

Original Article

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Anxiety among medical students and junior doctors in Denmark

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ABSTRACT

INTRODUCTION. International studies document that medical education and the transition from student to medical doctor may be a stressful and difficult time. High anxiety levels impact professional performance and quality of life. The aim of this study was to investigate the prevalence of anxiety among Danish final-semester medical students and newly graduated medical doctors, including individual changes.

METHODS. This was a descriptive cohort and cross-sectional study based on a questionnaire given to medical students and newly graduated doctors between December 2020 and May 2021. The survey used the following validated anxiety scales: the Leeds Self-assessment of Anxiety scale and the State-Trait Anxiety Inventory. The data were analysed for medical students and doctors as cross-sectional analyses.

RESULTS. A total of 175 medical students and 65 newly graduated doctors were included; 20 participated in both surveys. We found that 54 (32.5%) of the medical students and 12 (19.4%) of the newly graduated doctors scored pathologically anxious ($p = 0.06$). The measured anxiety level was higher than the anxiety level found in the background populations from other studies. Anxiety was related to gender and to previous treatment for stress or anxiety and it persisted from student life into life as a young doctor.

CONCLUSION. A high proportion of the medical students reported anxiety, a condition which remained among the young doctors.

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The transition from medical student to medical doctor (henceforth, “doctor”) can be a stressful and difficult time for many people [1]. Many students and young doctors suffer from anxiety [2, 3], which may impact negatively on their ability to practice medicine safely and effectively [1]. Individuals with anxiety have a larger, statistically significant decrease in quality of life than people with congestive heart failure, diabetes and myocardial infarction [4].

A study indicates that the global prevalence of anxiety among medical students is 33.8% [5]. It has been suggested that mental distress has some of its origin in medical school [6] and that mental health problems requiring treatment in postgraduates may be predicted before graduation [7]. Student distress has been reported to be associated with cynicism, an unwillingness to care for the chronically ill and decreased empathy [6].

Young doctors may be characterized as a group of people who experience satisfaction with their work, but also a group in which work challenges their mental health [8]. Pathological anxiety (please see “Methods” for definition) is internationally documented to occur in a significant proportion of newly graduated doctors. According to McCullough et al., 27.3% (n = 11,500) of British first-year doctors screen pathologically anxious and the proportion seems to be rising [9]. This is troubling because stressed and anxious doctors are affected in their personal lives and carry a higher risk of making mistakes, both fatal and minor, losing empathy and leaving the medical profession [6, 10].

Several factors play a part in whether doctors develop anxiety, and it is known that interventions may be used to modify these factors to reduce anxiety [9].

The aim of this study was to investigate the prevalence of anxiety in Danish final semester medical students and in Danish doctors with one month of work experience, including changes and individual trends over time.

METHODS

This descriptive cohort and cross-sectional study was based on questionnaire responses provided from December 2020 to May 2021. To be eligible, the participants needed to be either a medical student who was signed up for the final exam at the University of Southern Denmark or a newly graduated doctor who had initiated an internship in the Region of Southern Denmark.

The participants were sent an e-mail with a link to the questionnaire, which took about 15-20 minutes to complete. Responses from the medical students were collected 1-3 months before their graduation, and responses from the doctors were collected 1-2 months after they started at the hospital. Dates for the collection of responses were chosen to make the results as comparable as possible to previous international studies on first-year doctors [9], and to be able to investigate the effect of changing from being a student to serving as a doctor. The students were expected to have a representative level of anxiety 2-3 months before graduation; but for some of the students, the survey was delayed due to technical difficulties. Participation was voluntary and the participants were included after informed consent. During the time when the survey was active, all of those who had been invited were sent reminders encouraging them to participate. The study was pseudonymised and the identifier (the e-mail address), which allowed for linking of their responses in the two questionnaires, remained unknown to the researchers.

This study was reported according to the STROBE guidelines.

