An Evaluation of the Prevalence of the Risk of Disordered Eating, Poor Sleep Quality and Perceived Stress in Medical Students

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Research Article

Abstract

Background: An increase in the prevalence of eating disorders (EDs), sleep problems, and stress in the general population and medical students is becoming an area of concern. This study was designed to determine the incidence of sleep and EDs in medical students and to assess the relationship between these factors and stress levels.

Methods: A descriptive, cross-sectional study was performed, and the data were collected using a self-administered, structured questionnaire via instant chat groups and social media advertisements between September and December 2019. Medical students (years 1–6) (n = 1100) enrolled at the College of Medicine and Medical Science, Arabian Gulf University, Bahrain, were recruited in the study. The electronic survey included questions on the participants' demographic characteristics. The tools utilized were the Pittsburg Sleep Quality Index (PSQI), the 26-Item Eating Attitudes Test (EAT-26), and the 10-Item Perceived Stress Scale (PSS-10). The data were analyzed using Stata® (version 17.0).

Results: Responses were received from 730 participants out of 1100 (67%). 649 (58%) were included in the final analysis,68% women and (32%) men. The mean age of the participants was 22.73 ± 2.31 years. Mean body mass index (BMI) was 25.56 ± 5.6 kg/m^2 (55% had a normal BMI). The mean EAT-26, PSQI, and PSS-10 scores were 16.99 ± 9.09, 38.00 ± 3.13, and 25.67 ± 6.97, respectively. The prevalence of EDs, poor sleep quality, and stress symptoms was 32% (95% confidence interval [CI]: 28.01–35.32), 67% (95% CI: 62.62–70.05), and 50% (95% CI: 46.07–53.93), respectively. Univariate logistic regression analysis revealed that female sex was a risk factor for EDs, sleep problems, and stress (odds ratio of 2.10, 95% CI: 1.30–3.45).

Conclusions: Counseling services should be offered to medical students affected by anxiety, poor eating habits, and morbid obesity at the start of the first year of university. Medical students with sleeping problems require special attention throughout their time at college. Strategies to mitigate stress while studying should be given.

Trial registration: Not applicable.

Introduction

The escalation in the prevalence of eating disorders (EDs) in individuals of all ages, ethnic, and socioeconomic backgrounds is increasingly becoming an area of concern.[1] The prevalence of EDs in the general population is 5%[2] and is estimated to range from 7–20% in university/college students.[3] EDs are associated with several co-morbidities and an increased risk of mortality.[4] In a recent review, the risk of EDs in medical students was evaluated in 19 cross-sectional studies conducted in nine countries (a total of 5722 individuals). Statistically significant evidence of between-study heterogeneity was found, and the total pooled rate of ED risk was 10% (497/5722 students, 95% confidence interval [CI]: 7.80–13.0). Between studies, prevalence was estimated to range from 2–29%.[5]

EDs describe illnesses that are characterized by irregular eating habits and severe distress or concern about body weight or shape. Eating disorders are associated with inadequate or excessive food intake, which ultimately damage the well-being of individuals. The most common forms of EDs include anorexia nervosa, bulimia nervosa, and binge eating. [6]

Medical students are considered a high-risk group for EDs for several reasons, including academic stress and a heavy workload.[7] Estimates of the prevalence of EDs in medical students vary across studies, ranging from 2–70%,[8] and variations in ED risk are linked to several factors, such as age, gender, year of study, and ethnicity. The relationship between ED and stress has not been adequately elucidated; for example, an association was not found between the rate of EDs and stress in one study.[9]

Numerous tools are available to screen for EDs; commonly used screening instruments include the 26-Item Eating Attitudes Test (EAT-26), Eating Disorder Inventory-2, Eating Disorder Examination Questionnaire, and the Sick, Control, One Stone, Fat, Food Questionnaire.

