

## ORIGINAL ARTICLE



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## Effect of daily water intake on the level of anxiety among medical students of Khawaja Muhammad Safdar Medical College, Sialkot

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### ABSTRACT

**Background and Objective:** A high incidence of burnout, depression, and anxiety is found among medical undergraduate and postgraduate students worldwide with the increasing prevalence of stress. The objective of this study was to analyze the correlation between water intake and the risk of anxiety among medical undergraduates of a public sector medical college in Pakistan.

**Method:** This cross-sectional study was conducted on 375 medical undergraduates of Khawaja Muhammad Safdar Medical College, Sialkot, Pakistan. To assess the level of anxiety, the Generalized Anxiety Disorder Assessment Scale 7 (GAD-7) was used. Points 3-0 were assigned to response categories of “nearly every day,” “more than half the days,” “several days,” and “not at all,” respectively. GAD-7 score was calculated by adding together the scores for seven questions. Scores of 15, 10, and 5 were taken as cut-off points for severe, moderate, and mild anxiety, respectively. Calculation of water consumption was carried out based on the number of water glasses intake per day. It was classified into <4, 4-7, and >7 of water/day.

**Result:** Out of 110 male medical students, 58.2% were suffering from normal to mild anxiety and 41.8% from moderate to severe anxiety. A total of 40.0% and 60.0% of female medical students were suffering from normal-mild and moderate-severe anxiety, respectively. The risk of anxiety was more among female than male students. Logistic regression indicated a correlation between decreased anxiety and female gender and water intake of 4-7 or >7 glasses/day.

**Conclusion:** The findings of the current study showed lesser anxiety levels in male students and an inverse relationship between water intake and level of anxiety. Therefore, increasing the intake of water can be beneficial in reducing stress and anxiety thus improving the quality of life.

**Keywords:** Anxiety, medical students, plain water, stress, water intake.

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### Introduction

The incidence of mental disorders has been increasing day by day during the last decade.<sup>1</sup> Mental disorders have affected about 29.2% of the people worldwide.<sup>2</sup> Medical education is tough and extensive, demanding high physical and mental strength. Many studies have reported a high rate of anxiety disorders among medical students. A meta-analysis has shown that medical undergraduates have an increased prevalence of anxiety from 29.2% to 38.7% globally.<sup>3-5</sup> In Pakistan, anxiety and depression are great dilemmas among medical students. According to a survey in Surat Medical

College, Pakistan, in 2012, all medical students were exposed to stressors and 40% of the medical students were at great risk while according to another study about 50% of the medical students were suffering from anxiety.<sup>6,7</sup>

Workload, sleep deprivation, financial concerns, and academic pressure are the stressor factors among medical students.<sup>8,9</sup> Anxiety can impair the perceptual motor function,<sup>10</sup> which is necessary for medical students and physicians to give efficient treatment to their patients. A high incidence of burnout, depression, and anxiety is found among medical undergraduates and postgraduates of Nepal,

with the increasing prevalence of high-grade achieving stressors.<sup>11</sup> Medical students are not aware of their anxiety and stress and this alarming unawareness can lead to a high degree of burnout and exhaustion among them.<sup>12</sup> In this study, medical students are selected as subjects because they have high exposure to anxiety and its control can be easily and effectively studied.

Many nutritionist guidelines suggest that health status can be increased by increasing daily water intake. A high level of water intake is extremely valuable in the prevention of obesity and management of diabetes.<sup>13</sup> Obese people are at a higher risk of depression than the lean ones.<sup>14</sup>

Children and older adults are more prone to voluntary dehydration due to lack of consciousness.<sup>15</sup> There is a positive link between dehydration and cognitive abilities like memory, vigor, attention, mood, esteem-related activities, etc.<sup>15,16</sup> Physiological stress caused by moderate hypohydration can be alleviated by fluid replacement therapy.<sup>17</sup>

In a recent survey in Iran, it was found that drinking plain water had an inverse link with depression, but water consumption and anxiety did not show any statistically valid relationship.<sup>2</sup> A study postulated that drinking hydrogen-rich water is associated with reinforcement of the central nervous system function comprising mood, autonomic nervous system, and anxiety.<sup>18</sup>

A considerable amount of work has been carried out on medical students to figure out anxiety and its risk factors. It is therefore the need of the hour to find out simple intervention strategies to cope with the stress and anxiety among this population. Little work has been conducted to find out the relationship between drinking plain water and the level of anxiety among medical students in Pakistan. Hence, this study aimed to determine the impact of drinking plain water on the level of anxiety among medical students of a public sector medical college in Sialkot, Pakistan.

