Assessment of academic stress and its coping mechanisms among medical undergraduate students in a large Midwestern university

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Abstract

Academic stress is the most common mental state that medical students experience during their training period. To assess academic stress, to find out its determinants, to assess other sources of stress and to explore the various coping styles against academic stress adopted by students. Methods: It was a cross sectional study done among medical students from first to fourth year. Standard self-administered questionnaires were used to assess academic stress and coping behaviour. Mean age of the 400 participants was 20.3 ± 1.5 years. 166(41.5%) of them were males. The academic stress was found to be of mild, moderate and severe level among 68(17%), 309(77.3%) and 23(5.7%) participants respectively. Overall coping with stress was found to be poor, average and good among 15(3.8%), 380(95%) and 5(1.2%) participants respectively. Passive emotional ($p = 0.054$) and passive problem ($p = 0.001$) coping behaviours were significantly better among males. Active problem coping behaviour ($p = 0.007$) was significantly better among females. Active emotional coping behaviour did not vary significantly between genders ($p = 0.54$). Majority of the students preferred sharing their personal problems with parents 211(52.7%) followed by friends 202(50.5%). Binary logistic regression analysis found worrying about future ($p = 0.023$) and poor self-esteem ($p = 0.026$) to be independently associated with academic stress. Academic stress although a common finding among students, the coping style to deal with it, was good only in a few. The coping behaviours were not satisfactory particularly among male participants. This along with other determinants of academic stress identified in this study need to be addressed during counselling sessions.

Keywords Academic stress · Determinants · Coping behaviours · Medical students

Introduction

Academic stress has been reported to be the most common mental state that medical students experience during their training period (Ramli et al. 2018). It is on the rise among them probably due to increasing course requirements (Ramli et al. 2018; Drolet and Rodgers 2010). Kumaraswamy (2013) observed that the issues known to precipitate academic stress were excessive assignments, peer competition, examinations and problems related to time management. University students, for the life phase they are going through, also have to deal with many other stresses such as detachment from the

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family, building of self-identity and issues concerning adolescence period and those in relation to student-workers. The stress of the medical student is also connected to the relationship with the patient in the clinical period.

Some amount of academic stress is beneficial as it brings about healthy competition with peer group, promotes learning and helps to excel in academics (Malathi and Damodaran 1999; Afolayan et al. 2013). Lumley and Provenzano (2003) however reported that, excess of academic stress adversely affects academic performance, class attendance and psychological well-being of students. If it is not identified early and managed, it can cause depression, anxiety, behavioural problems, irritability, social withdrawal and physical illnesses (Adiele et al. 2018; Deb et al. 2015; Verma et al. 2002; Chen et al. 2013).

In addition to assessment of academic stress among under graduate medical students, it is also essential to analyze the various stress coping mechanisms adopted by them. This will help researchers in suggesting appropriate intervention strategies for the benefit of the students. Students in turn can educate their patients in future to identify stress and suggest measures to deal with it.

Previous studies have reported that medical students used active coping mechanisms (Al-Dubai et al. 2011; Chawla and Sachdeva 2018; Gade et al. 2014; Abouammoh et al. 2020), positive reframing (Al-Dubai et al. 2011; Chawla and Sachdeva 2018), planning (Chawla and Sachdeva 2018; Wu et al. 2018), positive reappraisal (Wu et al. 2018), emotional support (Chawla and Sachdeva 2018; Gade et al. 2014), peer discussions (Oku et al. 2015) and acceptance (Al-Dubai et al. 2011; Chawla and Sachdeva 2018) as means for coping stress. There were minimal reports of usage of avoidance strategies for coping stress among medical students (Al-Dubai et al. 2011; Chawla and Sachdeva 2018).

Royal College of Psychiatrists (2011) reported that students with secure attachments to family and those residing in a supportive community are in a better position to handle stress. Therefore assessment of various determinants of academic stress is essential to frame most suitable remedial measures for the benefit of the affected. This study was hence done to assess academic stress, to find out its determinants, to assess other sources of stress and to explore the various coping styles adopted by medical students to deal with academic stress in a coastal city in south India.

Materials and Methods

This cross sectional study was conducted in the month of March 2018 at a private medical college in Mangalore. The institutional ethics committee approval was taken before the commencement of the study. Permission to conduct the study was taken from the Dean. Sample size of 364 participants was

calculated at 95% confidence intervals (CI), 90% power and the proportion of medical students with average level of academic stress taken as 51.4% based on the findings of Mostafavian et al. (2018). A non-response rate of 10% was added to arrive at the final sample size which was calculated as 400 participants. A total of 100 students of Bachelor of Medicine and Bachelor of Surgery course from first year to fourth year were therefore chosen to participate in this study using simple random sampling method.

