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Sources of academic stress among Iranian adolescents: a multilevel study from Qazvin City, Iran

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Abstract

Background: Academic stress can cause mental and physical problems and affect adolescents' healthy development. This study aimed to estimate academic stress and explore its sources at the individual- and school levels among school-going adolescents in the city of Qazvin, Iran.

Results: This cross-sectional study used a stratified cluster sampling to recruit 1724 students aged 12–19 years from 53 schools in Qazvin City. Data were collected using a validated self-administered questionnaire. The mean academic stress score was 45.7 (95% CI 45.2, 46.3). The stress level was statistically higher among older 47.5 (95% CI 46.7, 48.3) than younger 44.1 (95% CI 43.4, 44.9) adolescents. The main academic stressors included: future uncertainty 69.7 (95% CI 68.8, 70.7), academic competition 58.5 (95% CI 57.3, 59.6), and interaction with teachers 56.1 (95% CI 55.3, 56.9). Gender, educational period, school type, family socioeconomic status, and father's education were associated with academic stress.

Conclusions: We conducted a multilevel study using a random sample of male and female students in the city of Qazvin, Iran. Results indicated moderate levels of stress among Iranian adolescents. The academic stress was associated with several individual and school-level variables. Students and their families and teachers need education on stress prevention methods and coping mechanisms. Future research should focus on developing and testing multilevel policies and interventions to improve students' mental health and academic performance.

Keywords: Academic stress, Adolescence, Students, Multilevel analysis, Iran

Background

Academic stress is a public health concern [1]. While schooling aims at preparing children to become physically, mentally, and professionally prepared for their adult life, it can pose a burden on their mental health [2–4]. The high expectations of parents and teachers [5] from 'students' school performance (examination grades), large amounts of homework, and malfunctioned student-teacher and peer relations are some examples of potential stressors [6]. For their simple coping mechanisms [7], long-term exposure to stress may result in

mental health issues such as anxiety disorders and depression [8, 3]. Stress can also cause stomachache, sleep disorders, and feeling exhausted [9, 10]. If not treated properly, stress, and the associated mental health issues can persist into adulthood and increase the risk of chronic illness later in life [11]. Stress can also affect the school performance and 'students' motivation, which results in higher stress levels and worry in a vicarious loop [12]. It also increases the risk of problem behaviors [13].

Most of the recent literature on academic stress among adolescents belongs to low- and middle-income countries [3, 14–17]. The reported stress levels among school-aged adolescents across countries in Asia have shown minimal variations [18], and females have shown higher stress levels than males [10]. The most commonly

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reported stressors include home life, family conditions, education system, academic competition, future uncertainty, interaction with teachers, school disciplines, parental involvement, financial problems, and peer pressure [14, 18, 5, 6]. As these elements differ between settings, the sources of academic stress may also vary. Studying sources of stressors is crucial for planning early mental health prevention interventions at school, community, and family levels.

Iran is a middle-income country and has a relatively young population. The rapid population growth and the weak economy have created a highly competitive labor market that demands professional or academic education degrees from job applicants over the past few decades. To enroll in colleges and universities, high school students must compete in a highly competitive national exam called "Konkoor" [19]. The rally for securing a seat, preferably at a state-funded top-ranked university, has made parents and schools intensify educational activities during primary or secondary school years. These actions have posed an enormous burden on many students, especially those with fewer resources or capacity.

On the other hand, the economic struggles following a decade of war have put a lot of stress and pressure on Iranians lives, especially the younger generations. Despite the importance of the issue, academic stress and its sources among Iranian students benefit from further evaluations. This study aimed to explore the academic stress and its potential sources at individual and school-level among adolescents in Qazvin, Iran.

Methods

In this cross-sectional study, using stratified cluster sampling, we enrolled high school students in Qazvin City—north-west of—Iran in 2018. We considered the educational period as strata: the first educational period for 7–9 grads and the second educational period for 10–12 grads in high school. In total, 53 schools (clusters) out of 221 were selected from both strata. From each school, 30 students were randomly selected and included. Overall, 1740 students participated in the study after obtaining oral and written informed consent from participants and their parents/guardians. The Ethics Committee of Tehran University of Medical Sciences 'approved the study protocol (IR.TUMS.VCR.REC:1396.4610).

