The prevalence of chronic fatigue syndrome and depression in Guilan medical students in 2020

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Introduction
Chronic fatigue syndrome (CFS), or myalgic encephalomyelitis (ME), is a chronic and disabling illness that has various definitions. It is commonly characterized by fatigue lasting for at least six months, worsened by exertion, and is not relieved by rest, leading to a reduction in daily activities. Other symptoms include sleep that does not refresh and neurocognitive problems characterized by slowness of thought or mental fog. Other fatiguing illnesses that can cause similar symptoms should be ruled out. The prevalence of CFS is estimated to be between 836,000 and 2.5 million Americans in the United States by the Institute of Medicine (IOM) and approximately 0.4%-2.5% around the world. Moreover, it is more common between 20 and 40 years old. Women are 1.5 to 2 times more likely than men to suffer from CFS.

On the other hand, depression is among the most common mental disorders, characterized by sadness, loss of interest or pleasure, feelings of guilt or worthlessness, disturbed sleep or appetite, feelings of tiredness, and poor concentration leading to impairments in daily activity. Between 1994 and 2014, the lifetime prevalence of depression was reported to be 10.8%. The prevalence of this disorder is more common among women (5.1%) than men (3.6%). In Iran, the rate of mental disorders was reported to be 23.4%, of which severe depression accounts for 10.4%. According to the results of a study, the range of any mental illness declines from 20 to 30-40 years old. A study in 2018 reported a significantly increased prevalence of depression in the United States between 2005 and 2015, increasing in young people more rapidly than in older people.

Abstract
Background: Chronic fatigue syndrome (CFS) and depression are specific mental disorders that can negatively affect college students’ social, occupational, and academic performance, especially medical students. This study aimed to investigate the prevalence of CFS and depressive symptoms and their relationship with medical students.

Methods: This cross-sectional analytical study was conducted with 175 medical students at the Guilan University of Medical Sciences in 2020 in Guilan in the north of Iran. Three levels of medical students, including basic sciences and physiopathology, externship, and internship students, participated. A demographic information questionnaire, the Beck Depression Inventory-II (BDI-II), and the Chalder Fatigue Questionnaire (CFQ) were used to collect data. SPSS 22 was used to analyze the data, including Mann-Whitney, Kruskal-Wallis, and Spearman tests.

Results: The mean age of the participants was 23.92 ± 2.04 years. Of 175 participants, 50.9% were males. In all, 11.4% of subjects reported levels of CFS, and 38.8% of them showed levels of depression. The rates of CFS and depressions were not associated with age, gender, marital status, educational level, geographic area, or student habitation (P > 0.05). The use of cigarettes (P = 0.002), alcohol, and substances (P < 0.0001) showed a significant relationship with higher levels of CFS and depression scores. The relationship between the CFS score and depression was significant (r = 0.523, P < 0.0001).

Conclusion: The prevalence of CFS and depression among medical students were 11.4% and 38.8%, respectively. There was a positive association between CFS and depression. Implementing screening policies is recommended, along with programs to help promote mental and physical health among students.

Keywords: Chronic fatigue syndrome, Depression, Medical students

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Although the general population is at risk for mental health illnesses, college students are highly vulnerable to psychiatric disorders. In recent years, mental health has been widely studied among college students, and numerous studies show that mental health problems are very prevalent in this group. Investigation into 374 students between the ages of 18-24 years found that 33% of them had depressive symptoms. In both medical and non-medical students, the prevalence of depression is considerable, but no difference was found between the two groups in some studies.

In Iran, the rate of moderate to severe depression has been reported to be around 19.0% at the Kurdistan University of Medical Sciences. Findings of two meta-analysis studies have found that around 28% of medical students had depression or showed depressive symptoms. In another meta-analysis in China, the rate of depression was found to be 32.7% in medical students. In other studies, the prevalence of depressive symptoms in medical students was reported to be 41.0% in Brazil and 65.0% in Egypt. In addition to academic pressures, other factors such as long training, workloads, financial difficulty, and sleep insufficiency might all contribute to psychological problems, such as depression in medical students.

Fatigue is also a common problem in medical students, and it may affect not only their academic performance but severe fatigue is also associated with more stress. Several factors can contribute to this problem, such as academic pressure, workload, family expectations, and lifestyle factors like sleep quality and smoking. Based on a study by Pourmovahed et al., it seems that there may be a correlation between CFS and depression in medical students.