## Methods

This cross-sectional study was carried out for 6 months duration (April 2021-October 2021). After approval by the Institutional Ethical Review Committee, a standard and validated questionnaire was distributed among all the medical undergraduates, from 1st to 5th year, of Khawaja Muhammad Safdar Medical College (KMSMC), Sialkot. Written consent was taken from all the students. Undergraduates of both genders, aged from 18 to 25 years, studying in different classes of MBBS, irrespective of marital status, were included.

Any student already suffering from any psychological ailment or on medication for anxiety-related disorders was excluded. The convenient sampling technique was used for sampling.

The questionnaire comprised two main parts: (A) water consumption assessment and (B) anxiety assessment. Consumption of water was assessed by asking the number of glasses of water a person consumes daily. Consumption of water was classified into three groups: <4, 4-7, and >7 glasses of water/day.

Anxiety was analyzed by using the Generalized Anxiety Disorder Assessment Scale 7 (GAD-7). Points 3-0 were assigned to the response categories of “nearly every day,” “more than half the days,” “several days,” and “not at all,” respectively. GAD-7 score was calculated by adding together the scores for the seven questions. Scores of 15, 10, and 5 were taken as cut-off points for severe, moderate, and mild anxiety, respectively.<sup>19</sup>

## Statistical analysis

Statistical Package for the Social Science version 20 (SPSS) (IBM SPSS statistics 20) was used for statistical analysis. Participants were categorized into three groups (<4 glasses/day, 4-7 glasses/day, and >7 glasses/day) regarding water intake and four groups regarding anxiety levels: normal (No), mild, moderate, and severe. Pearson’s chi-squared test was used to compare the frequency of moderate to severe anxiety between genders, marital status, water intake, and year of study. To make the results more precise, respondents with normal to mild anxiety levels were grouped as one and moderate to severe anxiety as two. The level of significance was taken as  $p < 0.05$ . The relationship of gender, marital status, year of study, and water intake with the level of anxiety was determined by using the logistic regression analysis.

## Results

Questionnaires were distributed to  $N = 500$  medical students (100 students of each year of MBBS). Response was received from 375 students. Of these 375 students, 110 were male and 265 were female. The prevalence of anxiety was 92.3% among all respondents; 37.6% suffered from mild anxiety, while 10.1% reported severe anxiety.

The percentage of daily water intake was highest (56%) for the range of 4-7 glasses per day (Table 1).

In Table 2, we see that the risk of moderate to severe anxiety was lower in men (41.8%) than in women (60.0%) ( $p = 0.001$ ). Similarly, the frequency of moderate to severe anxiety was higher in those students whose water intake was <4 glasses/day ( $p = 0.001$ ). However, no significant association was observed among marital status and year of study with the level of anxiety.

The results indicated that no relationship was found between marital status and moderate-severe anxiety. However, female gender and water intake of 4-7 and >7 glasses/day were associated with the decreased risk of anxiety in the current study (Table 3).

**Table 1.** Frequency of patients' characteristics.

Variables	Categories	Frequency	Percentage
Gender	Male	110	29.3
	Female	265	70.7
Marital status	Single	363	96.8
	Married	7	1.9
	Engaged	5	3.2
MBBS study year	1 year	105	28.0
	2 years	85	22.7
	3 years	93	24.8
	4 years	56	14.9
	5 years	36	9.6
Water intake (glasses/day)	<4	97	25.9
	4-7	210	56.0
	>7	68	18.1
Anxiety	Normal	29	7.7
	Mild	141	37.6
	Moderate	167	44.5
	Severe	38	10.1

**Table 2.** Association of different factors with the level of anxiety.

Factors	Categories	Anxiety		p-value*
		Mild	Moderate-severe	
Gender	Male	64 (58.2%)	46 (41.8%)	0.001*
	Female	106 (40.0%)	159 (60.0%)	
Marital status	Single	166 (45.7%)	197 (54.3%)	0.736
	Married	2 (28.6%)	5 (71.45)	
	Engaged	2 (40.0%)	3 (60.0%)	
MBBS study year	1 year	43 (41.0%)	62 (59.05)	0.195
	2 years	38 (44.7%)	47 (55.3%)	
	3 years	40 (43.05)	53 (57.0%)	
	4 years	26 (46.4%)	30 (53.6%)	
	5 years	23 (63.9%)	13 (36.1%)	
Water intake	<4 glass	29 (29.9%)	68 (70.1%)	0.001*
	4-7 glass	101 (48.1%)	109 (51.9%)	
	>7 glass	40 (58.8%)	28 (41.2%)	

\*Chi-squared test.