Instruments

Data collection focused on the following domains of information: family socioeconomic status (SES), background information, and academic stress. Data on basic characteristics consisted of gender, family SES, parents' education, and parents' employment. Family SES was estimated based on their assets using the principal component analysis method [20, 21]. Assets included in the

questioned were freezer (in addition to a refrigerator), large size LCD-LED TV, microwave, the dishwashing machine, computer or laptop for family, private computer or laptop for adolescent, Play Station (X-BOX or PS4), the number of cars owned by the family, the number of rooms in their house, and whether participants had own room, the housing status (rental, ownership, other), adolescent received additional (non-public) educational assistances, adolescent participated in the art and sports classes, frequency of going to cinema and concerts, traveling abroad, and the number of trips in the country during the last year. The majority of the middle- or lower-income families in Iran may not afford some or most of the above assets or services.

Academic stress

To assess academic stress, we used the recently validated "Iranian Adolescents Academic Stress Questionnaire" (IAASQ) [22]. The questionnaire was self-administered and measured academic stress sources using 48 questions in 9 domains: family conditions, educational system, academic competition, future uncertainty, interaction with teachers, school disciplines, parental involvement, financial problems, and peer pressure. The measurement scale was a five-point Likert, with response categories ranging from "not at all/very little (score = 1) to "very much/always (score = 5). Cronbach's alpha for individual domains ranged from 0.58 to 0.85, and the intra class correlation (ICC) for the entire questionnaire was 0.80 (95% CI 0.66–0.90), implying an acceptable validity and reliability [22].

Statistical analysis

We estimated and reported the distribution of different sources of academic stress. Students were studying in the same school (cluster) could have similar academic stress sources. Because in regular regression models, the assumption of clustering data was not available, evaluating the association between the variables is inappropriate. Therefore, multilevel linear regression modeling enabled us to address the hierarchical nature of data. We considered two levels: student and school. Student-level variables (level 1) included parents' job and education, and family SES. Based on their governance, there are three main types of schools: governmental (no tuition fee), private (students must pay tuition fees), and schools for talented and other schools with selection processes and competitive entrance exams. We considered the following variables for the school level: gender (schools for girls or boys), type of school, and educational period. In Iran, girls and boys study in separate schools, and gender does not vary within schools. Therefore, we had to consider it as a school-level variable.

The dependent variable, academic stress, was considered as a continuous variable. Independent variables

were gender, the educational period of high school, family SES, parents' educations, parental employment, and type of school. We used the bivariate linear regression models to test the determinant factors separately for each academic stress source. School type, family SES, parents' education, parents' jobs were entered into the model as dummy variables. Governmental school, high family SES, being illiterate, and employed were regarded as baseline categories. We entered all variables with a *p* value ≤ 0.2 from the bivariate analysis in the multiple regression models [23]. Due to collinearity between the father's and mother's education, only the father's education was entered into the model. In the bivariate analysis, the association between father's and mother's jobs with any academic stress sources was not significant; thus, they were not included in multiple regression models. The statistical analyses were performed using Stata version 14 (Stata Corp., LP).

Results

Participants' baseline characteristics are presented in Table 1. In total, we included 1740 students nested in 53 schools. We excluded 16 participants due to missing responses on some key variables in their questionnaire. The remaining 1724 questionnaires were included in the study. The participants' age had a mean (SD) of 15 (1.7) and ranged from 12 to 19 years.

Table 2 presents sources-specific scores of academic stress. The mean score of academic stress was 45.7 (95% CI 45.2, 46.3). The mean score of academic stress did not differ substantially between girls (mean 46.3; 95% CI 45.5, 47.1) and boys (mean 45.2; 95% CI 44.4, 45.9) at the school level. The scores of the first and second educational periods of high school were 44.1 and 47.5, respectively (*p* < 0.001). The highest ratings of academic stresses belonged to future uncertainty, academic competition, and interaction with teachers. Home life, peer pressure, and school regulations had the lowest scores.

