimes | | Mostly | | Always | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No | % | No | % | No | % | No | % | No | % |
| How often did you feel tired for no good reason? | 30 | 5.2% | 109 | 19.1% | 196 | 34.3% | 180 | 31.5% | 57 | 10.0% |
| How often did you feel nervous? | 8 | 1.4% | 80 | 14.0% | 185 | 32.3% | 191 | 33.4% | 108 | 18.9% |
| How often did you feel so nervous that nothing could calm you down? | 119 | 20.8% | 174 | 30.4% | 141 | 24.7% | 96 | 16.8% | 42 | 7.3% |
| How often did you feel hopeless? | 120 | 21.0% | 146 | 25.5% | 125 | 21.9% | 123 | 21.5% | 58 | 10.1% |
| How often did you feel restless or fidgety? | 55 | 9.6% | 124 | 21.7% | 194 | 33.9% | 128 | 22.4% | 71 | 12.4% |
| How often did you felt so restless that you could not sit still? | 149 | 26.0% | 161 | 28.1% | 162 | 28.3% | 63 | 11.0% | 37 | 6.5% |
| How often did you feel depressed? | 67 | 11.7% | 139 | 24.3% | 149 | 26.0% | 108 | 18.9% | 109 | 19.1% |
| How often did you feel that all activities seemed like an effort? | 36 | 6.3% | 144 | 25.2% | 186 | 32.5% | 130 | 22.7% | 76 | 13.3% |
| How often did you feel so sad that nothing could cheer you up? | 106 | 18.5% | 169 | 29.5% | 150 | 26.2% | 95 | 16.6% | 52 | 9.1% |
| How often did you feel worthless? | 179 | 31.3% | 130 | 22.7% | 117 | 20.5% | 75 | 13.1% | 71 | 12.4% |
| **Overall stress level** | Normal | | Mild | | Moderate | | Severe | | | |
| | 100 (17.5%) | | 108 (18.9%) | | 98 (17.1%) | | 266 (46.5%) | | | |

## Personal Sources of Stress

The most-reported academic sources of stress (Table 3) are self-study strategy issues (58.4%), followed by difficulty in reading textbooks (58.2%), dissatisfaction with exam performance (50.5%), and concern about future careers (49%). Regarding psychological sources of stress, a lack of time management was the most frequently reported (56.5%), followed by less time for family or social life (48.4%), an inability to overcome distractors (36.4%), and peer competition (34.6%). Regarding health-related stress sources, 51.7% of the students reported sleeping difficulty, followed by depression (43.2%), food quality (29.2%), and chronic health problems (16.3%). Regarding environmental sources, uncomfortable classroom chairs was the most selected (61.4%), followed by overcrowded classrooms (39.5%), unclean classrooms (35.7%), and poor ventilation in the classrooms (34.3%).

## Impact of Stress

The most-reported impact of stress (Figure 1) was anxiety (62.9%), followed by mood swings (60%), impaired academic performance (51.9%), insomnia (35.8%), thoughts of changing specialties (27.3%), and bioconcentration (27.1%), while the least reported was developing psychiatric disorders (4.7%).

## Suggested Solutions

Table 4 shows solutions the students suggested for stress management during the MBBS program. Exactly 71.9% of students rated the creation of a nurturing learning environment as an acceptable or excellent suggestion for minimizing stress, and 76% suggested identifying struggling students and giving them individualized support. Furthermore, 79.9% rated it acceptable or excellent for teachers to ensure a supportive learning environment, 73.6% suggested teaching students skills for stress management and promoting self-awareness, and 72.2% suggested encouraging students to promote personal health through regular physical activity and adequate sleep.

## Association Between Stress and Study Variables or Sociodemographic Data

Table 5 and Figure 2 show the determinants of stress in medical school during the MBBS course. Severe stress levels were detected among 60.7% of female students and 31% of male students, with statistical significance (P = 0.001). The highest prevalence of severe stress was detected among students who lacked learning resources (68.8%), followed by those who complained of ambiguity in teaching, learning, and assessment strategies (64.1%), and those who had problems with