Therefore, depression is of considerable importance in college students since it predicts a decrease in academic performance, especially in first-year students. In addition, considering the importance of CFS in the well-being of medical students and their academic performance, we examined the prevalence of CFS and depression in Guilan medical students and their relationship with each other, due to the relatively high prevalence of depression in medical students in previous studies and the small number of studies on CFS and depression in Iran, especially among Guilan medical students. Timely recognition and diagnosis of psychological problems is an effective approach to improve medical students’ mental and physical health and their performance.

Material and Methods
The current cross-sectional study consisted of a sample of 175 students at the Guilan University of Medical Sciences in the academic year 2019-2020. After obtaining ethical approval, participants were selected by convenience sampling. Inclusion criteria included studying at the Guilan Medical School and willingness to participate in the research; exclusion criteria included any history of serious psychiatric or physical illnesses. After explaining the objectives of the study and obtaining informed consent, three questionnaires were completed by the participants. These included a demographic information questionnaire, the Chalder Fatigue Questionnaire (CFQ), and the Beck Depression Inventory-II (BDI-II). Due to COVID-19 conditions, the questionnaires were made available in two ways: printed and uploaded on the Internet.

Scales
Demographic information questionnaire
This questionnaire included demographic information, such as age, sex, marital status, educational level, substance use, and smoking.

Chalder Fatigue Questionnaire (CFQ)
Chalder, Berlowitz, and Hirsch, in 1993, developed a short 14-item instrument to measure the mental and physical symptoms of fatigue. The items of this tool are scored based on a 4-point Likert scale (0 = less than usual, 1 = no more than usual, 2 = more than usual, 3 = much more than usual). Overall scores range from 0 to 42, and the cut-off point is 22. This scale has been used in several studies in epidemiology and treatment outcomes in CFS patients. The validity and reliability of this scale were examined by Chalder et al. using the list of clinical interview symptoms, and the sensitivity and specificity were reported to be 75% and 74%, respectively. The internal consistency coefficient was 0.85 for physical fatigue and 0.82 for mental fatigue.

In Iran, in a study by Nasri et al., this scale was used as a screening tool, and the test-retest coefficient, internal consistency, and split-half coefficient were calculated at 0.85, 0.91, and 0.82, respectively, showing the high reliability and validity of this scale.

Beck Depression Inventory (BDI-II)
This questionnaire is one of the most suitable tools for measuring depression. It was created by Aaron T. Beck and has 21 items that measure the physical, behavioral and cognitive symptoms of depression. Each item has four options that are scored on a scale of 0 to 3 for a total score between 0 and 63. This scale indicates the severity of depression: no depression (0-13), mild depression (14-19), moderate depression (20-28), and severe depression (≥29). The BDI-II shows high reliability and can separate depressed from non-depressed subjects. The internal consistency of BDI-II has been reported at 0.9, and the test-retest reliability has been estimated to be between 0.73 and 0.96. In Iran, internal consistency and test-retest reliability were reported at 0.87 and 0.74, respectively.

Statistical analysis
Based on Abedini et al., the sample size for the current study was calculated to be 175 people. SPSS 22 was used to analyze the data based on descriptive and analytical statistics. The Kolmogorov-Smirnov test showed that
distribution was not expected. Therefore, Mann-Whitney and Kruskal-Wallis nonparametric tests were used. Spearman's test was also used to determine the relationship between study variables. In this study, a P value of less than 0.05 is considered significant.

**Results**

The current study was conducted with 175 medical students from three-course areas, including basic sciences and physiopathology, externship courses, and internship courses, with a mean age of 23.92 ± 2.04. Table 1 shows the demographic characteristics of the participants.

The mean score for physical fatigue was 6.79 ± 4.89 and 5.04 ± 3.98 for mental fatigue, while the mean score for CFS was 11.83 ± 7.96. Figure 1 shows the frequency of CFS in participants.

The mean score of depression in the participants was 13.10 ± 10.52. The prevalence of depression in students is shown in Figure 2. Of 175 students, 69 (38.8%) reported levels of depression.