Tables 3 and 4 presented the association between academic stress sources and different variables through the bivariate and multiple multilevel linear regression analysis. In the bivariate analysis (level 2 variables), academic stress of home life, future uncertainty, interaction with teachers, peer pressure, and parent involvement differed at a statistically significant level between schools for girls and boys. Except for academic stress due to peer pressure and parent involvement, other sources were significantly associated with the educational period. Academic competition's stress was higher in the first educational period than in the second educational period. All other sources of academic stress were higher in the second educational period. Stress-related to teachers' interaction, the education system, school regulation, and financial pressure were significantly associated with

Table 1 The background characteristics of the adolescents in Qazvin City, Iran, in 2018 (*n* = 1724)

	Male, *n*(%)	Female, *n*(%)
School type		
Governmental	474 (55.1)	527 (61.0)
Special	247 (28.7)	177 (20.5)
Private	139 (16.2)	160 (18.5)
Educational period		
First	515 (59.9)	388 (44.9)
Second	345 (40.1)	476 (55.1)
Family socioeconomic status		
High	295 (34.3)	280 (32.4)
Moderate	305 (35.5)	270 (31.2)
Low	260 (30.2)	314 (36.3)
Mother's education		
Illiterate	16 (1.9)	26 (3.0)
Primary school/middle school	162 (18.8)	204 (23.6)
High school/diploma	282 (32.8)	311 (36.0)
Bachelor	272 (31.6)	218 (25.2)
Masters/Ph.D	115 (13.4)	92 (10.7)
Missing	13 (1.5)	13 (1.5)
Father's education		
Illiterate	7 (0.8)	16 (1.8)
Primary school/middle school	161 (18.7)	194 (22.4)
High school/diploma	247 (28.7)	274 (31.7)
Bachelor	262 (30.5)	244 (28.2)
Masters/Ph.D	170 (19.8)	125 (14.5)
Missing data	13 (1.5)	11 (1.3)
Mother's employment		
Government employee	194 (22.1)	154 (18.2)
Private/self-employed	17 (1.9)	30 (3.5)
Physician/master	13 (1.5)	6 (0.7)
Retired	17 (1.9)	16 (1.9)
Housewife	598 (68.2)	632 (74.6)
Missing data	38(4.3)	9 (1.1)
Father's employment		
Government employee	377 (43.8)	356 (41.2)
Private/self-employed	339 (39.4)	366 (42.3)
Physician/master	27 (3.1)	22 (2.5)
Retired	90 (10.5)	91 (10.5)
Missing	27 (3.1)	1 (3.4)

school type. In the bivariate analysis of level 1 variables, the family SES had a significant association with home life stress, interaction with teachers, peer pressure, financial pressure, and total score of academic stress. However, only stress due to home life and economic pressure

Table 2 The scores of different sources of academic stress among high-school adolescents in Qazvin City, Iran ($n = 1724$)

