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Original Article

A quantitative study of test anxiety and its influencing factors among medical and dental students

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الملخص

أهداف البحث: أجريت هذه الدراسة لتقييم قلق الإختبار وعوامله المؤثرة على طلاب الطب وطب الأسنان.

طرق البحث: أجريت هذه الدراسة المقطعية المستعرضة بين الطلاب من ثلاث كليات للطب وطب الأسنان خاصة وعامة في إقليم البنجاب في الباكستان. شمل الاستطلاع بيانات عن الملف الديموغرافي للمشاركين في الدراسة باستخدام مخزون قلق الاختبار بواسطة سبيلبرجر.

النتائج: شملت الدراسة ٦٨٠ طالبا مع متوسط ٢٠.٩٣±١.٧٦ عاما. سجل تقريبا نصف العينة (٥١.٨٪) درجة عالية في قلق الاختبار (مخزون قلق الاختبار >٤٥)، وكان متوسط درجة مخزون قلق الاختبار أعلى قليلا عند طلاب الأسنان (٤٧.٧٥±١١.٤٥) عن طلاب الطب (٤٦.٤٢±١٢.٧٩). حصلت الطالبات درجة أعلى بكثير في متوسط درجة مخزون قلق الاختبار (٤٨.٤٥±١٢.٧٩) من الطلاب (٤١.٨٥±٨.٩١). أظهر الطلاب من الكليات الخاصة درجة أعلى من قلق الاختبار (٥٠.١٥±١٣.٢٣) عن الطلاب في الكليات العامة (٤٢.٨٨±٩.٧). وأظهر الطلاب الذين تخرج والديهم من كلية أو جامعة زيادة قلق الاختبار بشكل ملحوظ عن الطلاب الذين لم يحصل والديهم على تعليم. الجنس الأنثوي (النسبة الفردية المعدلة ٢.١٠، ٩٥٪ فاصل الثقة: ١.٣٧، ٣.٢٢)، طالب الكلية الخاصة (النسبة الفردية المعدلة ٢.٨٨، ٩٥٪ فاصل الثقة: ١.٩٠، ٤.٣٨) وكان حصول الأم على تعليم في الكلية أو جامعي مرتبطا بأعلى قلق الاختبار (النسبة الفردية المعدلة ٢.٠٥، ٩٥٪ فاصل الثقة: ١.٢٥، ٣.٣٥).

الاستنتاجات: في مجموعة دراستنا، كان قلق الاختبار شائعا بين طلاب الطب وطب الأسنان. وكان الجنس الأنثوي، الطلاب من الكلية الخاصة، والتعليم العالي للأمهات مرتبط بشكل كبير بقلق شديد من الاختبار. يمكن لنتائج هذه الدراسة أن ترشد تطوير برنامج يمكن أن يقلل من قلق الاختبار لدى الطلاب ويحتمل أن يحسن تعليمهم.

الكلمات المفتاحية: قلق الاختبار؛ الجنس؛ تعليم الوالدين؛ النتيجة الأكاديمية؛ الطلاب

Abstract

Objective: The study was conducted to assess test anxiety and its influencing factors on medical and dental students.

Methods: A cross-sectional study was conducted among students from three private and public medical and dental colleges in the Punjab province of Pakistan. The survey included statements about the demographic profile of the study participants and used the Test Anxiety Inventory (TAI) by Spielberger.

Results: The study included 680 students with a mean age of 20.93 ± 1.76 years. About half the sample (51.8%) scored high on test anxiety (TAI score > 45), and the mean TAI score was slightly higher for the dental (47.75 ± 11.45) than medical students (46.42 ± 12.79). Female students had a significantly higher mean TAI score (48.45 ± 12.79) than male students (41.85 ± 8.91; $p < 0.001$). The students from private colleges had a significantly greater test anxiety score (50.15 ± 13.23) than students from public colleges (42.88 ± 9.7; $p < 0.001$). Students whose parents were graduates from a college or university perceived significantly increased

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test anxiety than those of parents with no/school education ($p < 0.001$). A female gender (adjusted odds ratio (AOR) 2.10, 95% CI:1.37, 3.22), being a private college student (AOR 2.88, 95% CI:1.90, 4.38), and having a mother with a college or university education (AOR 2.05, 95% CI: 1.25, 3.35) were significantly associated with high on test anxiety.