The students were briefed about academic stress and the objectives of this study, in the classroom setting, and written informed consent was taken for their participation. In order to maintain anonymity, the filled in consent form were first collected back from the participants. Later the questionnaires were distributed by the investigators. It was a semi-structured questionnaire containing both closed and open ended questions. It was pre-tested in a group of ten students before its use in the current study. No changes in the questionnaire resulted following the pre-testing and the data collected in this phase were not included in the final study.

Data Collection Tools

Academic stress was assessed using the academic stress inventory tool for university students prepared by Lin and Chen (2009). They had reported the alpha value of Cronbach's reliability test for this questionnaire as 0.90. The questionnaire was slightly modified during the content validation phase in this study to incorporate questions on career related issues along with few other minor changes. This questionnaire contained 35 items which were designed in a five point Likert scale. The responses in the scale were "completely disagree," "disagree," "neutral," "agree," and "completely agree", with scores ranging from one to five points respectively. Cumulative scores ranging from 35 to 81, 82 to 128 and 129 to 175 were considered as mild, moderate and severe levels of academic stress respectively.

The coping techniques employed by the respondents was assessed using the academic stress coping style inventory developed by Lin and Chen (2010). The Cronbach's alpha value of internal consistency for the stress coping style questionnaires was reported by them to be 0.83. It was shortened during the content validation phase to result in 25 questions designed again in Likert's five-point scale. Scores were ranging from 5 for "completely agree" to 1 for "completely disagree". Overall coping with stress was rated as poorly adoptive when cumulative score of the participant ranged from 25 to 58, average when it was 59 to 92 and good when it was 93 to 125.

Coping behaviour were grouped as active emotional coping, active problem coping, passive emotional coping and passive problem coping behaviours. Active emotional coping behaviour involved individuals adopting the attitude of

emotional adjustment like positive thinking emotions and self-encouragement, when faced with academic stress. Active problem coping behaviour involved dealing academic stress by focussing at the centre of the problem and finding a solution themselves by being calm and optimistic or by searching assistance from external sources. Passive emotional coping behaviour involved constraining emotions, self-accusation, getting angry, blaming others or God or by giving up. Passive problem coping behaviour involved procrastinations, evasive behaviours or going into alcohol or drug abuse while facing academic stress (Lin and Chen 2010).

The overall alpha value of Cronbach's reliability test for the academic stress and coping style inventory questionnaire used in this study was calculated to be 0.901, indicating excellent reliability.

Statistical Analysis

The data entry and analysis were done using IBM SPSS for Windows version 25.0, Armonk, New York. Statistical tests like Chi square test, Fisher's exact test, Student's unpaired t test and Karl Pearson's coefficient of correlation were used for analysis. All the determinants of academic stress significant at 0.15 level were placed in the multivariable model. Backward stepwise elimination procedure was done to identify the independent determinants of academic stress in the model at the last step. p value 0.05 or less was used as the criterion for significance.

Results

A total of 400 students participated in this study and all of them gave satisfactorily filled forms. Their mean age was 20.3 ± 1.5 years and median age was 20 years with an Inter Quartile Range (19, 22) years. As many as 166(41.5%) of them were males. Out of the total participants, 45(11.2%) were local residents, 51(12.8%) were outsiders but within the same state, 262(65.5%) were from other states within India, 35(8.8%) were non-residential Indians and the rest 7(1.7%) were foreigners. Medium of schooling among 388(97%) students was English.

Among the participants, 67(16.7%) were currently staying at their home or rented apartment while the rest 333(83.3%) were staying in the hostels or were staying as paying guests. Majority of them [228(57%)] were staying with their friends. Among others, 118(29.5%) were staying alone, 46(11.5%) with their parents, 7(1.8%) with their relatives and one with her elder sibling.

With respect to lifestyle habits, majority of the participants [249(62.2%)] went to college by walk, and majority [339(84.7%)] slept for 6 to 8 h on an average per day. (Table 1).