Approximately one third of the general population experiences sleep problems.[10] Medical students are a vulnerable subgroup for sleep difficulties owing to the intensity of their studies over a long duration.[11] In addition, medical students present with more sleep difficulties, compared to students studying law or economics.[12] Research into sleep issues in medical students is required because of the known relationship between sleep, mental illness and students' academic performance.[13] In addition, there is evidence to support the perspective that good-quality sleep is needed for enhanced cognitive and psychomotor performance.[14]

Data are available on the incidence of sleep problems in medical students from countries in Asia, Europe, and North and South America. The rate of sleep problems in China, India, Hong Kong, Malaysia, Lithuania, Brazil, and Mexico was reported to be 30%, 30%, 70%, 36%, 40%, 38%, and 24%, respectively;[15] in this regard, it is likely that discrepancies across countries can be elucidated by the different measurement tools used and differences in the students' age and gender.[16]

Other factors associated with sleep problems in medical students include the attitudes of medical students, internet usage, and sleep apnea.[17–18] Genzel reported that the timing of sleep had a more significant impact on students' performance than sleep length or quality.[19] The most widely used tools to assess sleep quality are the Pittsburg Sleep Quality Index (PSQI) and the Epworth Sleepiness Scale (ESS).

The extent to which cultural aspects are responsible for differences in the prevalence of sleep problems and the risk of EDs has not been adequately assessed in the literature. In addition, studies have not extensively evaluated the relationship between sleep problems, eating problems, and stress in medical students. Two studies from Iran and the Kingdom of Saudi Arabia found an association between sleep disturbances and stress levels.[20,21] Forty-three studies (a total of 18619 medical students from 13 different nations) were included in a recent systematic review and meta-analysis on the prevalence of sleep disturbances in this population. The average pooled sleep duration (K = 16, N = 10512) of the

medical students was 6.3 hours per night. Based on the PSQI scores, 55% of the students (95% CI: 48.00–62.00] reported poor-quality sleep (K = 33, *N* = 15462) (a mean pooled score of 6.3). According to the ESS, 31% (95% CI: 24.40–37.70) of the students reported excessive daytime sleepiness (K = 18, *N* = 5688). Age and gender were not shown to be significant confounders for sleep quality or excessive daytime drowsiness.[22] Sleep duration–sleep quality interaction meta-regression models yielded similar statistically significant findings. The findings of the current study will inform a growing body of evidence of a link between sleep duration and sleep quality as a predictor of excessive daytime sleepiness in medical students.

It is important to determine whether medical students experience sleep problems and eating problems and if there is a relationship between them and with stress. Therefore, this study was designed to determine the incidence of sleep and EDs in medical students and to assess the relationship between these factors and stress levels.

Method

Design

A descriptive, cross-sectional design was used to collect data for this study in Bahrain. Self-administered, structured questionnaires were delivered via instant chat groups and social media advertisements between September and December 2019. Medical students (years 1–6) enrolled at the College of Medicine and Medical Sciences (CMMS), Arabian Gulf University, were recruited. Ethical approval was obtained from the Research and Ethics Committee, CMMS, Arabian Gulf University. Electronic consent or e-signatures were obtained from the participants who were informed that their participation was voluntary and that they could withdraw from the study at any time.

Sample

Convenience sampling was applied, and a poll or questionnaire was mailed to a student mass from year 1 to 6(CMMS).

General population control

Published data estimates suggest that approximately 10% of all medical students are at risk of EDs and 50% experience poor sleep quality and high stress levels. Thus, to measure this proportion using a 5% margin of error, it was estimated that a minimum of 500 survey responses would be required. Based on an anticipated 50% response rate, the survey was distributed to 1100 participants. Convenience sampling was used to select the sample. It was estimated that the minimum sample size required (i.e., 384 participants with a 95% CI) would have a real value within a 5% (type I error [α]) level and 20% (type II error [β]) level of the observations made. The formula for sample size *n* was as follows: n N*X/(X + N − 1), where X Zα/22*p*(1-p)/MOE2. Zα/2 denoted the critical value of normal distribution at α/2 (e.g., at a 95%

CI level, α was 0.050, with a critical value of 1.96); MOE was the margin of error; *p* was the sample proportion, and *N* was the population size.

Procedures

The research was performed in compliance with the World Medical Association's Declaration of Helsinki, and approval for the research to be conducted was received from the faculty.

Instruments

An anonymous questionnaire comprising open- and closed-ended questions was administered electronically. The electronic survey included questions on the participants' demographic characteristics, including their age, sex, educational level, residence setting (urban or rural), and their parents' level of educational attainment. The tools used to evaluate sleep problems, eating problems, and stress were the Pittsburg Sleep Quality Index (PSQI), the 26-Item Eating Attitudes Test (EAT-26), and the 10-Item Perceived Stress Scale (PSS-10), respectively.

