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Psychiatric and psychological follow-up of undergraduate and postgraduate medical students: Prevalence and associated factors. Results from the national BOURBON study

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ABSTRACT

Background: Physicians are at risk of burnout, anxiety and depression. Prevention is needed from the beginning of the medical studies to detect early poor mental health outcomes.

Objective: To determine the prevalence and associated of psychiatric or psychological follow-up in a national sample of undergraduate and postgraduate medical students (UPMS).

Methods: UPMS of the 35 French Medicine faculties were recruited through mailing lists and social networks between December 2016 and May 2017 and fulfilled Internet anonymised questionnaires.

Results: Overall, 10,985 UPMS were included in the present study (2165 (19.7%) postgraduate, 31.6% males, mean aged 21.8 years). Overall, 1345 (12.2%) were followed-up by a psychiatrist and/or a psychologist, 20.5% of them were regular anxiolytic consumers and 17.2% of them were regular antidepressant consumers. In multivariate analyses, being followed-up by a psychiatrist and/or psychologist was associated with older age (aOR = 1.2[1.2–1.2], $p < 0.0001$), female gender (aOR = 0.5[0.5–0.7], $p < 0.0001$), current alcohol use disorder (aOR = 1.3[1.3–1.5], $p < 0.0001$), higher anxiolytic (aOR = 3.1[2.5–3.7],$p < 0.0001$) and antidepressant (aOR = 11.7[7.6–18.0],$p < 0.0001$) consumption, and with lower self-reported general health, social functioning and mental health quality of life (all aORs = 0.9, all $p < 0.05$). The UPMS followed-up by psychiatrist and/or psychologist reported to have been more frequently exposed to sexual assault (5.1% vs. 0.9%, aOR = 2.5[1.3–4.7], $p < 0.0001$), domestic violence (3.3% vs. 0.8% aOR = 2.1[1.2–4.0], $p = 0.01$) and parents divorce (11% vs. 6.4%, aOR = 1.5[1.2–1.9], $p = 0.001$). Students followed-up by a psychiatrist and/or psychologist reported more frequently to seek alleviating anxiety (aOR 1.9[1.6–2.3], $p < 0.0001$), depression (aOR 1.7[1.3–2.1],$p < 0.0001$), coping with studies difficulties (aOR 1.5[1.2–1.8],$p < 0.0001$), experiencing more stress at hospital (aOR = 2.3[1.6–3.5],$p < 0.001$) and more burnout syndrome (aOR = 1.4[1.1–1.8], $p = 0.03$).

Conclusions: Around 12% of UPMS are followed-up by a psychiatrist and/or a psychologist. These students reported higher antidepressant and anxiolytic consumption, psychic suffering and altered quality of life, associated with professional pressure and personal issues. Public health programs should be developed to help these students through their studies to prevent later mental /addictive issues and professional suffering. Improving UPMS mental health may also improve the later quality of care of their patients and global stress at hospital.

1. Introduction

Physicians, and even medical students clearly represent an at-risk collective in our society for increased prevalence of mental disorders. Medical school is recognized as an arduous undertaking (Dyrbye et al., 2009; Reed et al., 2011), with high levels of associated stress (Dahlin et al., 2005). Previous studies have suggested that medical students had poorer mental health than the general population of the same age, experiencing high rates of depression and suicidal ideation (Dyrbye et al., 2006). The percentage of medical students screening positive for depression who sought psychiatric treatment was 15.7% in a recent meta-analysis (Rotenstein et al., 2016). Depression is often associated with addictive behavior. A recent study has found an increase of binge drinking in medical students (Duroy et al., 2017).

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Burnout ranged from 7.0% to 75.2% in this population according to country-specific factors (Erschens et al., 2018). These circumstances lead to massive damage for the later physicians, which is reflected for instance in the highest suicide rate of all occupational groups – which is approximately 3–5 times higher than in the general population (Krug et al., 2002). The constraints, which can occur due to psychological stresses and disorders, can also lead to hazards for patients in the form of incorrect medical decisions (Chen et al., 2013).