The survey content

The survey consisted of three validated anxiety scales: the Leeds Self-assessment of Anxiety General Scale (Leeds SAA General Scale) [11] and two anxiety scales which make up the State-Trait Anxiety Inventory Form Y-1 (STAI) [12]. The survey also collected information about age, gender and their time as medical students.

The Leeds SAA General Scale screens for anxiety through questions pertaining to six main symptoms in anxiety: panic, restlessness, agoraphobia, irritability, palpitations and fearful mood [9, 11]. The scale was chosen for this study since it is validated to work as a case-finding tool for people who meet the criteria for an anxiety diagnosis but have not been diagnosed by a doctor. If the respondent scores seven or more points on the Leeds SAA General Scale and is thus classified as pathologically anxious, a statistically highly significant likelihood exists that the respondent would be diagnosed with an anxiety disorder after being interviewed by a psychiatrist. The Leeds SAA General Scale was used in a wide range of international studies.

The STAI is a commonly used inventory form to assess anxiety in research. Considerable evidence attests its

validity and its high internal consistency coefficient [6, 12]. The STAI contains 40 questions divided into two questionnaires: The STAI State Anxiety Scale, which explores how the respondent feels at a specific moment, and the STAI Trait Anxiety Scale, which explores how the respondent feels in general. The anxiety scores each range from 20 (no anxiety) to 80 (high level of anxiety). This study was authorised to use the State-Trait Anxiety Inventory Form Y-1 (STAI) by Mind Garden, Inc. [13].

Analysis

The data were analysed for medical students and doctors as cross-sectional data and as individual-based change for those who participated in both surveys.

For the unpaired cross-sectional data, proportions were calculated and associations between the binary outcomes were analysed using the chi-squared test. Associations between ordinal data and binary outcomes were analysed using the Wilcoxon-Mann-Whitney test. The median scores, interquartiles and range scores were described.

For the paired cohort data, proportions were calculated and associations between binary outcomes were analysed using the McNemar change test. The associations between ordinal data and binary outcome was analysed using the Wilcoxon signed rank test. The median scores were described.

To investigate the individual-based anxiety change over time, a graph was made linking the respondents at the two measuring points.

The data concerning the participants' age, gender and the five experience questions were analysed as cross-sectional data for medical students and doctors combined.

Missing data

According to the manual, if three or more of the questions from the STAI were left unanswered, the validity of the scale should be questioned [12]. Thus, results from each of the two STAI subscales where three or more questions are left unanswered were excluded. If one or more of the questions from the Leeds SAA General Scale were not answered, the results from this scale were also excluded. If answers to all three scales were inadequate, the respondent was excluded from the study.

Missing data concerning the participants' age, gender or the five experience questions were treated as such.

Trial registration: not relevant.

