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La santé mentale des étudiants avec un trouble du comportement alimentaire et un syndrome de l'intestin irritable en France

Mental health among university students with eating disorders and irritable bowel syndrome in France.

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Titre courant : Santé mentale chez les étudiants français

Meantal health among french university students

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Résumé

Position du problème : Les étudiants sont soumis au stress lié à la pression académique, l'autonomisation et la transition de l'adolescence à l'âge adulte. Cette population jeune pourrait donc présenter un risque élevé de pathologies comme les troubles du comportement alimentaire (TCA) et le syndrome de l'intestin irritable (SII). L'objectif était de déterminer la prévalence des TCA, du SII, des deux pathologies et les comportements associés.

Méthode : Une étude transversale a été réalisée chez les étudiants de l'université de Rouen-Normandie (France). Les étudiants ont répondu à un auto-questionnaire anonyme avec des items sur les caractéristiques sociodémographiques, les comportements à risque, la dépression (le score de Duke), le stress (le score de Cohen), l'épuisement professionnel (le score de Maslach), l'insomnie (l'Index de Sévérité de l'Insomnie), les TCA (le test SCOFF-F) et le SII (le Rome III).

Résultats : Cette étude a inclus 731 étudiants (ratio hommes/femmes = 0,43). Les prévalences des TCA, du SII et des TCA-SII coexistant étaient respectivement de 16,7%, 7,8% et 2,7%, plus élevées chez les femmes. La dépression, le stress, l'épuisement émotionnel, l'insomnie et la cyberaddiction étaient significativement associés aux TCA et au SII, ou TCA-SII. Les étudiants avec des TCA avaient un risque plus élevé d'avoir un SII (Odds Ratio ajusté (ORA = 2,42, IC 95% : 1,30-4,51), les étudiants atteints de SII avaient un risque plus élevé de TCA (ORA = 2,46, IC 95% : 1,32-4,55) et étaient plus souvent en troisième année d'études universitaires ou plus (ORA = 2,95, IC 95% : 1,50-5,76).

Conclusion : De nombreux étudiants souffrent de TCA et de SII, avec un risque significatif de coexistence d'un TCA-SII. Le TCA et le SII altèrent la santé mentale des étudiants, ce qui pourrait avoir des conséquences sur leurs parcours académiques. Le dépistage, utilisant

des tests simples et rapides comme SCOFF et ROME IV (mise à jour du ROME III en 2016), est essentiel dans cette population à risque.

Mots clés : Dépression; stress; épuisement émotionnel; insomnie; troubles du comportement alimentaire; syndrome de l'intestin irritable; étudiant

Abstract

Background: University students are subject to stress due to academic pressure, empowerment and transition from adolescence to adulthood. This young population may have a higher risk of functional disorders as eating disorders (ED) and irritable bowel syndrome (IBS). Our objective was to determine the prevalence of ED, IBS and both and the associated behaviours.

Methods: A cross sectional study was conducted in Rouen University (France). Participating students filled an anonymous self-questionnaire with items on socio-demographics, depression (Duke score), stress (Cohen score), emotional exhaustion (Maslach Inventory), insomnia (Insomnia Severity Index), cyberaddiction (Internet Addiction Test), ED (SCOFF-F test) and IBS (Rome III).

Results: This study included 731 students (male/female ratio=0.43). The prevalences of ED, IBS and co-existing ED-IBS were respectively 16.7%, 7.8% and 2.7%. ED and IBS were more common in female students. Depression, stress, emotional exhaustion, insomnia and cyberaddiction were significantly associated with ED and IBS or both. Students with ED had a higher risk of having IBS (Adjusted Odds Ratio (AOR)=2.42, 95% CI: 1.30-4.51), and conversely students with IBS had a higher risk of having ED (AOR=2.46, 95%

CI: 1.32-4.55) and were more likely to be in the third year of academic study or above (AOR=2.95, 95% CI: 1.50-5.76).

Conclusion: Students (female especially) suffer from ED and IBS, with a significant risk of co-existing ED-IBS. ED and IBS are related to multiple mental health symptoms which could lead to negative academic consequences. Screening, using simple and quick tests as SCOFF questionnaire and ROME IV criteria (update of ROME III in 2016), is essential in this population of university students.