Table 1 Life-style related habits among the study participants

Characteristics	Number	Percentage
Mode of transportation to and fro to the college[†]		
By walk	249	62.2
College bus	52	13.0
Two wheelers	51	12.7
Car	33	8.2
Auto rickshaw	17	4.2
City bus	15	3.7
Internet facility at place of stay		
Present	389	97.3
Absent	11	2.7
Usual speed of internet connection at the place of stay ($n = 389$)		
Good	133	34.2
Average	191	49.1
Poor	65	16.7
Participation in extracurricular activities conducted in the college		
Mostly	73	18.2
Sometimes	184	46.0
Rarely	107	26.8
Never	36	9.0
Type of extracurricular activities chosen for participation (at least once a week) after the college hours[†]		
Swimming	137	34.2
Indoor/Outdoor Sports	99	24.7
Gymnasium	90	22.5
Dance	37	9.2
Music/Singing	6	1.5
None	55	13.7
Most common place for having food		
Hostel mess/ Restaurant	333	83.3
At home/ At the apartment	67	16.7
Average hours of sleep per day		
≤5	41	10.3
6 to 8	339	84.7
≥9	20	5.0
Total	400	100.0

†Multiple responses

Sources of Stress among Participants

Majority of students either agreed or strongly agreed that some teachers provided so much of academic information, making it difficult for students to assimilate knowledge [177(44.2%)]. Fear of failure in the exams was the other major cause of academic stress [206(51.5%)]. (Table 2).

Majority of students either agreed or strongly agreed that by missing few lectures, they felt anxious about falling short of attendance towards the end [204(51%)]. They also regretted

Table 2 Perception of participants regarding academic training related practices as a source of academic stress (*n* = 400)

Items	Completely disagree	Disagree	Neutral	Agree	Completely agree
Teacher related characteristics					
I feel that content of exercises and reports of some teachers are too strict	44(11)	171(42.8)	131(32.8)	43(10.7)	11(2.7)
I feel that the exercises and reports of some teachers are too difficult	43(10.7)	198(49.5)	110(27.5)	40(10)	9(2.3)
I feel that the exercises and reports of some teachers are excessive	43(10.7)	174(43.5)	97(24.3)	70(17.5)	16(4.0)
Some teachers provide too much data; which causes difficulty to assimilate knowledge	22(5.5)	108(27)	93(23.2)	152(38)	25(6.3)
I feel that I am not able to adapt to some teachers' teaching methods	19(4.8)	98(24.5)	118(29.5)	132(33)	33(8.2)
Academic performance related characteristics					
I feel that my parents think that I am not serious with my studies	87(21.8)	143(35.8)	49(12.3)	84(21)	37(9.3)
I have conflicts with my parents due to my academic results	120(30)	156(39)	59(14.7)	42(10.5)	23(5.8)
I feel that there is vast difference between my current results and high school results	26(6.5)	50(12.5)	72(18)	140(35)	112(28)
I worry that my academic results will not meet my parents' expectations	69(17.3)	88(22)	78(19.5)	113(28.2)	52(13)
Assessment related characteristics					
I do not get enough sleep at night because I worry about the class tests	135(33.7)	144(36)	58(14.5)	49(12.3)	14(3.5)
I stay up late before all the big and small tests	71(17.7)	115(28.7)	61(15.3)	119(29.8)	34(8.5)
I feel that the tests and class content of some subjects are variable, which results in inadequate preparation	35(8.7)	111(27.7)	129(32.3)	99(24.8)	26(6.5)
I feel pressurized because of frequent examinations	39(9.7)	134(33.5)	105(26.3)	100(25)	22(5.5)
Fear of failure in exams stresses me	50(12.5)	78(19.5)	66(16.5)	143(35.7)	63(15.8)

having wasted time set apart for studies [240(60%)]. (Table 3).

Overall the level of academic stress was found to be mild among 68(17%), moderate among 309(77.3%) and severe among 23(5.7%) participants. The mean academic stress score was found to be 100.6 ± 19.7. Gender wise variation in academic stress levels was noticed. It was of mild, moderate and severe level among 29(17.5%), 129(77.7%) and 8(4.8%) males and among 39(16.7%), 180(76.9%) and 15(6.4%) females respectively ($X^2 = 0.472$, $p = 0.79$).

The other non-academic sources of stress reported by participants were lack of sufficient vacations [130(32.5%)], staying away from family [103(25.7%)], worrying about future [70(17.5%)], low self-esteem [52(13%)], having trouble with friends 39(9.7%)], facing financial difficulties [33(8.2%)], interpersonal conflicts [28(16.7%)], conflicts with roommates [26(6.5%)], issues with partners [23(5.8%)], sleeping disorders [21(5.2%)], transportation problems [20(5%)], problems in the family [18(4.5%)], searching a partner [17(4.2%)] and lack of parental support [5(1.2%)].