Table 2 shows a comparison of the mean scores for CFS and depression in the participants in terms of demographic variables using Mann-Whitney and Kruskal-Wallis tests. Among the variables studied, there was a significant relationship between CFS and depression scores among smokers (P = 0.002), alcohol users (P = 0.011, P < 0.0001), and substance users (P = 0.002, P < 0.0001). Students who smoked drank alcohol, and used substances had higher mean CFS and depression scores.

Figure 3 shows that the positive relationship between the mean scores of CFS and depression in medical students is significant, using Spearman's test (r = 0.523, P < 0.0001).

**Discussion**

The current study examined the prevalence of CFS and depression among medical students and the relationship between them. A total of 175 medical students, with a mean age of 23.92 ± 2.04 years, participated in the study. In all, 11.4% of students reported levels of CFS, with physical fatigue more prevalent than mental fatigue. The prevalence of depression in students was 38.8%, and approximately 18% had moderate to severe symptoms. Students who smoked drank alcohol, or used substances had significantly higher mean CFS and depression scores. There was no significant relationship between demographic characteristics, including age, gender, marital status, educational level, geographic area, accommodation, and rates of CFS and depression among the students. Mean scores of CFS and depression did show a significant relationship in medical students.

The rate of CFS in our study was found to be 11.4%, while the prevalence of CFS is estimated at between 0.4%-2.5 % around the world. In line with the current study, the prevalence of CFS in nurses was found to be 7.3% by Nasri. The higher incidence of CFS may be due to stressful educational activities, study duration, fewer sports activities, poor sleep quality, or other existing stressors.

In addition, the prevalence of depression is reported at 10.8% in the world and severe depression is estimated at 10.4% in Iran, but, similar to the current study, different studies have shown higher rates of depression in medical students. The results of a study in Yazd, Iran showed that

| Variables                        | No. (%) |
|----------------------------------|---------|
| Gender                           |         |
| Female                           | 86 (49.1) |
| Male                             | 89 (50.9) |
| Age                              |         |
| ≤24                              | 103 (53.9) |
| >24                              | 72 (41.1) |
| Marital status                   |         |
| Single                           | 164 (93.7) |
| Married                          | 11 (6.3) |
| Educational level                |         |
| Basic sciences and physiopathology | 59 (33.7) |
| Externship                       | 57 (32.6) |
| Internship                       | 59 (33.7) |
| Geographic area                  |         |
| Native                           | 125 (71.4) |
| Nonnative                        | 50 (28.6) |
| Residency                        |         |
| Dormitory resident               | 29 (16.6) |
| Non-resident in the dormitory    | 126 (83.4) |
| Smoking                          |         |
| Yes                              | 38 (21.7) |
| Substance use                    |         |
| Yes                              | 15 (8.6) |
| Alcohol use                      |         |
| Yes                              | 42 (24.0) |

Figure 1. Frequency of CFS (N=175).

Figure 2. Frequency of depression (N=175).
around 27% of medical students in different medical fields reported moderate to severe symptoms of depression. In Hamedan, Iran, 37% of medical students experienced depression, with around 18% reporting moderate to severe depression. In Birjand, Iran, the results of a study found depressive symptoms in 31.8% of medical students; about 20% of them had moderate to severe depression. A study among medical and nursing students in Jahrom found that 15% of students had moderate to severe symptoms of depression. The high rate of depression and CFS in medical students compared to the general population shows the importance of paying attention to the well-being of college students, especially medical students, through screening policies along with counseling and treatment sessions, which ultimately play a crucial role in improving their academic and work performance and thus community health.

Consistent with the current study, there was a strong association between burnout and alcohol use in the United States and Hong Kong among medical students and between depression and tobacco and cannabis use among college students. The results of a study in Turkey showed that medical students who smoked cigarettes suffered from depressive symptoms 2.2 times more than nonsmokers. The prevalence of alcohol use among medical students was reported at 58% in the U.S. medical students, and in South Africa, the use of alcohol, drugs, and smoking was found to be considerable in medical students. It seems that behaviors such as substance use may be maladaptive coping behaviors to help relieve stress among college students, which has both personal and professional impacts on students’ lives.