Key word: Depression; stress; emotional exhaustion; insomnia; eating disorder; irritable bowel syndrome; university student

Background

Eating disorder (ED) and Irritable Bowel Syndrome (IBS) are frequent chronic disorders. ED are characterized by a disorder in relation to food, which is not secondary to a somatic or psychic disorder [1]. Based on version 5 of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), the lifetime prevalence of anorexia nervosa, bulimia nervosa, binge eating disorders and Other Specified Feeding or Eating Disorders (OSFED) are 1.7% to 4%, 0.8% to 2%, 2% to 2.3% and 5.0%, respectively [2,3, 4], which is, altogether, as high as 9-12%. These diseases are much more common among women [5, 6] and students (8-17 %) [7]. The aetiology of ED is a combination of biological, psychological and socio-cultural factors [8]. Many studies have shown that severe anxiety disorder increases the risk of developing an ED [9, 10, 11]. Psychiatric comorbidity is frequent in patients with ED. The most frequently reported are depressive disorders, followed by anxiety disorders, personality disorders and substance use disorders. People with ED are also more often stressed and depressed with a higher risk of cyber addiction or poly-addiction [12]. ED could be associated with behavioural coping mechanisms for psychological distress such as binge drinking, cigarette smoking, and frequent exercise [13]. Insomnia is related to an increased risk of ED [14].

IBS is a functional chronic disorder with digestive symptoms related to changes in motor function and sensitivity of the intestine. IBS can be diagnosed with ROME III criteria [15] and ROME IV since 2016 [16]. It is characterized by current abdominal pains or discomfort associated with transit disorders (diarrhea, constipation or mixed disorder). Its high prevalence (between 3% and 31%) [17] makes it the most common gastrointestinal disorder in the world [18, 19]. This prevalence is higher among women [20] and students where it can reach 32% [21]. Genetic, central (e.g. gut-brain dysregulation), hormonal, psychological, diet, and gastrointestinal (GI; e.g. altered motility) factors have all been

proposed to be potential candidates [22,23,24]. Moreover, IBS may be a result of various interactions between genetic and environmental factors [25]. IBS negatively impacts health-related quality of life in affected individuals and is associated with decreased work productivity and increased healthcare utilization and healthcare costs [26]. IBS has also been significantly associated with poor mental health status among students [27, 28].

IBS and ED are more prevalent between the late teens and the twenties. Until the early teenage years, the prevalence of IBS is relatively low but increases rapidly from the late teens onward [29].

Some studies have identified a higher prevalence of IBS in subjects with ED [30, 31]. Janssen's hypothesis is that the high prevalence of IBS in patients with ED could be related to the fact that motor and sensitivity disturbances together with psychiatric co-morbidities can lay the foundation for IBS [32].

Entry into higher education is accompanied by a period of transition from the end of adolescence to the beginning of adulthood, during which the increase in responsibilities (financial, autonomous), the stakes (school results, competition) and life changes (purpose, identity, exposure to many new experiences) [33, 34, 35], make it a difficult time for students. University students are thought to experience more stress than other groups of the population due to the stressful academic environment. Not only do they undergo a lot of physical stress and sleeplessness but also psychological stress as they face great future responsibilities. Studies have shown that stress experienced by students is associated with a higher presence of ED [36, 37] and IBS [38, 39].

ED and IBS share many similarities and are frequently associated with many co-morbidities such as anxiety, depression and stress. In the light of unanswered questions, we

conducted this epidemiological study to investigate the coexistence of ED and IBS among university students in France. Our objectives were two-fold: (1) to determine the prevalence of ED, IBS and co-existing ED-IBS among university students in France; (2) to investigate the role of socioeconomic and behavioural factors on ED, IBS, and co-existing ED-IBS in this group.

Methods

Design

Between October 2013 and January 2014, students were recruited as follows: for the Rouen group during their medical check-up. The study sample consisted of replies from 731/923 students in the Rouen group yielding a 79% response rate. The study design has been approved by the “Commission Nationale de l’Informatique et des Libertés” (The French Electronic Data Protection Authority) and Rouen University Hospital’s Institutional Review Board without mandatory informed consent.

Data collection

Rouen University students were invited to take part in a cross sectional study during a health forum on campus, by email, or during their mandatory medical survey at the university medical department. The students filled a confidential self-administered online form on the TS1C website or a paper questionnaire. The questionnaire takes 20 minutes to complete. All questions in the online questionnaire were compulsory. The online questionnaire was created with compulsory answers, meaning the student could not continue with the questionnaire if a previous question remained unanswered.