14(3.5%) participants had underlying chronic morbidities. These morbidities were allergic rhinitis among 3, migraine among 3, polycystic ovarian disease among 3, menorrhagia among 2 and allergy, peptic ulcer, hypothyroidism, and impaired glucose tolerance in one student each.

Coping Strategies Adopted by Participants

Majority of the participants [294(73.5%)] either agreed or strongly agreed that they tried to think or do something, that would make them feel happier and relaxed when they were stressed. (Table 4).

Overall coping with stress was found to be poor among 15(3.8%), average among 380(95%) and good among 5(1.2%) participants.

The mean coping with stress score was 75.2 ± 9.2. The mean score of various coping behaviours like active emotional coping (items 1 to 6), active problem coping (items 14 to 18), passive emotional coping (items 7 to 13) and passive problem

Table 3 Perception of participants regarding group related, self-inflicted, career related issues and time management practices as a source of academic stress (n = 400)

Items	Completely disagree	Disagree	Neutral	Agree	Completely agree
Group related characteristics					
I often face problems as to how to share work with my classmates when some exercises or reports require group work	59(14.7)	156(39)	103(25.7)	65(16.3)	17(4.3)
When group work is required to complete an exercise or report, I worry that I will not be able to find a suitable group member	62(15.5)	140(35)	81(20.2)	89(22.3)	28(7)
When I give a speech or presentation, I worry that my classmates will laugh at my inability to perform well	89(22.2)	150(37.5)	71(17.8)	63(15.8)	27(6.8)
I feel nervous when I need to make a speech or give a presentation	62(15.5)	91(22.7)	83(20.7)	123(30.8)	41(10.3)
Peer related characteristics					
When I want to study on my own, I am often affected by my classmates' chatting	43(10.7)	114(28.5)	96(24)	120(30)	27(6.8)
I feel that my classmates are very noisy during class and this influences my class situations	47(11.7)	125(31.2)	124(31)	73(18.3)	31(7.8)
I am concerned about the academic competition with my peer group	57(14.2)	116(29)	108(27)	101(25.3)	18(4.5)
I am very worried that my academic results are not as good as those of my classmates	62(15.5)	121(30.2)	100(25)	92(23)	25(6.3)
I feel left out when my peer group discusses learnt concepts in their native languages	89(22.2)	130(32.5)	92(23)	61(15.3)	28(7)
Self-inflicted issues					
I feel that my learning level is not as good as that of my classmates	42(10.5)	135(33.7)	103(25.8)	96(24)	24(6)
I feel that I have so many topics to read and that I am out of breath	32(8)	90(22.5)	100(25)	140(35)	38(9.5)
I feel that I have no interest in some subjects	15(3.7)	122(30.5)	76(19)	143(35.8)	44(11)
I feel that after I entered university, my performance was not as good as I had expected	25(6.2)	79(19.8)	102(25.5)	137(34.3)	57(14.2)
On missing few lectures I feel anxious about falling short of attendance towards the end	42(10.5)	85(21.2)	69(17.3)	144(36)	60(15)
Career related issues					
There is lack of counselling on career-related issues in the college campus	36(9)	82(20.5)	119(29.7)	114(28.5)	49(12.3)
Uncertainty about job placement worries me	57(14.2)	88(22)	135(33.8)	88(22)	32(8)
Thought of peers getting a placement ahead of me bothers me	79(19.7)	142(35.5)	115(28.7)	49(12.3)	15(3.8)
Time management practices					
I feel that it is very difficult for me to find a balance between my academic and social activities	46(11.5)	93(23.2)	98(24.5)	123(30.8)	40(10)
I feel that the time spent on social activities and student associations affect my academic work	42(10.5)	121(30.2)	114(28.5)	88(22)	35(8.8)
I find difficulty in sticking to my study time table during examinations	37(9.2)	74(18.5)	88(22)	133(33.3)	68(17)
I regret that I wasted time set apart for studies	43(10.7)	51(12.8)	66(16.5)	174(43.5)	66(16.5)

coping (items 19 to 25) were found to be 21.7 ± 3.4, 13.2 ± 2.7, 18.6 ± 4.6 and 18.3 ± 4.2 respectively. (Table 4).