Pittsburg Sleep Quality Index

The PSQI, a self-rated questionnaire, assesses sleep quality over a one-month interval. Responses to 19 individual items are used to generate seven "component" scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The sum of the scores of these seven components yields one global score.[23]

26-Item Eating Attitudes Test

The 26-Item Eating Attitudes Test (EAT-26) is used to identify ED risk based on attitudes, feelings, and behaviors related to eating. Twenty-six items assess general eating behaviors, and five additional questions evaluate risky behaviors. This measure can be used for adolescents, adults, and special at-risk samples, such as athletes. The scale contains three subscales: dieting, bulimia, and food preoccupation/oral control.[24]

10-Item Perceived Stress Scale

The 10-Item Perceived Stress Scale (PSS-10) is the most widely used psychological instrument for measuring perceptions of stress. It is a measure of the degree to which situations in an individual's life is appraised as stressful. The items are designed to assess the extent to which respondents gauge their lives to be unpredictable, uncontrollable, and overloaded. The scale also includes a number of direct queries about current levels of stress. There are no cut-off scores because the PSS-10 is not a diagnostic tool; the respondents' PSS-10 scores merely reflect stress severity. Individual PSS-10 scores range from 0–40, with higher values denoting greater perceptions of stress. Low stress is denoted by a score of 0–13; moderate stress is indicated by a score of 14–26, and high levels of perceived stress are signified by a score of 27–40.[25] The survey takes 30–40 minutes to complete.

Before the start of the current research, a pilot study was conducted on 10−15 students to test the clarity, practicality, and reliability of the instruments used. The instruments were administered to and answered by the participants online. Suitable incentives such as educational materials were proposed to encourage student participation in the study.

Data analysis

The data were analyzed using Stata® (version 17.0), along with descriptive frequency analysis. Mean ± standard deviation was used to measure the continuous variables, and frequency counts and percentages were utilized to evaluate the categorical variables. Bivariate and multivariate analyses were employed to identify factors associated with the outcomes of interest (EDs, sleep disturbances, and stress). Odds ratios (ORs) with 95% CIs were computed to reflect the level of association and statistical significance. The level of statistical significance was set at 0.050.

Results

A total of 730 (67%) students responded to the survey questionnaire; of this figure, 442 women and 208 men were included in the final analysis. The mean age of the study participants was 22.73 ± 2.31 years (a range of 19−33 years). Mean body mass index (BMI) was 25.56 ± 5.69 kg/m^2 (~55% had a normal BMI). Most (98%) of the participants were single (Table 1).

Table 1. The demographics of the participants in the study

Characteristics	n (%)
Sex	
Male	208 (32)
Female	442 (68)
Marital status	
Married	15 (2)
Single	635 (98)
Year of study	
Year 1	179 (27)
Year 2	135 (20)
Year 3	66 (16)
Year 4	66 (10)
Year 5	95 (15)
Year 6	113 (17)
BMI	
Underweight	68 (11)
Normal	338 (53)
Overweight	140 (22)
Obese	81 (13)
Income	
Less than US$500	193 (32)
US$500−$1000	201 (34)
US$1000+	205 (34)
Scholarship	
Yes	596 (91)
Self-financing	56 (9)

BMI: body mass index

The mean EAT-26, PSQI, and PSS-10 scores were 16.99 ± 9.09, 6.38 ± 3.13, and 25.67 ± 6.97, respectively. The prevalence of EDs, poor sleep quality, and perceived stress in the students was 32% (95% CI: 28.01−

35.32), 67% (95% CI: 62.62–70.00%), and 50% (95% CI: 46.07–53.93), respectively (Table 2). EDs, sleep problems, and stress were identified in the participants.

Table 2. A depiction of eating disorders, sleep problems, and perceived stress in the medical students

Condition	n (%)
Eating disorders (EAT-26)	
Yes	208 (32)
No	442 (68)
Sleep problems (PSQI)	
Poor sleep	430 (66)
The absence of sleep problems	220 (33)
Stress (PSS-10)	
Yes	611 (93)
No	39 (6)

EAT-26 = 26-item Eating Attitudes Test, PSQI = Pittsburg Sleep Quality Index, PSS-10 = 10-item Perceived Stress Scale

Univariate logistic regression analysis revealed that female sex was a risk factor for EDs, sleep problems, and stress (OR = 2.10, 95% CI: 1.30–3.45) (Tables 3 and 4).