Socio-economic characteristics

The self-questionnaire included socio-economic characteristics: age, gender, student job status, marital status, accommodation status (at parents, rented accommodation, or on campus), financial difficulties with a scale from 0 (not at all) to 5 (very much) (0 to 3 were regrouped in no financial difficulties and 4 and 5 were regrouped as financial difficulties).

University curriculum

Four student groups were formed: 1) the mixed discipline university group, including faculties and schools specializing in literature, psychology, sciences, art and sport, 2) the health care group, including faculties and schools specializing in medicine, pharmacy, nursing, physiotherapy, midwifery and radiology technologist studies, 3) the engineering group including engineering and business schools, and 4) the technology group, including different short technical courses. The academic year of study was also collected.

Body mass index

Self-reported height and weight were used to calculate body mass index (BMI) with the standard formula ($\text{BMI} = \text{weight [kg]} / \text{height}^2 [\text{m}^2]$). Students were classified as being: underweight ($\text{BMI} < 18.5 \text{ kg/m}^2$), normal weight (between 18.5 and 24.9 kg/m^2), overweight and obese ($\text{BMI} \geq 25 \text{ kg/m}^2$).

Eating disorder

A quick and simple SCOFF (Sick, Control, One stone, Fat, Food) questionnaire has been developed based on 5 questions, allowing the detection of a possible eating disorder [40]. In order to assess eating behaviours, we used the SCOFF questionnaire. A score of 2/5 indicates possible ED. SCOFF has been translated in French (SCOFF-F) and validated with an internal consistency (Cronbach's alpha) of 0.76 [41, 42].

Irritable Bowel Syndrome

Rome III criteria are widely used in the diagnosis of IBS [43]. These criteria include recurrent abdominal pain or discomfort (at least 3 days per month in the previous 3 months) associated with two or more of the following: 1) improved by defecation, 2) onset associated with a change in stool frequency, and 3) onset associated with a change in form (appearance) of stool.

Mental health

A Perceived Stress Scale (PSS) has been developed to measure the extent to which recent life status is appraised as stressful and has been validated in French [44, 45]. The PSS is not a diagnostic instrument, therefore there were no cut-offs to determine stressed individuals and only comparisons between individuals were allowed.

The Duke health profile is a cross-culturally adapted, valid and useful measure of perceived health in adolescents and adults. Depression and anxiety were measured on a scale from 0 indicating no symptoms to 100 indicating symptoms [46].

The Maslach Burnout Inventory (MBI) is a standard measure of burnout [47]. We assessed one of the three components of burn out, namely emotional exhaustion. Emotional exhaustion is characterized by feelings of emotional overextension as a result of work. MBI contains nine questions which rate how often participants experience various feelings. Participants responded on a seven-point scale from 'never' to 'everyday', scored 0–6, on how frequently they experienced the state described. MBI cut-off points were used: low, moderate and high emotional exhaustion were defined respectively with a score of less than 18, between 18 and 29 and more than 29.

Insomnia

The Insomnia Severity Index (ISI) is a self-report measure designed to assess perceived severity of insomnia [48]. ISI is a 7-item self-report questionnaire assessing the nature, severity, and impact of insomnia. The evaluated domains are: severity of sleep onset, sleep maintenance, early morning awakening problems, sleep dissatisfaction, interference of sleep difficulties with daytime functioning, perception of sleep difficulties by others, and distress caused by sleep difficulties. This measure consists of seven items on a 5-point Likert scale from 0 (not at all satisfied) to 4 (very much satisfied). The total score was interpreted as follows: absence of insomnia (0–7); sub-clinical insomnia (8–14); moderate insomnia (15–21); and severe insomnia (22–28). Furthermore, clinically significant insomnia is detected when the total score is > 14 . ISI yielded a Cronbach's alpha of 0.90 in the French version [49].

Cyberaddiction

The Internet Addiction Test [50] is a 20-item, 5-point self-reporting measurement designed to assess the degree of respondents' Internet use. The maximum score is 100. A score higher than 50 indicates a risk of cyber addiction. The questionnaire exhibits adequate reliability and validity (French Validation of the Internet Addiction Test) [51]. In the present survey, the internal consistency was 0.93 (Cronbach's alpha).