Mean active emotional coping score among males (n = 166) was 21.5 ± 3.5 and among females (n = 234) was 21.8 ± 3.3 (t = 0.613, p = 0.54). Mean passive emotional coping score among males (n = 166) was 19.1 ± 5.0 and among females (n = 234) was 18.2 ± 4.1 (t = 1.933, p = 0.054). Mean active problem coping score among males (n = 166) was 12.8 ± 2.8 and among females (n = 234) was 13.5 ± 2.5 (t = 2.711, p = 0.007). Mean passive problem coping score among males (n = 166) was 19.1 ± 4.4 and among females (n = 234) was 17.7 ± 3.9 (t = 3.412, p = 0.001).

The various measures adopted by participants to deal with stress were sharing problems with others [223(56.2%)], meditation [132(56.8%)], performing yoga [50(12.8%)], sleeping [29(7.5%)], practicing Tai Chi [13(3.5%)] and listening to music [11(3%)]. Other methods like watching television and exercising were reported by 8(2.2%) participants each, aromatherapy and sports by 5(1.3%) each, eating favourite food and consuming alcohol by two each and browsing through the internet by one participant.

Majority of the students preferred sharing their personal problems with parents 211(52.7%), followed by friends 202(50.5%), siblings 71(17.7%) and others 26(6.5%).

Eight(2%) participants reported using medications for the management of stress. One of them had taken Lorazepam tablets while another Sertraline tablets. The rest of them did not specify the medications.

Table 4 Distribution of coping strategies adopted by participants (n = 400)

Sl No.	Items	Completely disagree	Disagree	Neutral	Agree	Completely agree
1	I try to do or think of some things that will make me feel happier, and allow myself to relax	10(2.5)	23(5.7)	73(18.3)	218(54.5)	76(19)
2	I let myself calm down first and think of how to reconcile the negative emotions	4(1)	43(10.8)	92(23)	204(51)	57(14.2)
3	I eat and have fun to decrease the stress first	10(2.5)	62(15.5)	101(25.2)	155(38.8)	72(18)
4	I consider it to be a type of self-challenge	13(3.2)	48(12)	117(29.2)	177(44.3)	45(11.3)
5	I do usual things such as watching TV, reading comics, listening to music, sleeping, eating or going out to temporarily forget these frustrating things	6(1.5)	25(6.2)	74(18.5)	204(51)	91(22.8)
6	I am now feeling confident about my ability to handle personal problems	35(8.7)	46(11.5)	136(34)	134(33.5)	49(12.3)
7	I give up and blame God for being unfair when I face stress	152(38)	141(35.2)	62(15.5)	35(8.8)	10(2.5)
8	I make my friends uncomfortable when they provoke me when I am feeling down	51(12.7)	160(40)	112(28)	65(16.3)	12(3)
9	I do not give in when I argue with my friends	44(11)	124(31)	132(33)	81(20.2)	19(4.8)
10	I put my anger or fretful emotions on others	62(15.5)	155(38.7)	97(24.3)	68(17)	18(4.5)
11	I blame myself, retreat or shut myself away when I face stress	39(9.7)	116(29)	98(24.5)	111(27.8)	36(9)
12	I generalise that I have bad luck when I face stress	62(15.5)	118(29.5)	113(28.2)	90(22.5)	17(4.3)
13	I am feeling unable to cope with all things that should be done	34(8.5)	99(24.7_	128(32)	114(28.5)	25(6.3)
14	I search and look for related data from the library or the internet to do my homework	20(5)	50(12.5)	114(28.5)	174(43.5)	42(10.5)
15	I discuss issues with teachers, family, seniors, friends, online friends and classmates and ask for their opinions	31(7.7)	64(16)	108(27)	153(38.3)	44(11)
16	When I encounter conflicts in my academic study and activities, I will first arrange and plan	11(2.7)	54(13.5)	122(30.5)	169(42.3)	44(11)
17	I use a calm and optimistic attitude to think about how to cope with the problem	18(4.5)	53(13.2)	121(30.3)	162(40.5)	46(11.5)
18	I stay up finishing my homework until midnight	40(10)	80(20)	122(30.5)	126(31.5)	32(8)
19	I passively let nature take its course	21(5.2)	86(21.5)	141(35.3)	130(32.5)	22(5.5)
20	I am used to leaving aside the problem and not handling it for the time being	37(9.2)	128(32)	123(30.8)	86(21.5)	26(6.5)
21	I decrease my standards and try again with the new standards	44(11)	119(29.7)	143(35.8)	78(19.5)	16(4)
22	I look for religious hope or comfort for my soul	91(22.8)	109(27.2)	109(27.2)	75(18.8)	16(4)
23	The numbers of classes I bunk are becoming more and more	136(34)	119(29.7)	84(21)	35(8.8)	26(6.5)
24	I make myself numb by drinking alcohol or drug abuse	214(53.5)	92(23)	59(14.7)	27(6.8)	8(2)
25	I study the subjects I like better when I am in a class I do not like	39(9.8)	109(27.2)	120(30)	88(22)	44(11)

Reasons like lack of sufficient vacations and worrying about future were found to have highly significant association with academic stress among participants ($p \leq 0.001$). (Table 5).