Figure 1 shows a graph was plotted between prevalence of anxiety (y-axis) and level of water intake (x-axis). This bar graph represents the inverse relationship between anxiety and water intake.

### Discussion

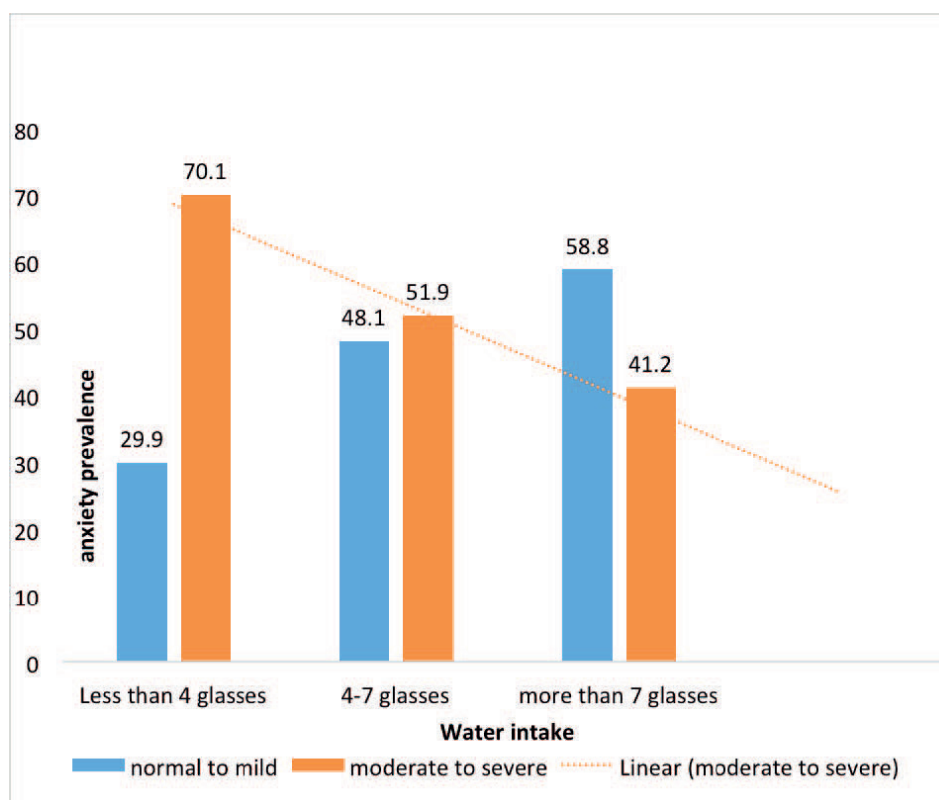
Anxiety is a multifactorial disorder which is greatly influenced by the lifestyle modification, especially dietary habits. Improvement in healthy nutritional behavior is essential to enhance health and performance of students.

The appropriate intake of water is beneficial in enhancing both physical and mental health. In this cross-sectional study on medical undergraduates of KMSMC Sialkot, Pakistan, an increased plain water intake has a direct impact on decreasing the level of anxiety. To our knowledge, this is the first study to correlate daily plain water intake and the level of anxiety, especially among medical students in Pakistan, although quite reasonable data is available on general masses to find out the relationship between daily plain water intake and obesity,<sup>20,21</sup> cancer,<sup>22</sup> hyperglycemia,<sup>23</sup> mortality,<sup>24,25</sup> and

**Table 3.** Simple and multivariate logistic regression analysis of different factors on the level of anxiety.

Variables	Categories	OR	p-value	95% CI		OR	p-value	95% CI	
				Lower	Upper			Lower	Upper
Gender	Female	Reference							
	Male	0.479	0.001*	0.305	0.753	0.392	0.000*	0.240	0.641
Marital status	Single	Reference							
	Married	2.107	0.377	0.403	10.999	2.610	0.285	0.450	15.140
	Engaged	1.264	0.799	0.209	7.655	1.416	0.718	0.215	9.349
MBBS study year	1 year	Reference							
	2 years	0.858	0.603	0.481	1.529	0.909	0.759	0.496	1.667
	3 years	0.919	0.770	0.522	1.618	1.032	0.917	0.568	1.875
	4 years	0.800	0.504	0.416	1.538	0.631	0.191	0.316	1.258
	5 years	0.392	0.019*	0.179	0.858	0.298	0.005*	0.129	0.687
Water intake	<4 glasses/day	Reference							
	4-7 glasses/day	0.460	0.003*	0.276	0.768	0.546	0.026*	0.320	0.930
	>7 glasses/day	0.299	0.000*	0.156	0.572	0.329	0.001*	0.168	0.645

\* = significant value,  $p < 0.05$



**Figure 1.** Bar chart representing the inverse relationship between water intake and level of anxiety.

depression.<sup>2</sup> These studies also show an inverse relationship between water intake and risk of the disease under question.