Statistical analysis

Students with missing data or outliers were excluded from the analysis. The Chi-square (χ^2) test was used for comparisons of discrete data. Continuous variables were summarized by means and compared using the Student's t-test. Factors with a p value below 0.20 were

included in the multivariate analysis and a p value below 0.05 was considered to be significant. Logistic regressions were performed to evaluate the independent determinants of ED, IBS and both ED-IBS. A model was performed to identify socio economic factors with ED, IBS and both ED-IBS as independent variables. Logistic regressions were performed to identify behavioural risk factors: depression, stress, insomnia, cyberaddiction and emotional exhaustion associated with ED, IBS and both ED-IBS. The models were adjusted on age, gender, academic year of study, curriculum, student job holder, financial difficulties. Adjusted Odds Ratios (AOR) and their 95 % confidence intervals (CI) were calculated. Statistical analysis was conducted using XlstatBiomed® 2016.02.27608 software package.

Results

Baseline characteristics of the study population

A total of 731 university students were included in the study. Baseline characteristics are described in Table 1. Mean age (Standard Deviation (SD)) of students was 20.0 years (SD=2.4) with a male/female ratio of 0.43. Students were distributed in four groups as follows: 53.5% in the mixed university group; 24.6% in the health care group; 11.6% in the technology group and 10.3% in the engineering group. BMI was normal in 74.1% of students and mean BMI was 22.1kg/m² (SD=3.6) (Table 1). The scores of depression, anxiety and stress were respectively 38.4, 39.1 and 16.1 (Table 2).

Prevalence of eating disorders, characteristics and associated risks among university students

The prevalence of students with ED was 16.7% (95% CI: 14.0-19.4) and was higher in

female than in male students (19.0% vs 11.4%; $p=0.01$). Overall, ED were more frequent (35.1%) among students with IBS than among students without IBS (15.4%) ($p<10^{-3}$). Scores of depression, anxiety and stress were higher among students with ED than the others (respectively 52.8/100, 51.8/100 and 20.1/40) (Table 2).

After logistic regression, socio demographic associations with ED were the female gender and the financial difficulties (Table 3). Depression, anxiety, stress moderate insomnia, emotional exhaustion and cyber addiction were also significantly associated with ED (Table 4). University students with ED had twice the risk of having IBS symptoms (AOR=2.42, IC95%: 1.30-4.51) (Table 4).

Prevalence of irritable bowel syndrome, characteristics and associated risks among university students

The prevalence of students with IBS was 7.8% (95% CI: 5.9-9.7) (Table 1) and was higher in female than in male students (9.6% vs 3.6%) ($p=0.006$). Overall, IBS was more frequent in students with ED (16.4%) than in students without ED (6.1%) ($p<10^{-3}$).

Scores of depression, anxiety and stress were higher among university students with IBS than the others (respectively 48.3/100, 49.3/100 and 19.6/40) (Table 2).

After logistic regression, socio demographic associations with IBS were the female gender, the financial difficulties and being in third academic year of study (Table 3). Depression, anxiety, stress, moderate insomnia, emotional exhaustion and cyber addiction were also significantly associated with IBS (table 4). University students with IBS had twice the risk of having ED (AOR=2.46, IC95%: 1.32-4.55).

Coexistence eating disorders and irritable bowel syndrome among university students

The prevalence of students with both ED and IBS was 2.7% (95% CI: 1.5-3.9) ($n=20$),

3.1% in female students and 1.8% in male students ($p=0.32$), with a mean age (SD) of 21.1 years (2.4). Scores of depression, anxiety and stress were respectively 56.0/100, 55.0/100 and 21.6/40. Students with both ED and IBS had a higher risk of depression, anxiety, stress, cyberaddiction, than other university students (Table 4).

Discussion

The overall prevalence of ED in our study was 16.7% and our samples consistently found that ED were more common among female students [7]. Students with ED were more often overweight or obese. However, the prevalence of overweight or obese students in our study was lower than in the general population, which is about 56.8% for men and 40.9% for women [52]. Female gender was a usual risk factor [5]. We did not find any difference between curriculums. A previous report found a higher risk among athlete students but in our study they have not been differentiated from the mixed discipline group [53]. Students with ED were twice as likely to have financial difficulties. We found that ED were significantly associated with depression, anxiety and stress as reported in the literature among non-students populations [54,12]. Emotional exhaustion was newly highlighted as associated with ED, this emotional exhaustion could lead to academic consequences as failing examinations, as reported by Almeida et al. [55].