RESULTS

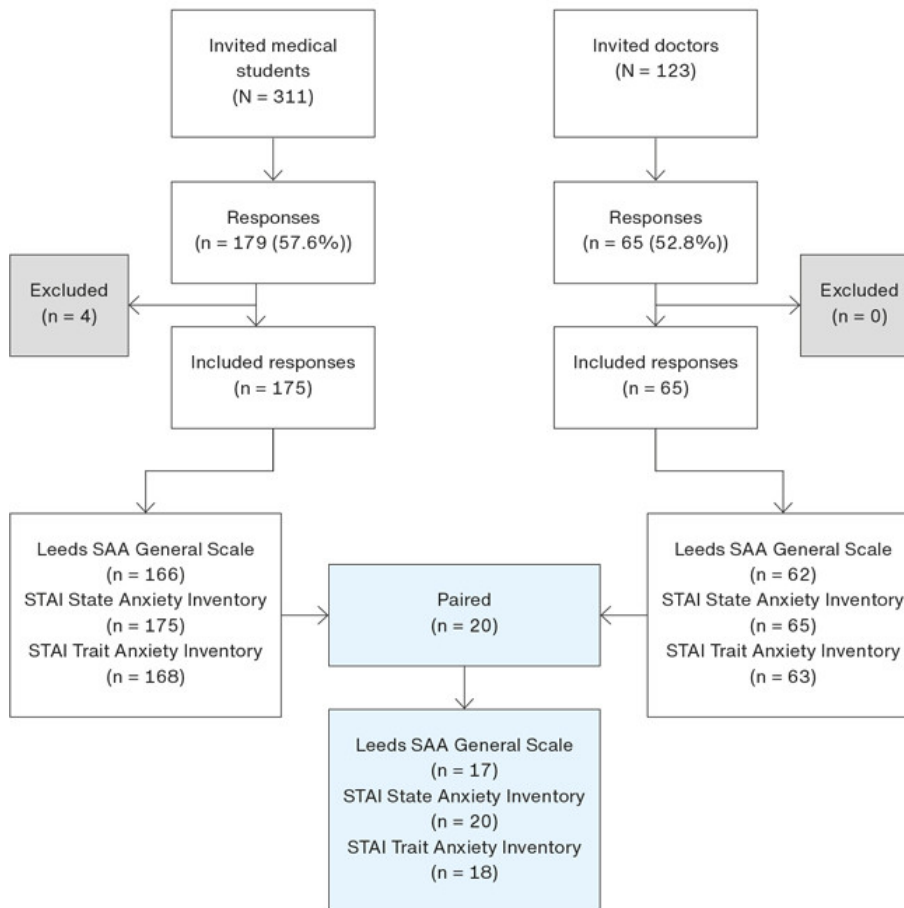
Data collection

A total of 175 medical students and 65 newly graduated doctors were included, 20 participated in both surveys. Basic information about the participants is presented in **Table 1**. A flowchart presenting inclusion and exclusion is shown in **Figure 1**.

TABLE 1 Basic characteristics of study respondents.

	Medical students (N = 175)	Doctors (N = 65)
Age, mean (range), yrs	28 (24-38)	27 (25-33)
<i>Gender, n (%)</i>		
Male	66 (37.7)	19 (29.2)
Female	108 (61.7)	46 (70.8)
Non-binary	1 (0.6)	0

FIGURE 1 The flow chart shows the number of invited persons, included responses in the study and responses excluded due to missing data.



SAA = Self-assessment of Anxiety; STAI = State-Trait Anxiety Inventory.

Cross-sectional descriptions

According to the Leeds SAA General Scale, 54 (32.5%) medical students and 12 (19.4%) doctors screened pathologically anxious ($p = 0.06$).

For the STAI state and trait anxiety subscales, the median anxiety levels were 37 on both scales for the students

and 41.5 and 36, respectively, for the doctors. Results from both STAI subscales showed no significant difference in anxiety level between the medical students and doctors (STAI State Anxiety Scale: $p = 0.11$ and STAI Trait Anxiety Scale: $p = 0.60$).