Conclusion: In our study cohort, test anxiety was common among medical and dental students. A female gender, being a student from a private college, and having a mother with a high education were significantly associated with high test anxiety. The study findings may guide the development of programs that can reduce students' test anxiety and potentially improve their education.

Keywords: Academic score; Exam anxiety; Gender; Parental education; Students

Introduction

Test anxiety is defined as 'an emotional state that has psychological and behavioural concomitants, and that is experienced in formal testing or other evaluative situations'.[1] According to Spielberger and Vagg, test anxiety is an element of general anxiety that interferes with performance in examinations and academic situations.[2] It was reported that an intelligent student can achieve lower scores in examinations because of test anxiety.[3] Test anxiety can cause students to feel nervous, worried, and fearful in evaluative situations and can affect their learning.[2,4]

The literature associates various factors with test anxiety among college students. Test anxiety is inversely related to grade point average (GPA), and female students demonstrate higher test anxiety than their male counterparts.[5] A female gender, excessive course loads, lack of physical exercise, inadequate rest, irrational thoughts, and long duration of examinations influence test anxiety among medical students.[6–9] Among dental students, gender, type of examination, and clinical courses affect exam anxiety.[10]

Medical and dental students are exposed to various practical, clinical, and written examinations in their intense undergraduate programs of study that require rigorous academic proficiencies and competencies. They are likely to face different academic situations and examinations that predispose them to anxiety. There are few studies on the prevalence of test anxiety among medical students. In addition, the literature lacks empirical studies on test anxiety among dental students. Moreover, associations of gender, parents' level of education, monthly family income, and academic performance with test anxiety among medical and dental students have not been fully investigated. Therefore, the present study was conducted to evaluate test anxiety

among medical and dental students in Pakistan using these variables. The available data on test anxiety among medical and dental students can be used to reduce test anxiety and improve their learning and academic performance.

Materials and Methods

Study design and subjects

This cross-sectional study was conducted among undergraduate students from different medical and dental colleges in Lahore and Faisalabad, Pakistan. Students from both public and private medical and dental colleges participated in the study. Data were collected from FMH College of Medicine and Dentistry of Fatima Memorial Hospital (FMH) System and de'Montmorency College of Dentistry in Lahore, and Punjab Medical and Dental College in Faisalabad. These colleges were selected through convenience sampling. Similarly, a convenience sample of students was selected for the study. Both male and female students from the first year through final years were invited to participate in the research, in which students who were healthy and provided written informed consent were included. A student was considered healthy if he/she indicated no psychological disorder or systematic disease that could affect his/her ability to respond to the questionnaire. A sample of 714 students was estimated on a 95% level of confidence, ± 3% precision, 50% degree of variability, and population size (N ≈ 2000). The sample was increased to 785 to compensate for non-response in the study.

Data collection instrument

Data was collected using a paper-based self-administered questionnaire that included questions about the socio-demographic profile of study participants and the Test Anxiety Inventory (TAI). The TAI scale is a self-administered questionnaire developed by Spielberger to assess test anxiety among school and college students.[11,12] The psychometric properties of the TAI scale have been tested and validity and reliability were found to be acceptable.[12] Cronbach's alpha in our analysis was 0.907.

The TAI questionnaire consists of 20 items used to evaluate the perceptions of study participants about the symptoms of anxiety before, during, and after examinations. In this study, the TAI questionnaire was used to evaluate test anxiety for summative assessment among participants. A four-point Likert scale is used for each questionnaire item, where (1) = almost never, (2) = sometimes, (3) = often, and (4) = almost always. The score of item #1 is reverse coded. The TAI scale consists of two subscales that evaluate the 'worry' and 'emotionality' of study participants. Both worry and emotionality are major components of the scale and each consists of eight items. The TAI Worry subscale consists of eight items (# 3, 4, 5, 6, 7, 14, 17, and 20), and the TAI Emotionality subscale also includes eight items (# 2, 8, 9, 10, 11, 15, 16, and 18) (see the appendix for the questionnaire).