Table 3. The risk factors for eating disorders, sleep problems, and stress using univariate regression analysis

Risk factors for EDs, sleep problems, and stress	OR	SE	p-value	95% CI
Age	1.00	0.01	0.494	0.99–1.02
Sex	2.09	0.53	0.004	1.26–3.45
Marital status	0.97	0.65	0.963	0.26–3.62
Income	1.17	0.16	0.250	0.90–1.52
BMI	1.02	0.18	0.290	0.98–1.06
Tuition	1.53	0.58	0.261	0.73–3.23
Year	1.11	0.06	0.076	0.99–1.24

EDs: eating disorders, BMI: body mass index, OR: odds ratio, SE: standard error, CI: confidence interval

Odds ratio = 2.06 for eating disorders, sleep problems, and stress

p-value = 0.003

Table 4. An evaluation of the correlation between the scores obtained for eating disorders, sleep problems, and stress in relation to specific risk factors using logistic regression analysis

Instrument	OR	SD	p-value
PSQI (sleep problems)	1.51	0.29	0.032
EAT-26 (EDs)			
Sex	1.63	0.33	0.017
Income	1.24	0.14	0.057
BMI	1.03	0.02	0.057
PSS-10 (stress)			
Year	1.23	0.13	0.045
EDs, sleep problems, and stress			
Sex	2.09	0.53	0.004
Year	1.10	0.06	0.076

EDs: eating disorders, BMI = body mass index, OR = odds ratio, SD: standard deviation, PSQI = Pittsburg Sleep Quality Index, EAT-26 = 26-item Eating Attitudes Test, PSS-10 = 10-item Perceived Stress Scale

Discussion

To the best of our knowledge, this was the first study to assess the relationship between EDs, sleep problems, and stress in medical students in Bahrain and the Arabic region. Nearly 10% of the medical students in the current study were shown to have a combination of EDS, sleep problems, and stress. Approximately one third of the students (32%) were shown to be at risk of developing an ED; two thirds were demonstrated to have sleep problems (67%), and 93% reported stress of any severity, with severe stress being reported by 50% of the participants.

An association was not established between the PSQI, EAT-26, and PSS-10 scores. Logistic regression of the PSQI, EAT-26, and PSS-10 scores, used to evaluate the risk factors for EDs, sleep problems, and stress (i.e., age, sex, marital status, income, BMI, and year), did not identify significant differences in this regard, with the exception of an increase in stress in the clerkship year and female gender being a risk factor for EDs, sleep problems, and stress. Logistic regression analysis of the EAT-26 scores for the same factors showed a borderline association between income and BMI (p = 0.570). However, this finding is not supported by the results of published studies. A recent meta-regression evaluated the relationship

between the risk of EDs and age, gender, and BMI in medical students and showed a pooled risk of 11% for EDs and significant correlations between age, sex, and BMI.[26] In another meta-analysis that addressed the prevalence of sleep problems in medical students, 55% of the students were demonstrated to experience poor-quality sleep based on the PSQI scores, and excessive day-time sleep was reported by 31% of them. The prevalence of sleep problems in that study was lower than that in the current study.[22]

A recent literature review in Malaysia identified a stress rate of 50% in medical students linked to examinations, workload, and responsibilities,[27] a rate that is almost equal to that of the severe stress levels perceived in the current study.

The CMMS is a regional medical school that accepts students of both sexes from six gulf Arab states. The majority of students (90%) are nominated through scholarships from their respective countries. Nearly 200 students are recruited annually, including some students from private schools. Typically, nearly two thirds of the students are women. In several studies, female gender was found to be a risk factor for EDs, emotional disorders, and stress in medical students.[28–30] CMMS students go to college directly after receiving their high school certificates, which explains the low rate of married students. Years 1 and 2 (27% and 21%, respectively) were more represented in the sample, compared to other years, as the students could be approached easily and asked to complete the study forms. Only 50% of the sample had a normal BMI. This finding was similar to those of other studies in the region.[31]