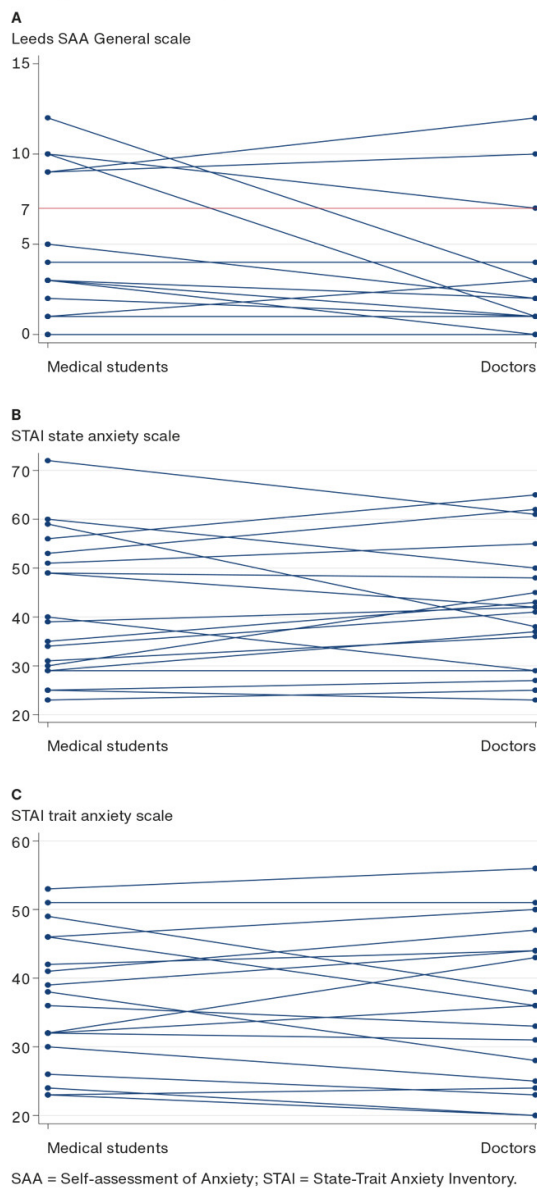
Individual-based change

It was possible to pair 20 of the respondents' surveys as shown in Figure 1.

Figure 2 shows how the paired population scored on the Leeds SAA General scale and the two subscales of the STAI.

FIGURE 2 The individual-based change over time on each of the three anxiety scales for the paired data. For each participant, the two measuring points are shown and combined by a line.

A. The Leeds Self-assessment of Anxiety (SAA) General Scale, a red line indicates the pathological anxiety cut-off value. **B.** The State-Trait Anxiety Inventory (STAI) trait anxiety describing the general anxiety level. **C.** The STAI state anxiety describing the anxiety level at a specific point in time.



On all three anxiety scales, it is shown that most of the respondents anxiety levels stayed consistent.

Experience, gender, age and anxiety

A significant association existed between gender, certain previous experiences and present level of anxiety.

Please see **Table 2**.

TABLE 2 Number of answers for each of the statements concerning the respondents' time as medical students are shown. The statements have been translated from Danish into English.

	N (%)	Leeds SAA General Scale		STAI state anxiety scale		STAI trait anxiety scale	
		pathological anxiety, n (%)	p value ^a	median score	p value ^a	median score	p value ^a
<i>Gender</i>							
Male	85 (36)	17 (21.3)	0.06	37	< 0.01	37	< 0.05
Female	154 (64)	49 (33.3)		42		40	
<i>Statement</i>							
1. I have worked as a substitute doctor > 20 h/wk							
Yes	84 (37)	25 (30)	0.72	41	0.90	39	0.74
No	146 (63)	41 (28)		41		39	
2. During my studies, I have had a job, which has prepared me for my clinical role							
Yes	186 (81)	48 (26)	0.05	40	< 0.05	38	0.11
No	44 (19)	18 (40)		43.5		43	
3. I have done voluntary work to help prepare me for my clinical role							
Yes	61 (27)	17 (28)	0.88	39	0.90	40	0.48
No	169 (73)	49 (29)		41		39	
4. I have been on sick leave or received treatment from a doctor or psychologist for stress, anxiety, depression or similar during my studies							
Yes	63 (28)	26 (43)	< 0.01	45	< 0.01	44	< 0.01
No	163 (72)	40 (25)		39		37	
5. I have experienced a major life-changing event in the past 6 mos. (sickness, childbirth, divorce, etc.) not counting the event of becoming a doctor							
Yes	35 (15)	13 (38)	0.19	41.5	0.39	40.5	0.40
No	194 (85)	52 (27)		41		39	

SAA = Self-assessment of Anxiety; STAI = State-Trait Anxiety Inventory.

a) Association between each statement and pathological anxiety.

Regarding gender, only one respondent answered in a non-binary way; therefore, analysis was not done on this group.

No significant association was observed between pathological anxiety measured on the Leeds SAA General Scale and age ($p = 0.55$).

DISCUSSION

On the Leeds SAA General Scale, 32.5% of the medical students and 19.4% of the newly graduated doctors score pathologically anxious. On the STAI scale, anxiety scores in the study population were higher than in the background populations in Australia and New Zealand [14, 15], but did not seem to change when transitioning from student to doctor, see below.