Procedures

The questionnaire was discussed among researchers to ensure the proper wording and format of the questions. The

instrument was then pilot-tested among 30 medical and dental students whose data were not included in the study. The final draft of the questionnaire all researchers agreed on and found satisfactory based on the group of 30 students was used for data collection.

Hard copies of the questionnaire were administered among students in their classrooms. Those who volunteered to participate in the study were requested to immediately return the completed questionnaires. The researchers checked that study participants responded to all the questionnaire items. Questionnaires with incomplete information were returned to the study participants to provide complete information or otherwise discarded.

Ethical considerations

The students who volunteered to participate in the study provided written informed consent. The study participants were informed about their voluntary participation and were ensured of the confidentiality and privacy of their responses. Their concerns and queries about the study were addressed by the researcher.

Statistical analysis

Twenty items of the TAI scale were calculated. The calculations of the worry and emotionality subscales were performed based on their eight items, respectively. A student t-test was performed to compare the mean score of TAI between male and female students, students from public and private colleges, and students in their non-clinical (first and second years) and clinical years (third to fourth/fifth years). The undergraduate dental program consists of four academic years while the medical program comprises five academic years; therefore, the third and fourth years are clinical years for dental students and the third to fifth years for medical students in Pakistan. Categorical data were analysed using a chi-square test. Bivariate and multivariate logistic regression analyses were performed to determine the association between test anxiety and independent factors (gender, parental education, monthly family income). The state-trait anxiety inventory (STAI) is a similar test developed by the same author. It uses a similar method to assess anxiety on a similar four-point Likert scale. Each individual subscale also has the same number of questions as the TAI and similar normalised references. The TAI displays moderate criterion validity with the STAI with increased convergent validity scores when specific directions were used, such as asking students to imagine themselves in a testing situation.[13] Hence, a TAI score of more than 45 was considered to indicate high on test anxiety. Data were analysed using the Statistical Package for Social Sciences Version 22.0 (IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp). A p-value of less than 0.05 was considered statistically significant.

Results

Of 875 students, 680 participated in the study yielding a response rate of 77.7%. The mean age of the sample was $20.93 \pm SD1.76$ years and the majority of students were females (71.9%). Medical students constituted 52.4% of the sample, and 51.2% of students were from private colleges. Table 1 presents students' socio-demographic information.

The mean TAI score of the sample was $46.6 \pm SD12.19$. There were statistically significant differences in different groups of students regarding the TAI, TAI Worry, and TAI Emotionality scales (Table 2). Female students had a significantly higher mean TAI score (mean $\pm$ SD:48.45 $\pm$ 12.79) than male students (mean $\pm$ SD:41.85 $\pm$ 8.91) (P < 0.001). The TAI Worry and Emotionality scores were also significantly higher for females than males (P < 0.001). The mean TAI score was slightly higher for dental (mean $\pm$ SD:47.75 $\pm$ 11.45) than medical students (mean $\pm$ SD:46.42 $\pm$ 12.79); however, the differences were not statistically significant.

Students from private colleges experienced significantly greater test anxiety (mean $\pm$ SD:50.15 $\pm$ 13.23) than those from public sector colleges (mean $\pm$ SD:42.88 $\pm$ 9.7) (P < 0.001). Students whose parents were college/university educated perceived significantly greater test anxiety than those whose parents had no/school education (P < 0.001). The mean TAI score did not differ significantly between students with a monthly family income of equal to or less than 100,000 Pak rupees and those with a monthly family income of more than 100,000 Pak rupees per month. However, the TAI Worry score differed significantly between these groups (P 0.001). A higher mean TAI score was found

Table 1: Socio-demographic characteristics of medical and dental students in Punjab, Pakistan.