Medical school in France has one of the longest study paths within French higher education. French medical studies are divided in three cycles. First cycle/premedical school (2 years) is only theoretical. The first year ends with a very selective examination called numerus clausus (in 2014 in France: 58,733 candidates for 7492 received in 2nd year medical i.e. 12.8%) (Remede.org, 2015). Second cycle (4 years) is both theoretical and practical, and all medical students must pass a "classifying national examination" at the end of 6th year, which determines the specialization of each student according to his/her rank. Third cycle/internship (4–5 years according to medical specialties) is mostly practical. Interns can manage patients, do shifts and prescribe drugs under the supervision of senior physicians. Students are required to submit and defend a thesis at the end of their internship to receive their MD. In summary, medical studies require sustained memory and attention abilities for at least a decade. At the same time, long periods of shifts and exam preparations may induce deep sleep deprivation, impacting mood and anxiety.

Reliable estimates of mental health and addictive behavior prevalence during medical training are important for informing efforts to prevent, treat, and identify causes of emotional distress among medical students (Shanafelt et al., 2003) especially in light of recent work revealing a high prevalence of depression in resident physicians (Mata et al., 2015).

No data is available to date on medical students mental health in France to date and there is currently no rules or established prevention programs in case of major mental disorder onset in medical students. The objective of the present study was to determine the prevalence of medical students followed-up by a psychiatrist and/or a psychologist and its associated factors.

2. Population and methods

2.1. Study design

The BOURBON study was inspired from previous studies on psychostimulant use in medical students (Fond et al., 2016; Micoulaud-Franchi et al., 2014). This study was a descriptive cross-sectional observational epidemiological national study.

2.1.1. Study population

The medical students were recruited in the 35 universities of medicine in metropolitan France. The survey was sent through faculty administration mailing lists for seventeen of them, social networks for two of them. Overall, 5 universities had refused to sent the survey to their students. Students were also contacted through friends and colleagues, who shared the survey by social networks. At the end, all the 35 universities were represented in the present study.

2.1.2. Collected data

Data was collected by a self-reported questionnaire between December 13, 2016 and May 15, 2017. All medical students inscribed at a medical faculty during the year 2016–2017 were included in the present study. The medical students were interviewed through an online, anonymous questionnaire via the Google Forms software. Completing the questionnaire took an average of 15 min. The questionnaire included:

– at least 23 questions for students who did not consume any substance.
– a maximum of 140 questions for students who, by their answers, opened the entire questionnaire.

Sociodemographic data was recorded (age, sex, having children) as well as the number of weekly worked hours and number of shifts/month.

2.1.3. Mental health variables

The following mental health variables were reported: current psychiatric or psychological follow-up, daily antidepressant, anxiolytic, hypnotic, mood-stabilizers, antipsychotics consumption. Psychotropic drug consumption was considered as an indicator of the psychiatric illness (e.g. antidepressant for major depression) as well as a marker of severity (antidepressants are indicated only for severe major depressive disorder).

2.1.4. Quality of life

The self-reported quality of life was assessed using the SF12-v2 quality of life score with 8 subscores (Physical Functioning, Role Physical, Bodily Pain, General Health, Vitality, Social Functioning, Role Emotional, Mental Health). Scores tending towards 100 indicate a better quality of life.

2.1.5. Addictions

The alcohol use disorder was defined by the French version of the Alcohol Use Disorder Identification Test (AUDIT) score ≥ 7 for men and 6 for women (Gache et al., 2005). This scale rates 10 items on a 5-point scale. Cannabis use disorder was defined by a French-version Cannabis Abuse Screening Test (CAST) score ≥ 2 (Legleye et al., 2011). This test is commonly used to screen for risk of cannabis use disorder, assesses health and social harm. It assesses the frequency of the following events within the past 12 months. Computing total full CAST scores can range from 0 to 24. Current daily tobacco smoking was self-declared. The regular or occasional consumption of ecstasy, cocaine, mushrooms, amphetamine, LSD, heroine, ketamine during the medical studies was reported. Survey questions about motives for use of psychostimulants were not mutually exclusive (i.e., students could report more than one reason).

2.1.6. Motives

The motives for consumption were detailed and reported in Table 1. As "Burnout" was only explored as a motive for psychoactive drug consumption, it was not specifically defined for the present questionnaire. No specific scale was used to define it to shorten the questionnaire and increase the response rate.