Variables		Financial issues	Parents' involvement	Peer pressure	School's regulations	Academic competition	Interaction with teacher	Future uncertainty	Educational system	Home life	Total academic stress
Gender	Female	46.3 (44.3, 48.3)	43.4 (42.0, 44.7)	31.3 (29.9, 32.6)	36.3 (34.9, 37.8)	59.4 (57.8, 61.0)	58.4 (57.3, 59.7)	72.1 (70.8, 73.5)	43.2 (41.8, 44.5)	27.5 (26.4, 28.5)	36.3 (46.0, 47.0)
	Male	48.4 (46.5, 50.3)	51.5 (50.1, 52.8)	34.4 (33.1, 35.7)	36.2 (34.9, 37.6)	57.6 (56.1, 59.2)	53.8 (52.7, 55.0)	67.4 (66.0, 68.9)	45.7 (44.4, 47.1)	31.02 (29.9, 32.2)	45.18 (44.0, 46.0)
Educational period	First	44.9 (43.1, 46.9)	48.2 (46.8, 49.5)	32.8 (31.4, 34.1)	32.2 (31.1, 33.4)	63.1 (61.7, 64.6)	53.4 (52.2, 54.5)	67.5 (66.1, 68.8)	40.7 (39.5, 42.0)	26.5 (25.4, 27.5)	44.1 (43.4, 44.9)
	Second	49.9 (48.1, 5.9)	46.6 (45.2, 48.0)	32.9 (31.6, 34.2)	40.7 (30.2, 42.2)	53.4 (51.7, 55.0)	59.2 (58.0, 60.3)	72.3 (71.0, 73.7)	48.5 (47.1, 49.9)	32.3 (31.1, 33.4)	47.5 (46.7, 48.3)
School type	Governmental	50.3 (48.5, 52.0)	47.3 (46.0, 48.5)	32.5 (31.2, 33.7)	35.5 (34.2, 36.8)	58.8 (57.3, 60.2)	57.0 (55.9, 58.1)	69.7 (68.5, 71.0)	42.4 (41.2, 43.6)	29.9 (28.9, 31.0)	45.7 (45.0, 46.4)
	Special	43.5 (40.8, 46.2)	47.5 (45.6, 49.5)	33.6 (31.7, 35.4)	41.2 (39.2, 43.3)	57.2 (54.9, 59.5)	57.9 (56.2, 59.7)	69.4 (67.4, 71.4)	49.0 (47.1, 51.1)	28.2 (26.6, 29.8)	46.5 (45.4, 47.7)
	Private	42.8 (39.7, 46.1)	47.7 (45.0, 41.5)	32.9 (30.6, 35.0)	31.7 (29.6, 33.7)	59.5 (56.8, 62.2)	50.7 (48.8, 52.5)	70.4 (68.0, 72.8)	44.7 (42.4, 47.0)	28.4 (26.6, 30.1)	44.7 (43.4, 46.0)
Family SES	High	39.5 (37.9, 41.8)	47.5 (45.8, 49.1)	30.5 (28.9, 32.2)	37.2 (35.5, 38.9)	57.8 (55.9, 59.7)	54.1 (52.6, 55.6)	67.8 (67.1, 70.5)	44.9 (42.4, 47.0)	25.8 (24.5, 27.1)	44.2 (43.2, 45.1)
	Moderate	46.7 (44.5, 49.1)	46.8 (45.2, 48.4)	32.5 (31.0, 34.0)	36.1 (34.4, 37.7)	58.1 (56.9, 60.0)	55.9 (54.4, 57.3)	69.7 (68.0, 71.4)	43.7 (42.1, 45.4)	28.2 (26.9, 29.5)	45.2 (44.3, 46.1)
	Low	55.7 (53.5, 58.0)	48.0 (46.2, 49.7)	35.4 (33.8, 37.0)	35.5 (33.8, 37.2)	59.5 (57.5, 61.5)	58.4 (57.0, 59.9)	70.8 (69.1, 72.5)	44.9 (43.2, 47.0)	33.7 (32.2, 35.2)	47.8 (46.9, 48.8)

Table 3 Multilevel bivariate linear regression analysis of variables associated with the sources of academic stress among adolescents in Qazvin City, Iran ($n = 1724$)