**Table 3** Personal Sources of Stress for Bachelor of Medicine and Bachelor of Surgery Students

| Domain | Items | Disagree | Neutral | Agree |
|---|---|---|---|---|
| | | % | % | % |
| Academic sources | Skipping classes | 41.8% | 37.9% | 20.3% |
| | Difficulty reading textbooks | 11.5% | 30.2% | 58.2% |
| | Self-study strategy issues | 9.8% | 31.8% | 58.4% |
| | Teamwork | 22.7% | 50.7% | 26.6% |
| | Dissatisfaction regarding exam performance | 11.2% | 38.3% | 50.5% |
| | Exposure to cadaver dissection and human suffering | 40.4% | 39.9% | 19.8% |
| | Concern for future careers | 13.5% | 37.6% | 49.0% |
| | Lack of interest in a subject/medicine | 39.9% | 38.1% | 22.0% |
| Psychological sources | Inability to communicate with others in the field | 38.1% | 38.3% | 23.6% |
| | Self-underestimation | 26.6% | 40.9% | 32.5% |
| | Lack of time for family or social life | 14.0% | 37.6% | 48.4% |
| | Lack of time management | 11.5% | 32.0% | 56.5% |
| | Peer competition | 21.9% | 43.5% | 34.6% |
| | Inability to overcome distractions; for example, smartphone addiction | 19.8% | 43.9% | 36.4% |
| Health-related sources | Sleeping difficulties | 17.7% | 30.6% | 51.7% |
| | Depression | 19.8% | 37.1% | 43.2% |
| | Chronic diseases (diabetes mellitus, asthma, anemia, hormones disturbances, thyroid disorders, vitamin D deficiency, etc.) | 64.7% | 19.1% | 16.3% |
| | Obesity | 61.7% | 24.8% | 13.5% |
| | Food quality | 29.7% | 41.1% | 29.2% |
| Environmental sources | Poor classroom ventilation | 32.0% | 33.7% | 34.3% |
| | Unclean classroom | 33.7% | 30.6% | 35.7% |
| | Uncomfortable classroom chairs | 15.2% | 23.4% | 61.4% |
| | High classroom temperature | 34.4% | 40.4% | 25.2% |
| | Low classroom temperature | 32.3% | 46.2% | 21.5% |
| | Overcrowded classroom | 25.5% | 35.0% | 39.5% |
| | Transportation issues | 44.6% | 30.1% | 25.3% |
| | Home environment | 50.2% | 25.9% | 24.0% |

the teaching style (57.4%). The lowest stress level was detected among students who had tasks (16%) with statistically significant differences (P = 0.001). Other associations between variables are shown in Table 5.

There are insignificant associations between stress levels and other sociodemographic data such as age (P = 0.085) and income level (P = 0.156), as seen in Table 5.
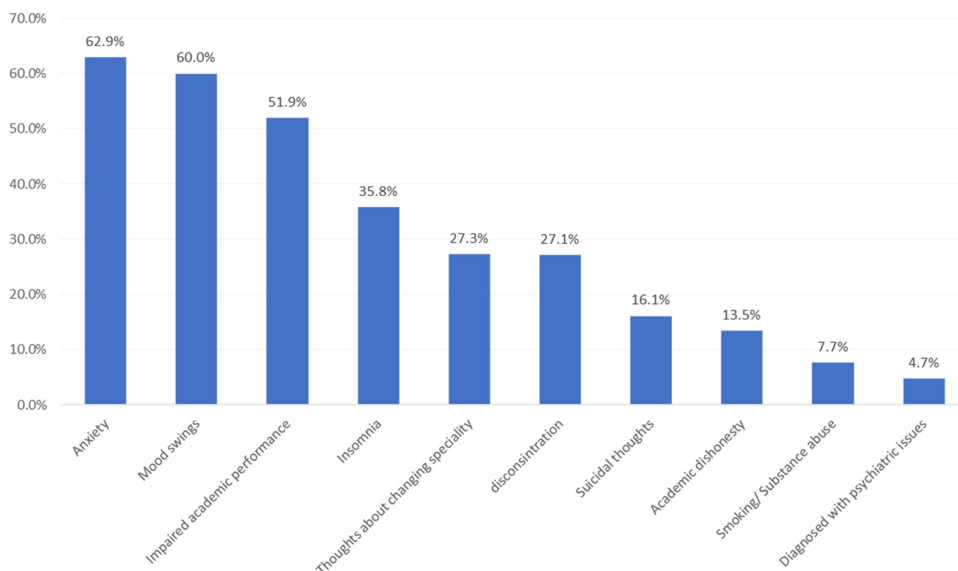
**Figure 1** Impact of stress on Bachelor of Medicine and Bachelor of Surgery students.