2.2. Ethical concerns

An email was sent to medical students using the database of French medicine student associations, as well as professional mailing lists and posted its content on specialized Internet forums. This email invited potential subjects to participate. It described and explained the rationale of the study, as well as its goals. They were invited to self-administer a confidential Web survey by clicking on a URL link: the study was absolutely voluntary and students could withdraw from the survey at anytime before sending back their questionnaire. Personal data were anonymized and stored on a secure server. Our survey did not record any identifiable data to protect subject anonymity. Care was taken to delete IP addresses from the dataset. Data were stored in an offline database for later analyses. No informed consent form was required. Participants were informed that by accepting to send back their anonymous questionnaires, they gave their informed consent to participate. The study was carried out in accordance with ethical principles for medical research involving humans (WMA, Declaration of Helsinki). According to the French law, no ethical number was needed for an

Table 1
Follow-up by a psychiatrist and associated mental health status. quality of life and addictive behaviors of 10,985 medical students recruited in 35 Medicine Faculties between december 2016 and May 2017. Significant associations in multivariate analysis are in bold. AOR: adjusted Odd Ratio. The variables were adjusted in multivariate analyses for all variables associated with psychiatric follow-up in univariate analyses with a $p < 0.2$.

	Whole sample (n = 10,985) n or mean (% or SD)		No psychiatric follow-up (n = 9640. 87.8%) n or mean (% or SD)		Psychiatric follow-up (n = 1345.12.2%) n or mean (% or SD)		Multivariate analysis after Jackknife validation				
							P value	aOR	IC95%		adjusted p value**
Sociodemographic variables											
Age (years)	**21.8**	**3.3**	**21.6**	**3.2**	**23.4**	**3.5**	**<0.0001**	**1.19**	**1.15**	**1.22**	**<0.0001**
Gender (female)	**3467**	**31.6%**	**3167**	**32.9%**	**300**	**22.3%**	**<0.0001**	**0.54**	**0.45**	**0.66**	**<0.0001**
Marital status (couple)	5551	50.5%	4827	50.1%	724	53.8%	0.01	0.9	0.7	1.0	0.06
Having children	204	1.9%	163	1.7%	41	3.0%	0.001	0.7	0.4	1.2	0.18
Postgraduate students (vs. undergraduate)	2165	19.7%	1761	18.3%	404	30.0%	<0.0001	0.9	0.7	1.2	0.43
Weekly hours of work > 40 h	2307	21.0%	1926	20.0%	381	28.3%	<0.0001	0.9	0.7	1.1	0.19
≥5 night shifts/month	650	5.9%	558	5.8%	92	6.8%	0.30				
Addictive behavior											
Current daily tobacco smoking	2078	18.9%	1744	18.1%	334	24.8%	<0.0001	1.04	0.88	1.22	0.66
Current cannabis use disorder*	622	5.7%	516	5.4%	106	7.9%	<0.0001	1.13	0.89	1.44	0.31
Current alcohol use disorder**	**3713**	**33.8%**	**3169**	**32.9%**	**544**	**40.4%**	**<0.0001**	**1.33**	**1.17**	**1.50**	**<0.0001**
Psychotropic drug consumption											
Anxiolytic consumption	**621**	**5.7%**	**345**	**3.6%**	**276**	**20.5%**	**<0.0001**	**3.05**	**2.49**	**3.74**	**<0.0001**
Antidepressant consumption	313	2.8%	82	0.9%	231	17.2%	<0.0001	**11,70**	**7,62**	**17,97**	**<0.0001**
Hypnotic consumption	234	2.1%	143	1.5%	91	6.8%	<0.0001	1.16	0.79	1.70	0.44
Mood stabilizer consumption	46	0.4%	18	0.2%	28	2.1%	<0.0001	1.37	0.53	3.52	0.51
Antipsychotic consumption	47	0.4%	17	0.2%	30	2.2%	<0.0001	0.80	0.28	2.32	0.68
Self-reported quality of life											
Physical functioning	**94.5**	**13.2**	**94.7**	**12.8**	**92.8**	**15.5**	**<0.0001**	**1.01**	**1.00**	**1.01**	**0.01**
Role physical	**85.5**	**20.5**	**86.1**	**20.0**	**81.2**	**23.3**	**<0.0001**	**1.00**	**1.00**	**1.01**	**0.03**
Bodily pain	90.0	17.3	90.6	16.7	86.0	20.8	<0.0001	1.00	0.99	1.00	0.38
General health	**75.4**	**20.3**	**76.7**	**19.1**	**66.6**	**25.4**	**<0.0001**	**0.99**	**0.99**	**1.00**	**<0.0001**
Vitality	35.1	22.8	36.0	22.8	29.1	21.7	<0.0001	1.00	0.99	1.00	0.69
Social Functioning	**74.2**	**22.7**	**75.8**	**21.9**	**62.4**	**25.2**	**<0.0001**	**0.99**	**0.98**	**0.99**	**<0.0001**
Role emotional	68.4	24.6	69.8	24.1	58.8	26.0	<0.0001	1.00	0.99	1.00	0.48
Mental Health	**56.6**	**19.5**	**57.8**	**19.1**	**47.9**	**19.6**	**<0.0001**	**0.99**	**0.98**	**0.99**	**<0.0001**
History of psychosocial risk factors during medical studies											
Mourning	**4104**	**37.4%**	**3491**	**36.2%**	**613**	**45.6%**	**<0.0001**	**1.15**	**1.01**	**1.30**	**0.03**
Sexual assault	**156**	**1.4%**	**87**	**0.9%**	**69**	**5.1%**	**<0.0001**	**2.50**	**1.33**	**4.72**	**0.01**
Domestic violence	**117**	**1.1%**	**73**	**0.8%**	**44**	**3.3%**	**<0.0001**	**2.16**	**1.18**	**3.95**	**0.01**
Physical assault	537	4.9%	417	4.3%	120	8.9%	<0.0001	1.26	0.97	1.62	0.08
Parents divorce	**766**	**7.0%**	**618**	**6.4%**	**148**	**11.0%**	**<0.0001**	**1.55**	**1.23**	**1.94**	**<0.0001**
Financial difficulties	2395	21.8%	1989	20.6%	406	30.2%	<0.0001	0.92	0.79	1.08	0.32