A large proportion of the students (68%) received a monthly income of US$500-$1000 and above as most of them received governmental financial support. Only 9% of the students did not have a scholarship. The CMMS utilizes problem-based learning for teaching through small tutorial groups in the pre-clinical phase. Three main sources of stress have been identified specific to CMMS. The first relates to the difficulties that students face transitioning to college; the majority are not in their home environment, come from neighboring countries, and stay on campus or in rented apartments. The second relates to the type of education offered —self-learning—presumed to be more challenging than classical education. The third being a female gender being a risk factor for stress. To date, two studies have been conducted on medical students in Bahrain.[32,33] The first evaluated depression and anxiety in medical students; however, it did not evaluate EDs, sleep problems, or stress. Therefore, it did not have a direct correlation with the current study. The second study assessed burnout prevalence using the same instrument (i.e., the PSS-10) used in the current study to evaluate stress. It also included a sample of CMMS students[33] and reported stress prevalence of 47%, comparable to the rate of severe stress observed in the present study.

Study limitations

Although this was the first study in Bahrain to have evaluated the prevalence of and the association between EDs, sleep problems, and stress in medical students using a standardized international instrument, it had some limitations that have might have affected the accuracy of the results. The study relied on the willingness, co-operation, and objectivity of the students. Students who scored positive for

disorders were not evaluated clinically to diagnose if this was indeed the case. Lastly, some of their answers were retrieved from memory; hence, it was difficult to gauge the extent to which they were accurate.

Clinical implications

Students at college entry points are subjected to interviews regarding their intentions toward and motivation for studying medicine. The authors of the current study suggest that the line of questioning should cover examination-related anxiety, morbid obesity, and sleep problems. Students who experience difficulties in these areas should be given the opportunity to contact counseling services for help and advice. Stress levels were found to be higher during the clinical clerkship year. This could have been the result of an excessive number of rotation examinations, with few breaks between rotations. In addition, the summer holiday is short as students are encouraged to carry out their electives during that time. Several students find that they are not ready to continue with their medical education on completion of the preclinical stage at the end of Year 4. These students should be counseled, and other options must be provided and explored. Such students can experience severe stress later owing to the fact that they lack the motivation to continue studying medicine.

Conclusion

An evaluation was performed of the risk of EDs, sleep quality, and perceptions of stress in medical students (years 1–6) at the CMMS, Arabian Gulf University, Bahrain, in the current study using internationally valid instruments. A high proportion of the participants were shown to be at high risk of acquiring EDs (31%), sleep problems (68%), and severe stress (50%); however, an association between these lifestyle factors was not established. Approximately 10% of the students realized high scores in relation to all three areas. Female gender was found to be a risk factor for eating, sleep problems, and stress, and the clinical clerkship year was associated with elevated levels of stress. Age, income, BMI, and marital status did not have a statistically significant association with sleep problems and stress.

Counseling services should be offered to students with anxiety, poor eating habits, and morbid obesity at the beginning of their first year of study. Students who report difficulties sleeping at any time should be referred immediately for counseling. Strategies to mitigate stress while studying should be given.

Abbreviations

BMI – Body Mass Index

CMMS = College of Medicine and Medical Students

C.I = Confidence Interval

O.R= Odd ratio

EDs = eating disorders

EAT-26 = 26-Item Eating Attitudes Test

PSS-10 = 10-Item Perceived Stress Scale

PSQI = Pittsburg Sleep Quality Index

S.D = Standard Deviation

S.E= Standard Error

Declarations

Ethical approval and consent to participate

Ethics approval and consent to participate in the study was obtained from the Research and Ethics Committee, CMMS, Arabian Gulf University.

Consent for publication

Not appliable.

Availability of data and materials

Data will be shared with the students once it is published.

Competing interests

Not appliable.

Funding

Authors' contributions

All the authors read and approved the final manuscript. AA was responsible for conceiving, writing, and reviewing the manuscript, as well as collecting the data. HJ was involved in conceiving, writing, and reviewing the manuscript, and RRH and MS were responsible for conceiving the manuscript and reviewing the final draft. AIJ , AKJ , LRD were involved in conceiving the manuscript and collecting the data.

Acknowledgements

All methods were carried out in accordance with relevant guidelines and regulations.

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