Study variables	Frequency N = 680	Percentage
Gender		
Male	191	28.1
Female	489	71.9
College		
Public	332	48.8
Private	348	51.2
Students		
Medical	356	52.4
Dental	324	47.6
Academic year		
Non-clinical year students	411	60.4
Clinical year students	269	39.6
Academic score in the previous year		
≥80% score	194	28.5
<80% score	486	71.5
Father's educational level		
School/no education	70	10.3
College/university education	610	89.7
Mother's educational level:		
School/no education	131	19.3
College/university education	549	80.7
Monthly family income:		
≤100,000 Pak rupees (US $645.22) per month	222	32.6
>100,000 Pak rupees (US $645.22) per month	458	67.4

Table 2: Association of socio-demographic factors with test anxiety among medical and dental students.

Study variables	TAI mean ± SD: 46.6 ± 12.19	P-value	TAI Worry mean ± SD: 18.03 ± 5.35	P-value	TAI Emotionality mean ± SD: 18.71 ± 5.27	P-value
Gender						
Male	41.85 ± 8.91	<0.001	16.58 ± 4.25	<0.001	16.64 ± 3.78	<0.001
Female	48.45 ± 12.79		18.6 ± 5.62		19.52 ± 5.55	
College						
Public	42.88 ± 9.7	<0.001	16.53 ± 4.24	<0.001	17.12 ± 4.37	<0.001
Private	50.15 ± 13.23		19.47 ± 5.88		20.22 ± 5.6	
Students						
Medical	46.42 ± 12.79	0.205	17.94 ± 5.58	0.215	18.69 ± 5.57	0.316
Dental	47.75 ± 11.45		18.51 ± 5.12		19.14 ± 4.91	
Academic year						
Non-clinical year students	46.25 ± 13.03	0.338	17.98 ± 5.67	0.717	18.58 ± 5.43	0.424
Clinical year students	47.13 ± 10.77		18.12 ± 4.82		18.91 ± 5.02	
Academic score in the previous year						
≥80% score	45.09 ± 12.12	0.041	17.37 ± 5.35	0.042	18.04 ± 5.25	0.037
<80% score	47.21 ± 12.18		18.3 ± 5.33		18.98 ± 5.26	
Father's educational level						
No/school education	41.19 ± 8.28	<0.001	16.06 ± 4.45	<0.001	17.06 ± 3.91	0.001
College/university education	47.22 ± 12.41		18.26 ± 5.4		18.89 ± 5.37	
Mother's educational level						
No/school education	41.84 ± 9.51	<0.001	16.55 ± 4.83	<0.001	16.74 ± 3.71	<0.001
College/university education	47.74 ± 12.48		18.39 ± 5.41		19.18 ± 5.48	
Monthly family income:						
≤100,000 Pak rupees (US$645.22) per month	45.67 ± 13.69	0.194	17.07 ± 5.61	0.001	18.98 ± 5.76	0.381
>100,000 Pak rupees (US$645.22) per month	47.05 ± 11.38		18.5 ± 5.16		18.58 ± 5.02	

for students who obtained a score of less than 80% (mean ± SD:47.21 ± 12.18) than for those who obtained a score equal to or more than 80% in the previous academic year (mean ± SD:45.09 ± 12.12) (P 0.001). A slightly lower TAI score was observed for pre-clinical students (mean ± SD:46.25 ± 13.03) than for those in their clinical years (mean ± SD:47.13 ± 10.77); however, the difference was not statistically significant.

High on test anxiety was used as the dependent variable. Table 3 shows its association with the socio-demographic factors. About half the sample (51.8%) demonstrated high on test anxiety. Female students were 2.43 times more likely to experience high on test anxiety than male students (P < 0.001). Similarly, students from private colleges had significantly higher odds (odds ratio (OR) 2.88) of high on test anxiety than those from public colleges (P < 0.001). Students with college/university-educated parents had a significantly greater likelihood of high on test anxiety than those whose parents had no/school education (P < 0.05).