anonymized online questionnaire in non-patients subjects.

2.3. Statistical analysis

Sociodemographic variables, addictive behavior, mental health status, history of psychosocial risk factors during medical studies, regular or psychoactive substance experience during medical studies, desired effect for substance consumption during medical studies and self-reported quality of life are presented using measures of means and dispersion (standard deviation) for continuous data and frequency distribution for categorical variables (Table 1). The data was examined for normal distribution with the Shapiro–Wilk test and for homogeneity of variance with the Levene test. Comparisons between medical students followed up by a psychiatrist and/or a psychologist vs. other medical students regarding sociodemographic variables, addictive behavior, mental health status, history of psychosocial risk factors during medical studies, regular or psychoactive substance experience during medical studies, desired effect for substance consumption and self-reported quality of life were performed using the chi-square test for categorical variables. Continuous variables were analyzed with Student t-tests for normally distributed data and in case of normality violation, additional Mann–Whitney tests were performed to confirm the result. STATA SVY module was used for analysis to adjust for the cluster sampling methodology. A single level of clustering on university was considered. Taylor method of linearization and Jackknife Repeated Replication (JRR) (Rao and Wu, 1985) was applied to calculate standard errors (SEs) of estimates (Armitage, 2005). A sampling weight Wi was derived for ith participant by using the inverse of sampling fraction formula (1/SF), where SF = (sample proportion/population proportion). The sample was balanced on the gender characteristic. Census report found a female proportion equal to 62% versus 68.4% in the sample. Thus weights were equal to:

$$W_{female} = \frac{1}{0.684/0.62} = 0.906 \text{ And } W_{male} = \frac{1}{0.316/0.38} = 1.202$$

All variables were considered relevant and those associated with psychiatric and/or psychological follow-up in univariate analyses with a p value <0.2 were included in the multivariate analyses as well as all relevant clinical variables that could be forced (none in the present case). All statistical tests were two-tailed, with α level set at 0.05.

3. Results

Overall, 10,985 medical students were included in the present study (31.6% males, mean aged 21.8 years). 3051(27.8%) participants were in the first year, 1294 (11.8%) in the second year, 1287 (11.7%) in the third year, 1191 in the fourth year (10.8%), 1094 in the 5th year (10.0%), 1203 in the 6th year (11.0%), 361 in the first year of internship (3.3%), 440 in the second year of internship (4.0%), 479 in the third year of internship (4.4%), 469 in the fourth year of internship (4.3%), 90 in the 5th year of internship (0.8%), 26 were taking an availability (0.2%). 302 (13.9%) interns were psychiatrists, 118 (5.5%) anesthetists, 171 (7.9%) surgeons, and 921 (42.5%) GPs. 6640 participants (60.4%) were in non-clinical years (year 1 and 2). 5551 (50.5%) were in couple and 204 (1.9%) had children. 18.9% were daily tobacco smokers, 5.7% reported a current cannabis use disorder and 33.8% reported a current alcohol use disorder.