Strengths and limitations

This study was one of the first to assess anxiety in medical students and first-year doctors in Denmark. A major

strength of this study is that three validated scales were used to assess the participants' anxiety. Furthermore, this survey had a high response rate for both medical students (57.6%) and doctors (52.8%) compared to similar international studies that show response rates between 20% [9] and 40% [3]. As with most research where a survey is sent out to a group of individuals, a risk of selection bias exists. However, with a response rate of over 50%, this risk is reduced. No data, i.e. age and gender, were collected on the students and doctors who did not complete the questionnaire.

The relatively small number of participants answering the questionnaire twice limited our ability to see statistically significant individual-based change. It did, however, allow an insight into whether the individuals' level of anxiety changed.

Anxiety in medical students and young doctors

This study found a high number of medical students and doctors with pathological anxiety, and a higher level of state and trait anxiety than previously found in the general population in other countries, as presented in "Cross-sectional descriptions". A study conducted in Australia found a median state anxiety of 30 and trait anxiety of 34 [14]. A New Zealand study found that the mean state and trait for men were 30.2 and 33.1, respectively, and for women they were 33.5 and 36.9, respectively [15].

The STAI Trait Anxiety Scale gives insight into how participants generally feel. This score would not be expected to change over a short period of time, which the results from this study (Figure 2B) also show. Trait anxiety being this high may potentially imply that medical students and doctors are a group of individuals who generally have a higher level of anxiety than other people.

The findings in this study gave reason to consider making further efforts to explore where, when and why anxiety arises, thereby providing insights into what may be needed to alleviate it. Subsequently, it may be beneficial to find students at risk of developing anxiety and implementing interventions to prevent high anxiety levels.

Anxiety between genders

In the study population, with both students and doctors combined, 33.3% of the women and 21.3% of the men screened pathologically anxious. Both the state and trait anxiety level of women were significantly higher than those of men. For the Leeds SAA General scale, the difference was not significant; however, with a p value of 0.06 a trend exists. It was also seen in other international studies that female medical students and doctors score higher than the male equivalents [3, 9]. A steady rise has been observed in the proportion of female doctors in many countries [16, 17], which is important to consider when prioritising interventions working towards better well-being and professional performance in the workplace.

Anxiety is already seen in medical school

A trend existed towards a higher percentage of pathological anxiety among medical students than among doctors. The findings give reason to further investigate if this high percentage of pathological anxiety may be found earlier or if it peaks in the last semester of medical school.

In the cross-sectional analysis, we found that the individuals who have a high level of anxiety when they are students also have a high level of anxiety after they become doctors. The positive association between anxiety level and students who have sought help implies that they have also had difficulties before participating in the survey (Table 2, statement 4). This may potentially indicate that an opportunity exists to identify this group of individuals earlier and take action to help lessen their anxiety, which may also help them experience less anxiety after they graduate. This is supported by Tyssen et al. [7], who found that many of the doctors with mental problems had similar problems in medical school and may therefore be identified before graduation.

In the cross-sectional analysis, we found that the participants who had a clinically relevant job during medical school had significantly less anxiety when measured by the State Anxiety Scale. It is not possible to conclude from this survey whether having a job leads to less anxiety, or if less anxiety leads to having a job. However, further investigation is warranted to establish if better opportunities for clinical experience during medical school would lower anxiety in medical students.

Clinical impact and perspectives

The findings of this study indicate that anxiety predated this study and therefore these individuals may be identified earlier, which would allow for interventions to be implemented sooner. Future studies should investigate if implementing specific interventions to relieve anxiety may reduce anxiety in medical students and doctors.

CONCLUSION

Although anxiety is challenging to measure and a self-rating scale, though validated, is not the same as a diagnosis, this research found that a high prevalence of anxiety exists among Danish medical students. The anxiety remains with the young doctors, and its prevalence is comparable with what has been found in medical students and first-year doctors in other countries. Several factors, such as gender, work experience and previously being in treatment, are associated with the prevalence of anxiety. Early detection of those who will develop anxiety may therefore be possible.

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