A multivariate logistic regression analysis showed that females (adjusted odds ratio (AOR) 2.10, 95% CI:1.37, 3.22), dental students (AOR 1.54, 95% CI:1.06, 2.22), students from a private college (AOR 2.88, 95% CI:1.90, 4.38), students with a score of <80% (AOR 1.66, 95% CI:1.10, 2.51), students whose mother had a college/university education (AOR 2.05, 95% CI: 1.25, 3.35), and students in their clinical years (AOR 1.91, 95% CI:1.27, 2.89) were significantly associated with high on test anxiety (Table 4).

Table 3: Bivariate analysis: Association of various factors with high on test anxiety in students.

Study variables	Unadjusted Odds Ratio (95% CI)	P-value
Gender		
Male*	2.43 (1.72, 3.43)	<0.001
Female		
College		
Public*	2.88 (2.11, 3.93)	<0.001
Private		
Students		
Medical*	1.52 (1.08, 2.14)	0.016
Dental		
Academic year		
Non-clinical year students*	1.27 (0.93, 1.73)	0.126
Clinical year students		
Academic score in the previous year		
≥80% score*	1.47 (1.05, 2.06)	0.023
<80% score		
Father's educational level		
No/school education*	2.23 (1.33, 3.74)	0.002
College/university education		
Mother's educational level:		
No/school education*	2.63 (1.76, 3.94)	<0.001
College/university education		
Monthly family income:		
≤100,000 Pak rupees (US $645.22) per month	0.57 (0.41, 0.79)	0.001
>100,000 Pak rupees (US $645.22) per month*		

* Reference category.

Table 4: Multivariate logistic regression analysis: Association of various factors with high on test anxiety in students.

Study variables	Adjusted OR (95% CI)	P-value
Gender		
Male*	2.10 (1.37, 3.22)	0.001
Female		
College		
Public*	2.88 (1.90, 4.38)	<0.001
Private		
Students		
Medical*	1.54 (1.06, 2.22)	0.022
Dental		
Academic year		
Non-clinical year students*	1.91 (1.27, 2.89)	0.002
Clinical year students		
Academic score in the previous year		
≥80% score*	1.66 (1.10, 2.51)	0.016
<80% score		
Mother's educational level		
No/school education*	2.05 (1.25, 3.35)	0.004
College/university education		

* Reference category.

Discussion

This study evaluated test anxiety in a sample of medical and dental students from three colleges in Punjab, Pakistan. Our findings indicate significant associations of gender, type of college, academic score, and parental education with test anxiety. A bivariate and multivariate analysis of data from this study confirmed factors that may be considered when planning to reduce test anxiety in medical and dental students.

In this study, gender differences were noted with respect to test anxiety: female students showed significantly higher test anxiety than male students. Similar results of significantly higher test anxiety scores among female undergraduate and graduate students were found in a study by Chapell et al.[5] A study of medical students by Rupani et al. also demonstrated increased test anxiety in females compared to their male counterparts, and the authors also reported significantly higher TAI worry and emotionality scores among female compared to male students.[8] These findings are in accordance with the results of our study where female students had high TAI worry and emotionality scores. In addition, our study indicated that female students were 2.1 times more likely to have high test anxiety than male students.

High test anxiety in female students can be attributed to the presence of their anxiety and problems with depression. Previous studies in the country also showed that female medical and dental students experienced higher levels of anxiety and depression than male students.[14–16] Similarly, recent systemic reviews of medical and dental students indicate the association of gender with depressive symptoms.[17,18] It is documented that psychological distress such as anxiety, depression, and conflicting demands are more common among females than males, which may

reduce their resistance to diseases.[19] There is evidence that female students complain more about the study material they have to cover, report stress more frequently than male students, and over-report symptoms of medical and psychological conditions.[20]

The literature consistently reports a statistically significant negative relationship between test anxiety and academic performance.[21,22] Female students with low test anxiety had significantly higher GPAs than female students who experienced high test anxiety.[5] These findings are aligned with the results of the present study where students with higher academic scores in the previous year scored significantly lower for test anxiety than students who achieved lower academic scores. In contrast, a study by Sansgiry et al. found no significant association between GPA and test anxiety. The authors described self-reported GPA and effective academic counselling services at Houston University for this insignificant association.[23]