The prevalence of IBS in our study was 7.8%. Our results were similar to those reported by Dong et al. in Chinese College [56] though higher than those previously reported in the general population in France [17, 19]. Our study did not highlight a higher prevalence among healthcare students as previously reported [21,57,58]. However, some studies were conducted in countries with higher prevalence of IBS than in France [17]. The female/male ratio among students with IBS was about 2 to 1, results confirmed by Wells et al. [59]. Students in their fourth academic year and above had a higher risk of IBS, which confirmed the results of a previous study conducted among medical students [60]. This would seem to indicate that the presence of IBS is closely related to that of ED, as suspected by Perkins et al. who suggested that ED might be predictive of the later

development of IBS [31]. Stress, anxiety and depression scores were associated with IBS as previously reported among medical students [21, 53, 61].

The prevalence of co-existing ED-IBS in our study was 2.7% with no difference between male and female students. Our results showed that students with ED were twice as likely to have IBS symptoms and conversely. This in turn might explain why we found a higher prevalence of IBS in students who also had ED than the reverse [31]. We found a lower prevalence of IBS among students with ED than in previous studies conducted in the general population (41% to 52%) [62, 63]. Associated mental health risk among student with both ED and IBS were the same than students with solely ED or IBS: depression, stress, emotional exhaustion. The association of ED with IBS did not increase the risks. Abraham et al. showed that the presence of IBS in ED patients is strongly related to eating disordered and psychological feelings [64].

Overall, university students remain an understudied population with many unanswered questions and missed opportunities for prevention, early detection, and intervention. Previous studies have typically been conducted in a single field, thereby limiting the generalizability of the findings. To the best of our knowledge, this is the first study focusing on mental health, ED and IBS among a large sample of university students in France and over a large range of academic years and fields. The highest associated risks with ED and IBS or both found in our study were emotional exhaustion, insomnia and cyberaddiction.

Our study has limitations. Though eligible students were all invited to participate in the study, the response rate was 79%. Our study population presented the same sex ratio and mean age as in the Eurostudent V European study [65]. The diagnoses were not confirmed by physicians and only assessed by questionnaire (SCOFF-F and ROME III). However, these scores have been largely used with a good reliability [40, 66].

Conclusion

Our study highlights the prevalence of ED, IBS and co-existing ED-IBS in university students. These students, especially female students, suffer from ED and IBS, with a significant risk of co-existing ED-IBS. ED and IBS were related to depression, stress insomnia and emotional exhaustion and IBS appeared to occur in students in higher years of academic study. In the future, it would be beneficial to systematically screen students using a simple and quick screening test as SCOFF questionnaire and ROME IV (update of ROME III in 2016). Universities present a unique opportunity for early intervention and prevention of ED, IBS and coexisting ED-IBS in a population of young adults.

Declarations

- Ethics approval and consent to participate

The study design has been approved by the “Commission Nationale de l’Informatique et des Libertés” (The French Electronic Data Protection Authority) and Rouen University Hospital’s Institutional Review Board without mandatory informed consent (Clinical Trials: ID: NCT03218670).

-Consent to publish

The authors consent to publish

-Availability of data and materials

Data base eating disorder and irritable bowel syndrom university students [Data set]. Zenodo. <http://doi.org/10.5281/zenodo.1051103>

-Competing interests

Author AS declares that he has no conflict of interest, Author PD is co-founder and shareholder of TargEDys SA, Author JL declares that he has no conflict of interest, Author MPT declares that she has no conflict of interest

- Funding

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Authors'Contributions

-MPT and AS made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data;

- AS, MPT has been involved in drafting the manuscript or revising it critically for important intellectual content;

- PD and JL given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content; and