Variables		Financial Pressure	Parents involvement	Peer pressure	School regulations	Academic competition	Teacher interaction	Future uncertainty	Educational system	Home life	Total academic stress
School level											
Sex	Female	1	1	1	1	1	1	1	1	1	1
	Male	0.37 (−0.17, 0.91)	1.31 (0.92, 1.71)***	0.65 (0.13, 1.15)*	0.02 (−0.64, 0.69)	−0.31 (−1.18, 0.56)	−0.73 (−1.22, 0.23)**	−1.07 (−1.74, 0.39)**	−0.79 (−1.95, 0.37)	−1.13 (−2.23, 0.04)*	−1.64 (−5.48, 2.19)
Educational period	First	1	1	1	1	1	1	1	1	1	1
	Secondary	0.65 (0.13, 1.15)*	−0.18 (−0.68, 0.32)	−0.01 (−0.53, 0.52)	1.25 (0.73, 1.78)***	−1.91 (−2.56, −1.26)***	0.8 (0.35, 1.25)***	1.11 (0.45, 1.77)**	2.39 (1.42, 3.36)***	2.01 (1.04, 2.96)***	6.17 (2.76, 9.58)***
School type	Governmental	1	1	1	1	1	1	1	1	1	1
	Special	−0.81 (−1.42, −0.20)**	−0.06 (−0.70, 0.58)	0.13 (−0.53, 0.78)	1.04 (0.30, 1.78)**	−0.49 (−1.56, 0.57)	0.24 (−0.34, 0.83)	0.11 (−0.77, 1.00)	2.24 (0.93, 3.55)**	−0.54 (−1.92, 0.84)	1.87 (−2.78, 6.52)
	Private	−0.94 (−1.61, −0.28)**	−0.01 (−0.72, 0.68)	0.001 (−0.72, 0.72)	−0.53 (−1.33, 0.27)	−0.06 (−1.22, 1.11)	−0.97 (−1.60, −0.33)**	0.08 (−0.89, 1.06)	0.55 (−0.88, 1.98)	−0.57 (−2.06, 0.92)	−2.52 (−7.59, 2.55)
Individual level											
Socioeconomic status	Rich	1	1	1	1	1	1	1	1	1	1
	Mild	0.84 (0.45, 1.22)***	−0.11 (−0.49, 0.26)	0.5 (0.04, 0.95)*	−0.31 (−0.69, 0.06)	0.12 (−0.43, 0.66)	0.24 (−0.08, 0.56)	0.28 (−0.30, 0.85)	−0.09 (−0.83, 0.64)	1.06 (0.37, 1.74)**	2.53 (−0.06, 5.06)
	Poor	1.85 (1.45, 2.25)***	0.08 (−0.31, 0.47)	1.12 (0.65, 0.95)***	−0.38 (−0.78, 0.02)	0.39 (−0.18, 0.97)	0.6 (0.26, 0.94)**	0.41 (−0.19, 0.01)	0.32 (−0.46, 1.10)	2.88 (2.16, 3.61)***	7.27 (4.59, 9.95)***
Fathers education	Illiterate	1	1	1	1	1	1	1	1	1	1
	Primary school/middle school	−0.63 (−2.04, 0.77)	0.38 (−0.95, 1.73)	−0.66 (−2.31, 0.98)	0.65 (−0.69, 1.98)	0.65 (−1.29, 2.59)	−0.38 (−1.52, 0.76)	0.94 (−1.12, 3.00)	−0.64 (−0.27, 1.99)	−1.23 (−3.70, 1.23)	−0.94 (−10.06, 8.19)
	High school/diploma	−1.14 (−2.55, 0.27)	0.36 (−0.94, 1.73)	−0.83 (−2.47, 0.82)	0.75 (−0.59, 2.09)	0.35 (−1.59, 2.29)	−0.056 (−1.2, 1.08)	0.65 (−1.41, 2.71)	−0.56 (−3.21, 2.08)	−2.06 (−4.54, 0.41)	−2.45 (−11.6, 6.69)
	Bachelor	−1.51 (−2.93, −0.09)*	0.42 (−0.93, 1.77)	−0.85 (−2.5, 0.80)	1.05 (−0.29, 2.41)	0.24 (−1.71, 2.20)	−0.12 (−1.27, 1.03)	1.18 (−0.89, 3.26)	−0.15 (−2.81, 2.51)	−1.93 (−4.43, 0.56)	−1.57 (−10.78, 7.61)
	Masters/Ph.D	−1.74 (−3.18, −0.30)*	0.38 (−0.99, 1.75)	−0.92 (−2.60, 0.76)	1.30 (−0.07, 2.68)	0.68 (−1.32, 2.67)	0.10 (−1.07, 1.28)	1.34 (−0.77, 3.45)	0.44 (−2.28, 3.15)	−2.87 (−5.42, 0.32)*	−1.20 (−10.59, 8.19)

Statistically significant negative estimates were presented with *italic font*

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 4 Multilevel multiple linear regression analysis of variables associated with the sources of academic stress among adolescents in Qazvin, Iran ($n = 1724$)