Coping with stress was average/good among 328(98.8%) participants with moderate/severe levels of academic stress in comparison to 57(83.8%) with mild level of academic stress ($p < 0.00001$).

Similarly correlation of academic stress scores with stress coping scores was found to be significant ($r = 0.467$, $p < 0.001$). Also correlation between academic stress scores with passive emotional ($r = 0.513$, $p < 0.001$) and passive problem ($r = 0.401$, $p < 0.001$) coping behaviours were found to be significant. However academic stress was not significantly correlated with active emotional ($r = -0.036$, $p = 0.468$) and active problem ($r = 0.072$, $p = 0.149$) coping behaviours.

Binary logistic regression analysis found worrying about future ($p = 0.023$) and poor self-esteem ($p = 0.026$) among participants to be significantly associated with academic stress after adjusting the confounding effect of other variables in the model. (Table 6).

For calculating unadjusted Odds Ratio and 95% CI, participants staying with friends/alone were compared with those staying with parents/siblings/relatives (reference value), participants reporting speed of internet connection at place of stay as average/poor were compared with those reporting good connectivity (reference value).

Discussion

An interesting fact about this study was that the response rate was total. This supports the importance of this study which addresses a felt need of every medical student.

Academic stress of moderate to severe level were reported among 83% participants in this study. In other studies done among medical students, academic stress was reported among

Table 5 Association between determinants and academic stress among participants

Determinants	Level of academic stress		Total
	Mild	Moderate/ Severe	
Staying with parents/siblings/relatives	16(29.6)	38(70.4)	54
Staying alone	21(17.8)	97(82.2)	118
Staying with friends	31(13.6)	197(86.4)	228
$X^2 = 8.03$, $p = 0.018$			
Usual speed of internet connection at the place of stay (n = 389)			
Good	31(23.3)	102(76.7)	133
Average	25(13.1)	166(86.9)	191
Poor	9(13.8)	56(86.2)	65
$X^2 = 6.34$, $p = 0.042$			
Lack of sufficient vacations as a reason for stress			
Yes	10(7.7)	120(92.3)	130
No	58(21.5)	212(78.5)	270
			$X^2 = 11.8$, p = 0.001
Worrying about future as a source of stress			
Yes	3(4.3)	67(95.7)	70
No	65(19.7)	265(80.3)	330
$p = 0.0008$			
Reduced self-esteem as a source of stress			
Yes	2(3.8)	50(96.2)	52
No	66(19)	282(81)	348
$p = 0.0048$			
Financial difficulties as a source of stress			
Yes	1(3.0)	32(97.0)	33
No	67(18.3)	300(81.7)	367
$p = 0.0267$			

50% (Dyrbye et al. 2008), 53% (Bamuhair et al. 2015), 61% (Zamroni et al. 2018) and 74.6% (Mostafavian et al. 2018) participants. Academic stress among university students of other courses were reported among 48.8% (Reddy et al. 2018), 70.7% (Sharififard et al. 2014) and 73% (Adiele et al. 2018) participants. From these comparisons, it was obvious

that academic stress was high among the participants in this study probably because of cultural factors.

There was no association between academic stress and gender of participants in this study as also reported by Mostafavian et al. (2018) and Zamroni et al. (2018). However several other studies done among university

Table 6 Multivariable Binary Logistic Regression analysis of the determinants of academic stress among medical students (n = 400)

Characteristics	Unadjusted OR	95% CI of unadjusted OR		P value	Adjusted OR	95% CI of Adjusted OR		P value
		Lower	Upper			Lower	Upper	
Staying with parents/siblings/relatives	2.381	1.237	4.58	0.008	0.525	0.258	1.066	0.075
Usual speed of internet connection at the place of stay (n = 389)	1.889	1.111	3.213	0.018	0.6	0.339	1.065	0.081
Worrying about future as a source of stress	5.478	1.67	17.971	0.0008	4.057	1.21	13.605	0.023
Reduced self-esteem as a source of stress	5.851	1.388	24.659	0.0048	5.24	1.22	22.515	0.026
Financial difficulties as a source of stress	7.147	0.96	53.226	0.0267	4.494	0.584	34.572	0.149
Issues with partners	4.755	0.63	35.891	0.148	3.821	0.478	30.525	0.206

students reported females to have significantly greater academic stress than males (Adiele et al. 2018; Bamuhair et al. 2015; Reddy et al. 2018; Al-Sowygh et al. 2013).