## Discussion
### Stress Levels

Almost half (46.5%) of the sampled students were severely distressed, according to the K10 test scores. Previous studies had shown high stress scores for medical students, particularly in the first year and decreasing significantly and progressively in the following years.[2,5] Our results were similar to those of a university in Malaysia (48.6%)[17] but showed lower stress levels than local universities: King Saud University, Riyadh (78.7%),[11] and Imam Abdulrahman Bin Faisal University, Dammam (82.6%).[5] This could be due to the different stress-assessment measurements used, or because of the higher ranking of those universities compared

to UQU, which could add more pressure on students to keep their rankings high and meet their visions. The high levels of stress among UQU medical students may be related to the university's recent changes in applying the new MBBS curriculum, teaching, and assessment methods. This update has revolutionized the educational experience for all staff, students, and lecturers and brought more challenges that may increase stress. The stress may be related to the nature of the reformed MBBS curriculum, which consists of integrated modules taught by different departments. This structure directs students to become more independent in studying and in linking the medical information together, thus adding much more responsibility and workload on the students. This

**Table 4** Suggestions and Solutions for Stress Management

| Suggestions | Completely Ineffective | | Low level of Effectiveness | | Acceptable | | Good | | Excellent | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No | % | No | % | No | % | No | % | No | % |
| Creating a nurturing learning environment | 47 | 8.2% | 114 | 19.9% | 175 | 30.6% | 127 | 22.2% | 109 | 19.1% |
| Identifying struggling students and providing specialized support | 56 | 9.8% | 81 | 14.2% | 145 | 25.3% | 115 | 20.1% | 175 | 30.6% |
| Teaching students stress management skills and promoting self-awareness | 51 | 8.9% | 100 | 17.5% | 124 | 21.7% | 144 | 25.2% | 153 | 26.7% |
| Encouraging students to promote personal health through regular physical activities and adequate sleep | 55 | 9.6% | 104 | 18.2% | 141 | 24.7% | 150 | 26.2% | 122 | 21.3% |
| Teachers ensuring a supportive learning environment for students | 38 | 6.6% | 77 | 13.5% | 124 | 21.7% | 131 | 22.9% | 202 | 35.3% |

**Table 5** Determinants of Stress for Bachelor of Medicine and Bachelor of Surgery Students

| Factors | Stress Level | | | | | | | | P-value* |
|---|---|---|---|---|---|---|---|---|---|
| | Normal | | Mild | | Moderate | | Severe | | |
| | No | % | No | % | No | % | No | % | |
| **Gender** | | | | | | | | | |
| Male | 67 | 24.5% | 72 | 26.3% | 50 | 18.2% | 85 | 31.0% | 0.001 |
| Female | 33 | 11.1% | 36 | 12.1% | 48 | 16.1% | 181 | 60.7% | |
| **Age (years)** | | | | | | | | | |
| 18–21 | 64 | 19.6% | 71 | 21.8% | 51 | 15.6% | 140 | 42.9% | 0.085 |
| 22–23 | 33 | 14.8% | 36 | 16.1% | 43 | 19.3% | 111 | 49.8% | |
| 24–25 | 3 | 13.0% | 1 | 4.3% | 4 | 17.4% | 15 | 65.2% | |
| **Academic year/batch** | | | | | | | | | |
| Second year (batch 2019) | 38 | 18.4% | 52 | 25.2% | 28 | 13.6% | 88 | 42.7% | 0.107 |
| Third year (batch 2018) | 27 | 19.1% | 24 | 17.0% | 24 | 17.0% | 66 | 46.8% | |
| Fourth year (batch 2017) | 23 | 13.7% | 26 | 15.5% | 36 | 21.4% | 83 | 49.4% | |
| Fifth year (batch 2016) | 12 | 21.1% | 6 | 10.5% | 10 | 17.5% | 29 | 50.9% | |
| **Income level** | | | | | | | | | |
| Low | 0 | 0.0% | 6 | 31.6% | 2 | 10.5% | 11 | 57.9% | 0.156 |
| Average | 92 | 19.1% | 90 | 18.7% | 82 | 17.0% | 218 | 45.2% | |
| High | 8 | 11.3% | 12 | 16.9% | 14 | 19.7% | 37 | 52.1% | |

**Notes**: *Pearson chi-square test or exact probability test as appropriate. The difference is significant at P value < 0.05.

is in line with previous studies that investigated the impact of curriculum changes on medical students' stress.[18,19] Conducting continuous training workshops about learning and studying skills may help students acquire the necessary skills and reduce their stress.