Variables	Financial issues	Parents' involvement	Peer pressure	School regulations	Academic competition	Interaction with teachers	Future uncertainty	Education system	Home life	Total academic stress
School-level										
Male gender	0.52 (0.08, 0.93)*	1.31 (0.92, 1.70)***	0.68 (0.160, 1.20)**	–	–	− 0.63 (− 1.02, − 0.23)***	− 0.94 (− 1.57, − 0.30)**	− 0.56 (− 1.46, 0.34)	− 0.82 (− 1.73, 0.15)	–
Secondary educational period	0.71 (0.29, 1.13)**	–	–	1.24 (0.76, 1.70)***	− 1.91 (− 2.56, − 1.27)***	0.75 (0.37, 1.13)***	0.99 (0.37, 1.61)**	2.15 (1.27, 3.04)***	1..93 (1.02, 2.80)***	6.15 (2.81, 9.49)***
School type (ref: governmental)										
Special	− 0.41 (− 0.94, 0.12)	–	–	0.85 (0.26, 1.44)**	–	0.27 (− 0.21, 0.75)	–	1.98 (0.88, 3.08)***	–	–
Private	− 0.14 (− 0.74, 0.45)			− 0.63 (− 1.28, 0.01)	–	− 0.82 (− 1.36, − 0.28)**	–	0.43 (− 0.77, 1.64)	–	–
Individual level										
Family SES (ref: high)										
Moderate	0.76 (0.37, 1.16)***	–	0.48 (0.02, 0.92)*	–	–	0.19 (− 1.36, 0.28)	–	–	1.01 (0.32, 1.70)**	2.55 (0.03, 5.08)*
Low	1.68 (1.24, 2.11)***	–	1.12 (0.65, 1.68)***	–	–	0.51 (0.16, 0.85)**	–	–	2.74 (1.99, 3.49)***	7.27 (4.61, 9.90)***
Father's education (ref: illiterate)										
Primary/secondary school	− 0.44 (− 1.83, 0.94)	–	–	–	–	–	–	–	− 0.83 (− 3.27, 1.59)	–
High school/diploma	− 0.68 (− 2.06, 0.71)	–	–	–	–	–	–	–	− 1.22 (− 3.67, 1.22)	–
Bachelor	− 0.90 (− 2.30, 0.49)	–	–	–	–	–	–	–	− 0.82 (− 3.29, 1.65)	–
Masters/Ph.D	− 1.00 (− 2.43, 0.43)	–	–	–	–	–	–	–	− 1.52 (− 4.05, 0.99)	–

SES socioeconomic status)
*$p < 0.05$
**$p < 0.01$
***$p < 0.001$

had a statistically significant association with fathers' education.

After adjusting for confounders, the multilevel linear regression analysis in school-level variables indicated higher stress levels due to future uncertainty, educational system, and interaction with teachers in schools for girls. However, stress related to peer pressure, parent involvement, and financial burden were higher in schools for boys. Moreover, the academic stress was higher in the second educational period,

holding all the other independent variables constant. The stress of home life, educational system, future uncertainty, teacher interaction, school regulations, and financial pressure was higher in the second educational period than the first educational period. The only stress of academic competition was in the first educational period. The stress of the educational system and school regulation was higher in schools for talented. Stress due to teacher interaction was lower in private schools. Among student-level variables, home life stresses, interaction with teachers, peer pressure, and financial pressure were higher among adolescents with low and moderate than high family SES. The stress of home life was higher in adolescents with illiterate fathers. Stresses due to the educational system and teacher interaction were associated with fathers' education.

Discussion

This study estimated a total score of academic stress for a sample of Iranian adolescents. Overall, the stress levels among study participants were modest. The sources of academic stress were different in schools for girls and boys. Various sources of academic stress were higher in the second educational period than the first educational period. School type and family SES were associated with different sources of academic stress. Academic stress was higher in the secondary educational period and among those with low family SES. Future uncertainty, academic competition, and interaction with teachers were the most common academic stress sources among participants. Our results have significant implications for education and health policy-makers and families with adolescent children in dealing and working with this vulnerable age group in the context of a middle-income setting.

Future uncertainty was the most critical source of academic stress in the second educational period of high school. This issue strengthens the adolescents' pressures and problems. School-going adolescents in Iran experience substantial stress concerning the university entrance exam through their families, school authorities, teachers, and peers. Some parents force adolescents to participate in various educational programs and intensive training courses to prepare for the National University entrance exam [24]. Private schools and institutions' goal is advertising and getting lucrative business. Moreover, the high unemployment rates have resulted in worries about the future among students and families.