Academic stress was found to be more among medical students in the first year (Nakalema and Ssenyonga 2014; Abdulghani 2008) or in the final year (Bamuhair et al. 2015). This was in contrast to the findings in this study were no such association was observed.

Place of residence was not associated with academic stress in this study and also in the study done among medical students in Iran by Mostafavian et al. (2018).

Academic stress in the present study was found to be least among participants who were staying with their parents, siblings or relatives. This may be because, number of students at this setting are outsiders. Studying over here, might also be their first occasion of moving out of their home environment. They therefore may be lacking their previously learnt support system such as banking on their family members and childhood friends during difficult times, as also observed by Kumar and Nancy (2011). They now have to find solutions to various problems by themselves, or by being dependent looking out for newer social contacts. If they were staying with their family members, perhaps they might have received the necessary emotional support during examinations and other stressful situations. The other benefits like getting hygienic food, good living conditions and people to take care of one's health would have been best when family members were around. The observations in this study were however contradicting the observation of Mostafavian et al. (2018) who observed that the academic stress was significantly more among those living at their houses compared to those at dormitories.

As many as 60% participants regretted having wasted time set apart for their studies. Poor time management was found to be associated with academic stress by other researchers too (Misra and McKean 2000; Macan et al. 1990). Good time management skills involves prioritization of activities and judicious usage of time available for organization of the tasks to be completed. Time management was found to determine academic performance by Misra and McKean (2000). Moreover those with sound time management behaviour were found to have fewer psychological and physical symptoms related to stress (Misra and McKean 2000; Macan et al. 1990). Lammers et al. (2001) reported that close to half of the students had notable weaknesses in their time management skills.

Fear of failure in exams and falling short of attendance towards the end were the reasons for academic stress among more than half the participants in this study. Teachers can play an important role in alleviating examination related fears and anxieties by conducting frequent mock examinations (Sharma et al. 2011). Meeting individual students' needs (Aherne et al. 2016), to find out the reason for missing classes, time scheduling of activities and providing constructive feedback to students (Sharma et al. 2016) are the other recommended

strategies advised by previous researchers. Abouserie (1994) stated that the amount of guidance and support offered by teachers would be a key factor in determining the stress levels of students in any institution. Students themselves have opined that social support from teachers and peer groups, consulting services, and various extracurricular activities are the most useful strategies to deal with stress (Chang et al. 2012). As opined by the student community themselves, every institution need to offer them psychotherapy sessions, trainings for reducing emotional tension and opportunities to improve social intelligence (Ruzhenkov et al. 2016).

Issues like worrying about future and poor self-esteem among participants in this study were significantly associated with academic stress in the multivariable analysis model. These problems may be related to issues like concern about clearing the increasingly competitive entrance exams and also about the fear of them not being able to pursue the specialty of their choice in future. To address such sensitive problems, there is a need of the placement of a professional counsellor at various professional colleges. Pressley and McCormick (1995) also suggested that the learning environment within classrooms should be non-competitive, collaborative and task-oriented and not performance oriented, so as to create a stress free learning environment.

Having said this, the course work at medical schools should not be too light either. Kanter (2008) suggested that this approach can affect the quality of education. Rather students need to be trained in the right way to directly solve the problems related to academic stress by themselves being a part of a self-help program (Chen et al. 2013; Aherne et al. 2016).

The various sources of academic stress among medical students listed in other studies were, vastness of curriculum as reported by 61.6% (Anuradha et al. 2017), 82.2% (Bamuhair et al. 2015), and 82.3% (Oku et al. 2015), fear of failure in examination by 61.8% (Anuradha et al. 2017), frequency of examination by 52.2% (Anuradha et al. 2017), lack of recreation and inadequate holidays by 51.8% (Anuradha et al. 2017) and by 76.4% (Oku et al. 2015), sleep related problems by 64.3% (Bamuhair et al. 2015), worrying about future by 78.2% (Bamuhair et al. 2015), family problems by 54% (Bamuhair et al. 2015), interpersonal conflicts by 57.1% (Bamuhair et al. 2015), low self-esteem by 51.7% (Bamuhair et al. 2015) and transportation problems by 56.2% participants (Bamuhair et al. 2015).