## Personal Sources of Stress

The students revealed stressors regarding self-study strategy issues, followed by difficulty in reading textbooks; therefore, a learning skills course should be developed to address students' needs and prepare them for new environments and challenges. A previous study conducted at UQU College of Medicine reported that most students understood the value of taking a learning skills course to meet the demands of university life during the transitional period.[10] Interestingly, the present study adds certain environmental stressors, including uncomfortable chairs and overcrowded, unclean, and poorly ventilated classrooms. According to recent systematic reviews, a less favorable learning environment is one of the factors associated with the development of

stress.[20] Hence, UQU College of Medicine should adopt techniques to solve these problems. Developing and enhancing the college building may decrease students' stress. Furthermore, several studies have found psychological and health-related issues resulting from stress, such as sleeplessness and depression.[11,15,21,22]

## Predictors of Stress

Our study reports a statistically significant association between severe stress levels and the female gender. This result is consistent with other studies in the literature which reported that female medical students are significantly predisposed to a high level of stress.[11,12,15,23,24] This might be due to the effect of gender differences in perceived stress and coping, as the genders are physiologically different.[25] Other studies, however, found no significant association between gender and stress levels.[2,26,27] This disagreement might be a result of different stress assessment methods or learning environments. Nevertheless, further studies are required to investigate
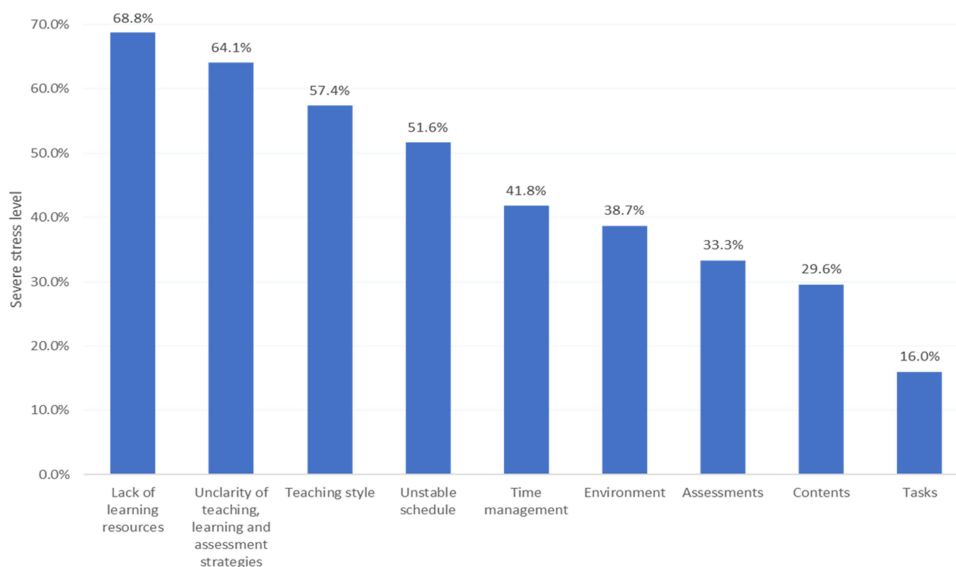
**Figure 2** Distribution of severe stress levels from most-reported stressor.

this relationship. Furthermore, the current study did not find a significant association between stress levels and age or income level. This is consistent with the findings of other studies that stated that the severity of stress level was not significantly associated with age or income level of medical students.[2,27,28,29] However, this is inconsistent with other studies in the literature that suggest that age and financial status are factors influencing the severity of stress.[30–32] This disagreement might be explained by the fact that most participants in the present study are from a younger-generation age group (19–25 years) and about 84% of them are on an average monthly income.

For the most stressful aspects of the MBBS curriculum, a significant relationship to lack of learning resources was found, followed by unclear teaching, learning, and assessment strategies. Our findings can be explained by a lack of guidance and clarity. One reason is the focus of the new curriculum, which encourages medical students to use textbooks and understand the information without "spoon feeding." It is worth mentioning that a previous study, conducted at UQU College of Medicine in 2010 during the period of the traditional curriculum, showed that medical students ranked peer competition (followed by poor English language skills) as the most difficult aspect during the MBBS course.[10] Clearly, we can observe that these factors are not currently causing stress, because English language teaching has since improved.