- All authors agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Table 1: Student characteristics and eating disorders or irritable bowel syndrome status (n=731)

| | ED N=122 | Non ED N=609 | p | IBS N=57 | Non IBS N=674 | p | Total N=731 |
|----------------------------|-------------|-----------------|--------------------|-------------|------------------|--------------------|----------------|
| Age <i>years</i> mean (SD) | 20.4 (2.2) | 19.9 (2.4) | 0.07 | 20.8 (3.9) | 19.9 (2.2) | 0.008 | 20.0 (2.4) |
| Female gender (%) | 79.5 | 68.2 | 0.01 | 86.0 | 68.7 | 0.006 | 69.9 |
| Curriculum (%) | | | | | | | |
| Technology group | 10.7 | 11.9 | 0.004 | 7.0 | 12.1 | 0.69 | 11.6 |
| Mixed discipline group | 66.4 | 51.1 | | 56.1 | 53.5 | | 53.5 |
| Health care group | 12.3 | 26.8 | | 24.6 | 24.3 | | 24.6 |
| School group | 10.7 | 10.2 | | 12.3 | 10.1 | | 10.3 |
| Academic year of study (%) | | | | | | | |
| 1 | 49.2 | 54.8 | 0.10 | 36.8 | 55.3 | 0.001 | 53.9 |
| 2 | 21.3 | 15.7 | | 19.3 | 16.5 | | 16.7 |
| 3 | 8.2 | 13.2 | | 8.8 | 12.7 | | 12.4 |
| > 3 | 21.3 | 16.2 | | 35.1 | 15.6 | | 17.0 |
| Student job holder (%) | 20.5 | 17.4 | 0.42 | 35.1 | 16.5 | < 10 ⁻³ | 18.1 |
| Accommodation (%) | | | | | | | |
| At parents' | 36.9 | 33.0 | 0.16 | 29.8 | 34 | 0.49 | 46.9 |
| In rented accommodations | 39.3 | 48.4 | | 54.4 | 46.2 | | 33.7 |
| On campus | 23.8 | 19.6 | | 15.8 | 19.8 | | 19.4 |
| Financial difficulties (%) | 47.5 | 25.3 | < 10 ⁻⁴ | 45.6 | 27.6 | 0.004 | 29.0 |
| Body mass index (%) | | | | | | | |
| Underweight | 10.0 | 10.9 | 0.01 | 8.8 | 10.9 | 0.41 | 10.8 |
| Normal | 65.8 | 75.7 | | 70.1 | 74.4 | | 74.1 |
| Overweight/obese | 24.2 | 13.4 | | 21.1 | 14.7 | | 15.1 |
| Depression score | 52.8 (24.7) | 35.5 (22.5) | < 10 ⁻⁴ | 48.3 (23.6) | 37.5 (23.6) | < 10 ⁻³ | 61.6 (23.8) |

ED: eating disorder

IBS: irritable bowel syndrome

Table 2: Factors associated with eating disorders or irritable bowel syndrome status among university students (n=731)

| | ED N=122 | Non ED N=609 | p | IBS N=57 | Non IBS N=674 | p | Total N=731 |
|------------------------------|-------------|-----------------|-------------|-------------|------------------|-------------|----------------|
| Irritable Bowel Syndrome (%) | 16.4 | 6.1 | $< 10^{-3}$ | 100.0 | 0 | | 7.8 |
| Eating disorders (%) | 100.0 | 0 | | 35.1 | 15.4 | $< 10^{-3}$ | 16.7 |
| Depression mean (SD) | 52.8 (24.7) | 35.5 (22.5) | $< 10^{-4}$ | 48.3 (23.6) | 37.5 (23.6) | $< 10^{-3}$ | 38.4 (23.8) |
| Anxiety mean (SD) | 51.8 (20.8) | 36.5 (20.3) | | 49.3 (19.7) | 38.2 (21.0) | | 39.1 (21.1) |
| Stress mean (SD) | 20.1 (7.6) | 15.3 (7.1) | $< 10^{-4}$ | 19.6 (7.6) | 15.8 (7.3) | 0.001 | 16.1 (7.4) |
| Emotional exhaustion (%) | | | | | | | |
| Low | 49.2 | 67.9 | $< 10^{-3}$ | 45.6 | 66.3 | 0.003 | 64.3 |
| Moderate | 30.3 | 22.4 | | 31.6 | 23.1 | | 24.1 |
| High | 20.5 | 9.7 | | 22.8 | 10.6 | | 11.6 |
| Insomnia (%) | | | | | | | |
| Absent | 25.4 | 43.0 | $< 10^{-4}$ | 26.3 | 41.3 | 0.01 | 40.1 |
| Sub-clinical | 43.4 | 42.5 | | 43.9 | 42.6 | | 42.8 |
| Clinical | 31.2 | 14.5 | | 29.8 | 16.1 | | 17.1 |
| Cyber-addiction (%) | 28.7 | 12.2 | $< 10^{-4}$ | 24.6 | 14.2 | 0.04 | 14.9 |