Overall, 1345 (12.2%) were followed-up by a psychiatrist or a psychologist, 621(5.7%) were regular anxiolytic consumers and 313(2.8%) were regular antidepressant consumers. In multivariate analyses after Jackknife validation, being followed-up by a psychiatrist and/or psychologist was associated with older age (aOR = 1.2[1.2–1.2], $p < 0.0001$), female gender (aOR = 0.5[0.5–0.7], $p < 0.0001$), current alcohol use disorder (aOR = 1.3[1.3–1.5], $p < 0.0001$), higher anxiolytic (aOR = 3.1[2.5–3.7],$p < 0.0001$) and antidepressant (aOR = 11.7[7.6–18.0],$p < 0.0001$) consumption, and with lower self-reported general health, social functioning and mental health quality of life (all aORs = 0.9, all $p < 0.05$). The UPMS followed-up by psychiatrist and/or psychologist reported to have been more frequently exposed to sexual assault (5.1% vs. 0.9%, aOR = 2.5[1.3–4.7], $p < 0.0001$), domestic violence (3.3% vs. 0.8% aOR = 2.1[1.2–4.0], $p = 0.01$) and parents divorce (11% vs. 6.4%, aOR = 1.5[1.2–1.9], $p = 0.001$) (Table 1). Students followed-up by a psychiatrist and/or psychologist reported more frequently to seek alleviating anxiety (aOR 1.9[1.6–2.3],$p < 0.0001$), depression (aOR 1.7[1.3–2.1],$p < 0.0001$), coping with studies difficulties (aOR 1.5[1.2–1.8],$p < 0.0001$), experiencing more stress at hospital (aOR = 2.3[1.6–3.5],$p < 0.001$) and more burnout syndrome (aOR = 1.4[1.1–1.8], $p = 0.03$) (Table 2).

4. Discussion

The major findings of the present study may be summarized as follows: in a national sample of 10,985 medical students, around 12% were followed-up by a psychiatrist. These students were dealing more frequently with professional adversity (stress before exams, responsibilities, stress at work in hospital, burnout syndrome) and personal stress events during their medical studies (parents' divorce, sexual assault and domestic violence), consume more antidepressants and anxiolytics and reported lower quality of life scores.

This study is the first study to explore the mental health of medical students in France. It is therefore not possible to determine a trend in the evolution of mental health status in this population. In the present sample, around 12% of medical students were followed-up by a psychiatrist and/or a psychologist. Among them, 20% were current daily anxiolytic consumers and 17% current daily antidepressant consumers. However, it is plausible that many students with major depression remain treated only by psychotherapy or not treated at all. This prevalence of 3.4% of antidepressant consumers in medical students is lower than the prevalence of 8% of major depression in the French general population (Fond G, Boyer L., 2018). There is no data in the specific student population to date. Further studies should determine the prevalence of major depression in French medical students. In one Portuguese study published in 2014, 11.4% of 289 medical students reported to be current or past antidepressant consumers (Ribeiro et al., 2014). In a Korean study published in 2007, 9.4% of medical students were found to be currently depressed and only 9.7% of them (0.9% of the entire sample) were correctly treated for depression. According to different severity levels, depression of Indian medical students ranked from 0.7% to more than half (Goel et al., 2016; Kumar et al., 2017; Ratnani et al., 2017). No data on antidepressant consumption of medical students of Asia, Africa or South-America and Latin-America is available to date. French medical students were therefore found to be 3 time more frequently antidepressant consumers (2.8% vs. 0.9%) than Korean one, which may be explained by access to medication, self-prescription or depression representation in the general population (that may lead to being ashamed of being depressed and treated). In a study published in 2005, 15.2% of 450 American medical students were found to be currently depressed and only 23% of them (2.8% of the whole sample) reported to be correctly treated (Tjia et al., 2005). This rate is comparable to those of the present study. In the present study, students followed-up by a psychiatrist or a psychologist were more frequently prescribed antidepressants and anxiolytics, which suggests that most of them were followed-up by a psychiatrist (as only psychiatrists can prescribe psychotropic drugs in France) and which suggest that the motives for psychiatric follow-up were severe (for example, antidepressants are only indicated in severe major depression in France).