Interestingly, the current study found a higher prevalence of severe stress levels during MBBS courses among the fifth-year students (batch 36, 2016) compared to a lower prevalence for the second-year students (batch 39, 2019). A study conducted in the United States demonstrated that there was a significant increase in risk of depression and perceived stress among third-year students, compared to first-year students.[11] In contrast, another study conducted in the College of Medicine of King Saud University found that the level of stress decreased as the year of study progressed.[2] This discrepancy can be explained by several factors: First, our study was conducted during the special circumstances of the coronavirus (COVID-19) pandemic of 2020, when schooling was halted at the beginning of the second semester. Hence, second-year students did not complete the entire year's experience and the comprehensive exams. Second, fifth-year students were the first batch learning the new MBBS curriculum at UQU College of Medicine, which put additional pressure on them. In comparison, the second-year students are the fourth batch following the curriculum update. Moreover, the fifth-year students are near graduation; hence, they are more likely to work hard on the requirements of the Saudi Commission for Health Specialties to gain acceptance for postgraduate training programs, which adds more pressure on them.

## Impact of Stress

Our study demonstrates that anxiety was the most common stress symptom in medical students (62.9%), followed by mood swings (60%), impaired academic performance (51.9), insomnia (35.8%), thoughts of changing specialties (27.3%), and poor concentration (27.1%). These findings are similar to those of several other studies in the literature.[32,33] Studies

conducted by Lakhiar et al.[34] Yadav et al[35] and Inam et al[36] found that medical students had the highest level of anxiety and depression compared to students of other specialties. An Indian study reported that medical students with high stress levels suffer from low concentration (86%) and mood changes (80%). These statistics are far higher than our findings;[37] this could be due to differences in lifestyles and the study curriculum. A local study in Riyadh demonstrated that medical students had a high level of stress, and that there was a significant correlation between high stress and low GPA (P = 0.01).[27] Another local study in Rabigh exhibited similar findings: students with high stress had lower grades in comparison to those with low stress.[3] Consistent results in a Pakistani study found an inverse correlation between stress and academic performance; the higher the stress, the lower the academic performance.[36] This may be because stress leads to overthinking, affecting preparation and concentration during studying, and decreasing sleep quality. This was proved by the study of Almojali et al, which found that high stress was associated with poor sleep quality, which correlated with lower GPA.[26] Unfortunately, there is no specific study focused on medical students' thoughts on changing specialties, but a similar study, involving medical students and residents, found that 12.1% of participants thought about withdrawing from medical school.[37]

## Limitations, Strengths, and Recommendations

This study examines stress and the learning environment among medical students in the new MBBS curriculum of UQU from novel and multifaceted perspectives. However, our study has certain limitations. First, the shared-method bias is probable, since medical students were the only reporters for all study variables and a self-report survey was the only tool used for data collection. Second, the data of the present study is perception-based data and was collected during the COVID-19 pandemic, which presents more challenges for medical students. Despite these limitations, our study's findings emphasize the presence of high stress levels among medical students at UQU and clarify the aspects needing improvement within the learning environment. It also sheds light on the difficulties that students face in medical schools and proposes solutions. We recommend further studies on female medical students to examine possible precipitating factors of their stress levels. Further follow-up studies are necessary to elucidate the determinants of our observed and severe stress levels among fifth-year medical students, and to promote the planning of interventions that can help students cope with future challenges.

The COVID-19 pandemic could have influenced students' responses. Hence, future investigations should be conducted under more favorable circumstances.

## Conclusion

The current study concluded that medical students face high stress, which is potentially expensive to both the student and society in terms of maladaptive stress coping mechanisms, personal and academic burnout, and decrease in resiliency. Therefore, professors and universities should look out for potential stressors and help students overcome them. Universities can also improve this situation by offering counseling services to students. Another way to overcome this problem would be to introduce compulsory stress-management training, as a part of the medical syllabus that students would not be able to skip due to academic pressure. Moreover, extracurricular activities such as physical activities or arts and music might help.

Changing the MBBS curriculum could be the reason for the increased stress levels, as the current study observed a statistically significant association between severe stress levels and a lack of learning resources, as well as complaints regarding unclear teaching. Thus, it may be worthwhile to consider orientation programs each year for students and staff, to increase their awareness and knowledge about the program structure, assessment method, and learning styles and resources. In addition, improving the learning resources —particularly the library services—will help students see their accomplishments in a more positive light and help protect them from academic burnout.

## Data Sharing Statement

The original contributions presented in the study are included in the article. Further inquiries can be directed to the corresponding author.

## Ethical Approval

Ethical approval was obtained from the Biomedical Ethics Committee of the Faculty of Medicine at Umm Al-Qura University (approval number HAPO-02-K-012-2020-08-430) and was conducted in accordance with the Declaration of Helsinki. Electronic informed consent was obtained from each participant prior to their answering the questionnaire. Participant privacy was ensured. No names or telephone numbers were requested from any participant.

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