According to the results, the mean score of CFS and depression in male students were higher than in females. However, the difference between the two groups was not significant. This result is consistent with studies from Rezaei et al. and Ershadi et al. on depression. According to a systematic review study in China, the rate of depression in medical students was significantly higher in males than in females. In contrast, a higher rate of depression was reported for females in other studies.

| Variables | CFS Mean ± SD | CFS P value | Depression Mean ± SD | Depression P value |
|-----------|-------------|-------------|----------------------|-------------------|
| Gender    | Female      | 10.86 ± 7.61 | 12.14 ± 8.73 | 0.695* |
|           | Male        | 12.76 ± 8.22 | 14.03 ± 11.99 | 0.454* |
| Age       | ≤24         | 11.53 ± 7.92 | 12.78 ± 9.42 | 0.545* |
|           | >24         | 12.25 ± 8.05 | 13.57 ± 11.99 | 0.911* |
| Marital status | Single | 11.60 ± 7.87 | 12.88 ± 10.42 | 0.161* |
|           | Married     | 15.27 ± 8.86 | 16.45 ± 12.14 | 0.220* |
| Educational level | Basic sciences and physiopathology | 11.27 ± 8.30 | 14.15 ± 12.53 | |
|           | Externship  | 11.81 ± 7.40 | 11.61 ± 8.28 | 0.659* |
|           | Internship  | 12.41 ± 8.22 | 13.49 ± 10.29 | 0.709* |
| Geographic area | Native | 11.60 ± 7.67 | 12.98 ± 10.60 | 0.231* |
|           | Nonnative   | 12.40 ± 8.69 | 13.42 ± 10.45 | 0.683* |
| Residency | Dormitory resident | 11.62 ± 8.93 | 12.83 ± 7.52 | 0.662* |
|           | Non-resident in the dormitory | 11.87 ± 7.78 | 13.16 ± 11.05 | 0.570* |
| Smoking   | Yes         | 15.26 ± 8.04 | 17.08 ± 11.06 | 0.002* |
|           | No          | 10.88 ± 7.70 | 12.00 ± 10.14 | 0.002* |
| Substance use | Yes | 18.80 ± 8.90 | 26.87 ± 16.84 | 0.002* |
|           | No          | 11.18 ± 7.57 | 11.81 ± 8.76 | <0.0001* |
| Alcohol use | Yes | 14.52 ± 8.36 | 18.05 ± 12.61 | 0.011* |
|           | No          | 10.98 ± 7.66 | 11.54 ± 9.30 | <0.0001* |

* Mann-Whitney test; ** Kruskal-Wallis test.

Figure 3. Relationship between CFS mean scores and depressive symptoms.
Pournovahed et al. reported that CFS in female students was significantly higher than in male students. The use of alcohol, substance use, and smoking might contribute to a higher rate of depression and CFS in males.¹¹

The current study results showed that the rate of depression in basic sciences and physiopathology students was higher than in the externship and internship groups of students, while the CFS level in the internship group of students was higher than in the others. However, these differences were not significant. Al-Alawi et al.⁵⁴ found a higher rate of depression and burnout in the preclinical grade. More theoretical courses and a higher number of exams in the early years of medical education, as well as adaptation problems with this field’s condition, might have led to a higher rate of psychological problems in this group of students. In the later years of medical education, a combination of practical and theoretical courses creates more interest, self-satisfaction, and self-efficiency in medical students.

Some studies have found a positive association between CFS and depression in line with the current study results.¹²,¹³ High numbers of medical students are exposed to stress, depression, and chronic fatigue due to unique problems, such as a high amount of course materials compared to other disciplines, severe stress due to dealing with critically ill patients, as well as other problems, including economic and family issues and even differences in cultures. Therefore, increasing awareness and improving students’ mental health through counseling sessions, providing appropriate conditions to increase the health and welfare of college students, and increasing the number and types of recreational facilities and educational facilities might reduce psychological problems, such as depression and CFS.

The limitation of the study was that clinical interviews were not conducted to more accurately diagnose depression or CFS. The role of other factors, such as lack of interest in the field of study, socio-economic status of the family, and family history of mental disorders affecting the rate of depression and CFS, are indicated to obtain more precise results in future studies.

Conclusion
According to the results, the prevalence of CFS and depression among medical students at a university in northern Iran were found to be 11.4% and 38.8%, respectively. Around 18% of these students had moderate to severe symptoms of depression. The rates of CFS and depression were not associated with age, gender, marital status, educational level, geographic area, or student accommodation. The use of cigarettes, alcohol, and substances, on the other hand, showed significant relationships with higher levels of CFS and depression scores. There was also a positive association between CFS and depression.
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