Women were found to be more frequently followed-up by a psychiatrist or a psychologist in the present study, which is consistent with previous studies suggesting that female gender was associated with lower well-being (Yousafzai et al., 2009). The results also suggested that the proportion of students followed-up by a psychiatrist and/or psychologist increased through medical studies, as the students followed-up were older than the others. Beyond impaired self-reported mental health quality of life, the subjects followed-up by a psychiatrist and/or psychologist also reported slightly impaired physical functioning and general health, which also suggests that psychic suffering may also be associated with physical problems that should be further explored. Impaired social functioning was also more frequently reported in those students, which suggests that social adversity may be one of the motives for psychiatric and/or psychological follow-up.

These students also reported to have been more exposed to personal and professional stressful events. Among professional events, study difficulties, stress before exams, stress in coping with responsibilities, stress at hospital and burnout syndrome have all be more frequently reported in students followed-up by a psychiatrist and/or psychologist. Personal events have also been identified, including sexual assault, parents' divorce and domestic violence. No causal relationship may be inferred from this association: adversity may increase psychic suffering, and psychic suffering may increase difficulties at work. However, it may reasonably be suggested that improving work's conditions for these students may help improving their mental health status and quality of life. Future studies should explore interventions to focus on this subgroup of students that seem particularly vulnerable. For example, almost 13% of followed-up students have reported to consume psychoactive drugs to deal with burnout vs. 3% in the other students, and 30% report study difficulties vs. 14% in the others. Prevention programs to help coping with burnout and study difficulties may be useful to improve psychic suffering in these students.

4.1. Perspectives

Recent studies have suggested that some other interventions may be useful in medical students experiencing stress including non-pharmacological intervention (mindfulness-based stress reduction (Kuhlmann et al., 2016), self-hypnosis, feedback on various health habits, educational discussion (Shiralkar et al., 2013)), complementary agents intervention (omega 3 (Kiecolt-Glaser et al., 2011) and probiotics (Kato-Kataoka et al., 2016)) and organizational interventions (changes in the length and type of curriculum, and changes in the grading system (Shiralkar et al., 2013)). Recent meta-analyses on interventions to reduce stress in physicians have suggested that

Table 2
Motives and circumstances of psychoactive substance consumption in medical students with a psychiatric follow-up (univariate and multivariates analyses). Significant associations in multivariate analysis are in bold.

	Whole sample (*N* = 10,985)		No psychiatric follow-up (*N* = 9640. 87.8%)		Psychiatric follow-up (*N* = 1345. 12.2%)		Multivariate analysis after Jackknife validation				
	N or mean (% or SD)		*N* or mean (% or SD)		*N* or mean (% or SD)		*P* value	aOR	IC95%		adjusted p value
Sociodemographic variables											
Age (years)	**21.7**	**3.3**	**21.6**	**3.2**	**23.4**	**3.5**	**<0.0001**	**1.16**	**1.12**	**1.19**	**0.00**
Gender (female)	**3467**	**31.6%**	**3167**	**32.9%**	**300**	**22.3%**	**<0.0001**	**0.47**	**0.38**	**0.58**	**0.00**
Motives and circumstances for psychoactive substance consumption during medical studies											
During party	6770	82.0%	5885	82.4%	886	79.1%	0.007	0.89	0.65	1.23	0.48
Pleasure seeking	6493	78.3%	5605	78.5%	858	76.6%	0.15	0.80	0.63	1.03	0.08
Novelty seeking	4372	52.9%	3767	52.8%	605	54.0%	0.43				
Group effect (private life)	3283	39.8%	2841	39.8%	442	39.5%	0.83				
Disinhibiting	3048	36.9%	2593	36.3%	455	40.6%	0.006	1.19	0.97	1.48	0.10
Alleviating anxiety	**1574**	**19.1%**	**1139**	**16.0%**	**435**	**38.8%**	**<0.0001**	**1.89**	**1.58**	**2.25**	**<0.0001**
Alleviating depression	**601**	**7.3%**	**402**	**5.6%**	**199**	**17.8%**	**<0.0001**	**1.68**	**1.33**	**2.14**	**<0.0001**
Stimulant	2152	26.1%	1827	25.6%	325	29.0%	0.02	1.04	0.88	1.24	0.62
Sedative	654	7.9%	454	6.4%	200	17.9%	<0.0001	1.23	0.95	1.60	0.12
Dealing with loneliness	180	2.2%	112	1.6%	68	6.1%	<0.0001	1.36	0.80	2.31	0.25
Dealing with mourning	166	2.0%	109	1.5%	57	5.1%	<0.0001	1.36	0.89	2.10	0.15
Study difficulties	**1391**	**16.8%**	**1048**	**14.7%**	**343**	**30.6%**	**<0.0001**	**1.48**	**1.21**	**1.82**	**<0.0001**
Dealing with. sentimental breakup	415	5.0%	314	4.4%	101	9.0%	<0.0001	0.95	0.75	1.19	0.65
Stress before exam	704	8.5%	530	7.4%	174	15.5%	<0.0001	0.75	0.57	1.00	0.05
Stress at work	**176**	**2.1%**	**89**	**1.2%**	**87**	**7/8%**	**<0.0001**	**2.41**	**1.59**	**3.68**	**<0.0001**
Professional Burnout	**387**	**4.7%**	**242**	**3.4%**	**145**	**12.9%**	**<0.0001**	**1.38**	**1.05**	**1.82**	**0.03**
Stress before shift	197	2.4%	118	1.7%	79	7.1%	<0.0001	1.18	0.76	1.81	0.45
Stress during shift	123	1.5%	78	1.1%	45	4.0%	<0.0001	0.86	0.49	1.52	0.61
Familial difficulties	327	4.0%	226	3.2%	101	9.0%	<0.0001	0.99	0.71	1.37	0.94
Financial difficulties	120	1.5%	77	1.1%	43	3.8%	<0.0001	1.11	0.70	1.76	0.64