In the multivariate logistic regression analysis of this study, maternal education level was strongly associated with test anxiety. Students whose mothers were college/university educated demonstrated a significantly higher mean score for test anxiety than those whose mothers had no/school education. Moreover, students with college/university-educated mothers were 2.05 times more likely to score high for test anxiety than those with uneducated/school-educated mothers. A possible reason that could explain these findings is that more educated parents are more likely to have high aspirations and expectations for their children and exert parental pressure for better academic performance, which may predispose them to increased academic stress and test anxiety.[24,25] A positive correlation (r = 0.32) has been demonstrated between test anxiety and depression.[26]

In Pakistan, students who obtain a high score in the entrance examination go to public medical/dental colleges. Most students who are unable to get admission into public institutions because of their low scores/grades join private colleges. The cost of medical education in public institutions is covered by the government and students pay a small tuition fee, while students in private colleges bear heavy expenses for obtaining their medical/dental education. On average, the annual fee for a public sector college is 19,000 Pakistani rupees (equivalent to US\$122.36), compared to 8,50,000 Pakistani rupees (equivalent to the US\$5484.36) for private colleges.[27] In the present study, students from private medical and dental colleges had a higher mean score for test anxiety than those in public institutions. Possibly, students in private colleges demonstrate high test anxiety because they have lower academic scores than students in public colleges. The negative relationship between academic achievement and test anxiety is well documented.[21,22] Students in private colleges mostly come from educated and high-income parents who may have greater expectations and exert increased parental pressure, thus resulting in increased test anxiety.[24,25]

The inclusion of an adequate sample of students in our study provides reliable evidence and adds to the existing body of literature on the topic. The recruitment of study participants from three colleges also improves the generalizability of study findings. To the authors' knowledge, this is the first study that evaluated the influence of academic

performance, parents' educational level, and type of college on test anxiety among medical and dental students. However, there are certain limitations to the study. Despite a high response rate, there is a possibility of self-report bias in the study. A cross-sectional sample from three medical/dental colleges may limit its generalizability. Therefore, the study findings should not be generalised to students in other medical and dental institutions in the country because of the difference in demographic factors and student characteristics in different locations. Medical and dental colleges comprise more female than male students in Pakistan; therefore, more female students were represented in our study. However, there are more medical students than dental students in the selected colleges, although our sample does not accurately represent the student population because of the convenience sampling technique used in the study. This should be kept in mind when evaluating the study results. In the future, a large study should be conducted in medical and dental colleges in other provinces of the country.

Conclusion

The study highlighted that test anxiety was common among medical and dental students. In this sample of students, significantly higher scores for test anxiety were obtained for females than males. Students with high academic grades demonstrated significantly lower test anxiety than those with low academic grades. Higher test anxiety was observed for students with college/university-educated parents compared to those whose parents had no/school education. The study also found that females, students from a private college, and students with college/university-educated mothers were significantly more likely to be high on test anxiety than male students, students from a public college, and students whose mothers had no/school education. The study findings may be utilised by academicians, educators, and administrators in medical/dental institutions to plan strategies and programs to reduce test anxiety and improve education.

Recommendations

High test anxiety poses a threat to the provision of high-quality education to medical and dental students. Therefore, efforts aimed at reducing test anxiety among students should particularly target female students, students from a private college, and students with college/university-educated mothers. Medical and dental institutions should regularly assess their curricula, learning environment, and support available to students with regards to test anxiety.

Source of funding

Conflict of interest

The authors have no conflict of interest to declare.

Ethical approval

Authors' contributions

MAN, FI, KA conceived and designed the study. FI and ZBS conducted the study and collected and organized the data. MAN, AT, AM analysed and interpreted the data and compiled the study results. All authors contributed to the initial and final draft of the manuscript. All authors critically reviewed and approved the final manuscript and are responsible for the content and similarity index of the manuscript.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jtumed.2020.12.014.

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