Coping with stress was found to be average among 95% participants in the present study. Almost three-fourth of the participants in the present study tried to think or do something that would make them feel happier and relaxed when they were stressed. Coping methods commonly used by students in previous studies were effective time management, sharing of problems, planned problem solving, going out with friends, social support, meditation and getting adequate sleep. Even emotion-based strategies to cope stress like self-blaming and

taking self-responsibility have been reported (Wolf 1994; Supe 1998; Stern et al. 1993; Redhwan et al. 2009).

Coping with stress in this study was better among participants with higher levels of academic stress which was similarly observed among Saudi Arabian medical students by Bamuhair et al. (2015). This suggests that students who perceived greater academic stress where in a position to apply coping strategies against it in a much better way. However the significant correlation between academic stress scores and passive emotional and passive problem scores indicates that the coping behaviour adopted by participants to deal with stress was not satisfactory. Therefore counselling the participants to adopt active coping behaviours is very essential at this setting. In a study done in Ghana by Atindanbila and Abasimi (2011), wrong or inadequate coping strategies were practiced by university students resulting in reduction of academic stress by mere 4%. Bamuhair et al. (2015) observed that 32.1% medical students felt too often that, they could not cope with stress. Therefore coping strategies against academic stress among university students in other parts of the world was not satisfactory either. The coping strategies adopted are generally found to vary depending on socio-cultural factors like region, social group, gender, age, and by individuals' previous experiences as per the WHO/EHA (1998).

Passive emotional and problem coping behaviours were significantly more among males. This meant that males adopted a number of unhealthy behaviours to deal with academic stress. Unpleasant social coping behaviour was found to reduce social support and increase loneliness by Kato (2002). Felsten (1998) observed that specifically procrastination as a coping behaviour was found to result in depression in both men and women.

Female students on the other hand had significantly better active problem scores under coping behaviour. They were hence more mature and composed than the male participants in analysing the centre of the problem in a calm and optimistic manner, and in finding solutions for the same. Bamuhair et al. (2015) observed that the mean of coping strategies score was significantly higher among females. Females were also found to be better at time management compared to their male counterparts (Misra and McKean 2000; Khatib 2014). Males therefore need to be counselled about healthy coping behaviours in dealing with academic stress.

Al-Sowygh et al. (2013) observed that the denial and behaviour disengagement as stress coping strategies were reported to be significantly more among females while self-blame was reported to be more among males. Bang (2009) reported that the coping mechanism of choice is related to the differences in the roles expected from gender. Males are expected to deal stressful situations by their outward actions while females are expected to focus on emotions and seek social support. Soffer (2010) stated that women usually choose health-promoting behaviours while men prefer health-risky behaviours.

There was no association between age of participants with the perceived level of academic stress or with the level of adaptability to cope with it in this study supporting the observations of Bamuhair et al. (2015).

Limitations

This was a cross-sectional study conducted in a single medical college. Therefore the findings of this study cannot be generalized to all medical students across India.

Conclusion

The results of the study reflect important insights into the nature of stress faced by the medical students and the ways they deal with the same. Academic stress was found to be common and was of moderate level in more than three-fourth of the participants. Level of coping with stress was found to be average among 95% of them. Worrying about future and poor self-esteem were independently associated with academic stress among students. Male participants adopted more of unhealthy means of coping with academic stress. Therefore they need to be educated regarding the healthy coping methods. Counselling sessions and other students' support systems need to be more organized to cater to the issues like career guidance, healthy coping behaviours, time management and to improve the self-esteem among the affected. Attention should also be paid to make the study environment in the classrooms more stress free without excessive academic load. Educating students about unpleasant consequences of stress is equally important. Teachers can also play a constructive role in mentoring and guiding students regarding choosing the right measures to cope with stress. Interactive academic sessions on stress control can further encourage medical students to single out each and every problematic issue. This would accomplish the aim of reducing the academic stress, adopting healthy academic stress coping behaviours, improving academic performance and minimizing anxiety among those with forethoughts about their future professional careers.

Mitchelle Xavier Machado: data collection, data entry, literature search, manuscript preparation, manuscript editing, revising the work critically for important intellectual content.

Varsha Nair: concept of this study, data collection, data entry, manuscript editing, revising the work critically for important intellectual content.

Shreya Matele: data collection, literature search, manuscript editing, revising the work critically for important intellectual content.

Navya Muthusamy: data collection, literature search, manuscript editing, revising the work critically for important intellectual content.

Aditi Sinha: data collection, literature search, manuscript editing, revising the work critically for important intellectual content.

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