ED: eating disorder

IBS: irritable bowel syndrome

Table 3: Socio demographic characteristics associated with eating disorders and irritable bowel syndrome (logistic regression) (N=731)

| | ED | | IBS | |
|---------------------------------------|------------------|-------|------------------|------|
| | AOR (IC95%) | p | AOR (IC95%) | p |
| Age | 1.02 (0.92-1.14) | 0.71 | 0.98 (0.84-1.13) | 0.75 |
| Female | 1.83 (1.12-2.98) | 0.02 | 2.49 (1.14-5.45) | 0.02 |
| Curriculum | | | | |
| Technology group | Ref | | | |
| Mixed discipline group | 1.41 (.072-2.76) | 0.32 | 1.26 (0.41-3.86) | 0.68 |
| Health care group | 0.61 (0.27-1.40) | 0.24 | 1.57 (0.47-5.25) | 0.46 |
| Engineering and business school group | 1.24 (0.51-3.00) | 0.63 | 1.64 (0.43-6.27) | 0.47 |
| Academic year of study | | | | |
| 1 | Ref | | | |
| 2 | 1.24 (0.71-2.17) | 0.44 | 1.53 (0.68-3.44) | 0.30 |
| 3 | 0.53 (.025-1.14) | 0.11 | 0.92 (0.32-2.67) | 0.88 |
| >3 | 1.02 (0.49-2.10) | 0.96 | 2.54 (1.01-6.38) | 0.04 |
| Financial difficulties | 2.29 (1.49-3.51) | <10-3 | 1.88 (1.03-3.41) | 0.04 |

ED: eating disorder

IBS: irritable bowel syndrome

AOR: adjusted Odds Ratio

Table 4. Behavior risks with eating disorder, irritable bowel syndrome and both (logistic regressions) (n=731)

| | ED* | | IBS** | | IBS and ED*** | |
|-------------------------|------------------|-------------------|------------------|-------|------------------|-------|
| | AOR (IC95%) | p | AOR (IC95%) | p | AOR (IC95%) | p |
| Depression (/10 points) | 1.29 (1.18-1.42) | <10 ⁻⁴ | 1.16 (1.03-1.31) | 0.02 | 1.24 (1.03-1.49) | 0.02 |
| Anxiety (/10 points) | 1.32 (1.19-1.46) | <10 ⁻⁴ | 1.20 (1.04-1.40) | 0.01 | 1.26 (1.02-1.54) | 0.003 |
| Stress (/10 points) | 1.33 (1.18-1.50) | <10 ⁻⁴ | 1.23 (1.05-1.44) | 0.01 | 1.31 (1.04-1.66) | 0.02 |
| Insomnia | | | | | | |
| Absent | Ref | | Ref | | Ref | |
| Mild | 1.35 (0.83-2.19) | 0.23 | 1.35 (0.68-2.66) | 0.74 | 0.72 (0.25-2.1) | 0.55 |
| Moderate | 2.82 (1.62-4.93) | <10 ⁻³ | 2.37 (1.10-5.08) | 0.03 | 2.11 (0.74-5.97) | 0.16 |
| Cyberaddiction | 2.59 (1.59-4.20) | <10 ⁻⁴ | 2.06 (1.06-4.03) | 0.03 | 2.50 (1.00-6.22) | 0.05 |
| Emotional exhaustion | | | | | | |
| Low | Ref | | Ref | | Ref | |
| Moderate | 1.91 (1.19-3.07) | 0.007 | 1.93 (1.01-3.70) | 0.05 | 2.69 (1.03-7.05) | 0.04 |
| High | 2.56 (1.44-4.55) | 0.001 | 2.50 (1.18-5.27) | 0.02 | 2.55 (0.85-7.63) | 0.09 |
| ED | NA | | 2.46 (1.32-4.55) | 0.004 | NA | |
| IBS | 2.42 (1.30-4.51) | 0.005 | NA | | NA | |

*Adjusted on age, gender, academic year of study, curriculum, student job holder, financial difficulties and IBS

**Adjusted on age, gender, academic year of study, curriculum, student job holder, financial difficulties and ED

*** Adjusted on age, gender, academic year of study, curriculum, student job holder, financial difficulties

ED: eating disorder

IBS: irritable bowel syndrome

AOR: adjusted Odds Ratio

NA: not applicable