In this study, academic stress was higher in the second educational period. Because of getting closer to the national university entrance exam, academic stress may increase among older adolescents. Based on Poland and Thailand's reports, students' academic stress levels rise with increasing age and academic grades. This issue has caused considerable mental health problems among adolescents, even students with excellent academic performances [25, 26]. Mental health prevention interventions in high schools, especially for the students in their late years of education in Iran, warrant further attention and investment.

Interaction with teachers was another source of academic stress in adolescents. High academic expectations from adolescents increase school stress, which hinders their academic achievements [27]. Academic stress is one of the most critical long-term practical factors on adolescents' life satisfaction [28]. The stress related to teachers and school regulations can decline adolescents' interest in school and studies. Thus, it may have negative impacts on the sense of the independence of adolescents [29]. Relationships of adolescents in the family, at school, and out of school determine their mental health and performance through satisfaction and happiness [28].

In this study, some of the academic stress sources at boys' and girls' schools differed considerably. For example, family and peers' role in academic stress has been higher in boys' schools than in girls'. Girls were more worried about the future because of having a lower likelihood of getting employed than their male counterparts. The students' relationship with teachers was more important in girls' schools than boys'. Prior studies did not find substantial differences in academic stress levels between males and females [14, 10]. Males and females may perceive similar stress differently and also react differently in response to the same stress [30, 31].

This study indicated parents' involvement in adolescents' educational tasks. Parents' high expectations from their offspring were principal sources of academic stress. These parents' behaviors can cause adolescents to pay little attention to their feelings and thoughts and decrease their self-esteem. Unfortunately, these characteristics of adolescents hinder developing relevant social skills for resolving interpersonal conflicts [32]. Shin et al. emphasized to have a proper emotional relationship between parents and adolescents. Poor relationship with parents and harsh parenting could result in pushing adolescents outside home and searching for role models and source of social support among their peers. When facing conflict with peers, these adolescents would feel helpless and become vulnerable towards mental issues [33]. In our study, peer pressure was one of the primary sources of academic stress, especially among males. Peer pressure mediates sexual behaviors through drug use and sexual stimuli paths, especially in boys [34].

Strengths and limitations

This study had some advantages and weaknesses. This study is one of the few research on academic stress levels and determinants among Iranian adolescents.

Multilevel modeling added value to the findings and to use the data's inherent hierarchical structure. This timely study at the beginning of new rounds of the USA sanctions against Iran will provide us with a benchmark to evaluate the sanctions' adverse effects on students' mental health in the coming years. The main limitation of this study was its cross-sectional design, which compromises causal inference. Secondly, the self-administered questionnaires used in this study assume similar levels of cognitive maturity between participants. However, the two age cohorts might slightly differ in their cognitive functions. Finally, the Iranian socio-cultural and educational system context makes the generalizability of the study results limited. Our results are more relevant to settings with similar education systems and cultural backgrounds.

Conclusions

The present study estimated academic stress and evaluated its multilevel sources among school-going adolescents in Qazvin City, Iran. Participants had moderate levels of academic stress. Educational period, school type, students' gender, parental relationship, and family SES were associated with academic stress among adolescents in this study. Since multilevel processes and factors are involved, the right solution to reduce academic stress would require multilevel interventions that address schools, families, and students. Future research should investigate how multilevel policies and interventions that mitigate academic stress can improve students' mental health and academic performance.

Abbreviations
CI: Confidence interval; LED: Light emitting diode; LCD: Liquid crystal display; ICC: Intra class correlation; IAASQ: Iranian Adolescents Academic Stress Questionnaire; PS4: Play Station; SES: Socioeconomic status; SD: Standard deviation; USA: United States of America

Availability of data and materials
The first author is responsible for the integrity of the data for this research and can be contacted regarding data-related queries.

Ethics approval and consent to participate
We obtained both oral and written informed consent from participants and their parents/guardians prior to interviews. The Ethics Committee of Tehran University of Medical Sciences approved the study protocol (IR.TUMS.VCR.REC.1396.4610.).

Consent for publication
All authors have provided consent for publication.

Competing interests
The authors declare that they have no competing interests.

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