organizational interventions may be more efficient that individual-based ones (Brand et al., 2017; Busireddy et al., 2017; Panagioti et al., 2017). There is a lack of data of good quality for interventions in medical students (Shiralkar et al., 2013). Interventions that were supported by a reduction in stress and anxiety in medical students included mindfulness-based stress-reduction or meditation techniques, self-hypnosis, and pass/fail grading (Shiralkar et al., 2013). Neer-peer mentoring based on personal development has also shown promising results in a recent meta-analysis (Akinla et al., 2018). In 2018, the French government has voted the modification of the first year and 6th year national exams to alleviate studies-related stress in medical students. Longitudinal studies should determine if these interventions would be associated with mental health improvement in medical students.

4.2. Limits

These results should be taken with caution. As our study has a cross-sectional design, no causal link can be definitely inferred. This data was self-reported, as in all but one previous studies (Rotenstein et al., 2016). Because of the study design, it was not possible to calculate an accurate response rate. According to the Observatoire National des professions de Santé (ONDPS), the number of interns in France in 2016–2017 is evaluated to 26,800 (ONDPS, 2015), which suggests that the present sample represent around 8% of the whole national medical students at this time. The number of second year medical students in France in 2016–2017 is evaluated to 8205 (ONDPS, 2015), which suggests a response rate around 16% in this section. Similarly, the number of 6th year medical students was evaluated to 8400 (ONDPS, 2015), which suggests a response rate around 14% in this section. Despite these limits, our sample is one of the largest studies assessing mental health, quality of life, psychoactive use and motives in medical students. It included around 32% of males, which is representative of the sex ratio of medical students in France in 2017 (Lapeyre and Feuvre, 2005). If antidepressants and anxiolytics were prescribed or not has not been reported in the present study, as well as suicidal ideations, self-reported depressive symptoms and maladaptive perfectionism (Chand et al., 2018). Although this questionnaire was disseminated through medical faculties and medical students network, it was not possible to check that participants were medical students due to anonymity ethical issues.

4.3. Strengths

The large national multicentric sample including medical students of all French faculties may be cited as strength of the present work. To avoid any declaration bias, the results were strictly anonymized. As previous results have suggested that medical students were not always able to identify depressive symptoms (Kuzman et al., 2014), mental health was proxy by psychiatric and/or psychological follow-up and psychotropic drug daily consumption including antidepressants. While some variables are collinear (like tobacco smoking and cannabis use disorder, or antidepressant and anxiolytic consumption), all associations remained significant due to the large sample size. Removing each variable did not change our results (data not shown).

5. Conclusion

Around 12% of medical students are followed-up by a psychiatrist and/or a psychologist. These students reported higher antidepressant and anxiolytic consumption, psychic suffering and altered quality of life, associated with professional pressure and personal issues. Public health programs should be developed to help these students through their studies to prevent later mental /addictive issues and professional suffering. Improving mental health in medical students may also improve the later quality of care of their patients and global stress at

hospital.

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Conflicts of interest

None declared.

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