The present study showed a high frequency of anxiety (92.3%) among medical undergraduates of KMSMC, Sialkot. Similar published studies, however, reveal a lower prevalence of anxiety among medical students from China (30.8%)<sup>26</sup> and Malaysia (44%).<sup>27</sup> In this study, females were more prone to

anxiety than males ( $p = 0.001$ ; OR: 0.479; 95% CI: 0.305-0.753) and the same is suggested in a previous study conducted in Saudi Arabia, where 66% of the females were reported to be suffering from anxiety as compared to males ( $p$ -value = 0.01).<sup>28</sup>

In this study, multivariate logistic regression analysis showed that higher water intake (4-7 and >7 glasses/day) is associated with the lower risk of anxiety ( $p$ -value = 0.003). A

previous study in Iran<sup>2</sup> showed that by adjusting the dietary intake, a potent risk factor for anxiety was decreased intake of water; however, a significant association was not found. An increase in water intake results in the dilution of plasma noradrenaline. The psychosomatic depression induces the activation of the norepinephrine-vasopressinergic system and subsequently hypothalamus-pituitary axis (HPA).<sup>29</sup> A proposed mechanism for all depressive disorders is the increase in vasopressinergic activation of HPA,<sup>29</sup> which may also be causing mental symptoms. Comparable results were found in the research conducted in 2018 in Iran where improved mental health was postulated to be associated with an increased water intake ( $p = 0.0001$ ).<sup>2</sup>

A moderate level of stress and anxiety tend to increase the decision-making ability in students,<sup>30</sup> but higher levels of stress shows opposite results.<sup>31</sup> The current study infers that an increase in drinking plain water can decrease severe anxiety, resulting in an increase in the decision-making ability of medical students who are dealing with patients in their practical training daily. Depression and anxiety are major issues among students that impede their performance in curricular activities.<sup>32</sup> Thus, adequate water intake can improve the students' performance in curricular activities and cognitive abilities. Recommended water intake is essential not only for students, but this hypothesis is applicable for general population of every age. Improved water intake can decrease the risk of anxiety among people and can improve their work efficacy. In a recent experimental study, water intake was intervened among laborers at workplace, which resulted in decreased systolic and diastolic blood pressure. The health-promoting effects of the water intake wellness intervention were akin to the butterfly effect.<sup>33</sup> The simple remedy of increasing the water intake not only decreases the risk of anxiety but also helps in improving the mental health, work efficiency, decision-making, and decreasing the risk of burnout among medical undergraduates.

## Conclusion

Adequate intake of water is a simple, cost-effective, and feasible method for improving the efficiency and cognitive capacity of medical students by reducing the level of stress and anxiety. Our findings suggest that there is an inverse relationship between daily plain water intake and risk of anxiety among medical students. This research may act as a gateway to the further exploration of benefits of hydrotherapy and other simpler interventions to cope effectively with day-to-day stress and anxiety.

## Limitations of the study

This study was based on the results of a single institution. While conducting the survey, personality type was neglected.

The cause of anxiety and mental status of students was not probed during this survey.

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## List of Abbreviations

GAD-7 scale: Generalized Anxiety Disorder Assessment Scale 7  
 HPA Hypothalamus-pituitary axis  
 SPSS Statistical Package for the Social Sciences

## Conflict of interest

None to declare.

## Grant support and financial disclosure

None to disclose.

## Ethical approval

The study was approved by the Institutional Ethical Review Board of KMSMC, Sialkot, Pakistan, vide Letter No. 23/REC/KMSMC, dated 07-04-2021.

## Authors' contributions

**YS:** Conception and design of the study, acquisition and interpretation of the data, and drafting of the manuscript.

**AA, SA, and ZM:** Data collection, questionnaire design, and drafting of the manuscript.

**SZ:** Critically revised the manuscript with intellectual input.

**ALL AUTHORS:** Approval of the final version of the manuscript to be published.

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