



Association Of Kolb's Learning Styles With Depressive Symptoms Among Students Of Two Colleges Of Medicine In Baghdad: 2024

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ABSTRACT

Background: Majority of mental problems started in young people, in addition to the superimposed stress of education during college period. Personal preferences of student like learning style can make them more liable to negative stress sequelae as it affects coping mechanism to stress. So focusing should be directed towards studying relationships among learning styles, stress, and mental health. Objective was to find prevalence of Kolb learning styles, depressive symptoms, and their associations, among students of Baghdad, and Al-Kindy medical colleges.

Method: A cross section study was conducted on 371 medical students in 1st and 4th grades, in medical colleges of Baghdad and Al-Kindy. Data collection period was from 15/1/2024 to 25/2/2024. Valid and reliable dependent tools were used, Kolb learning style inventory, and patient health questionnaire-9 for depression symptoms. Sample stratification was applied according to: college, grade, and gender strata to get rid of confounder in design phase. Chi square used for analysis. A further post-hoc, standardized residual was applied in analysis phase to test the strength of association. To eliminate confounders in analysis phase, a Cochran-Mantel-Haenszel Method was used.

Result: Mild and moderate depression symptoms registered 63%, while moderate-severe degree 19%. Most prevalent learning style was assimilating 34.5%. Least reported learning style, accommodators 15.9%, recorded significant association with severe degree of depressive symptoms, p value 0.033. Younger age group, and first grade had a significance with severe degree of depression symptoms, p value 0.023, and 0.015 in order. Female group significance was with moderate-severe degree of depression symptoms, p value 0.029.

Conclusion: Over half of students at both colleges experienced mild and moderate degrees of depression symptoms. First rank learning style was the assimilation. Accommodators, younger age, and first grade recorded significance association with severe degree of depression symptoms, while being female reported this association with moderate- severe degree.

Keywords: Depressive symptoms, Iraq College of medicine, Kolb Learning styles

Introduction

A mental disorder is a challenging disability. Students' college years, particularly those spent in medical school, are crucial because they present a range of problems that might lead to mental health issues. Students with mental disorder may exhibit symptoms such as increased anxiety, trouble in focusing, remembering things, mood swings, dissatisfaction, and suicidal thoughts. These problems impede students' ability to meet their

academic goals. Therefore, substantial disruptions in thought, feeling, and functioning behavior are caused by mental breakdown.¹ Latter three domains are the ground for learning style. This style is an individual's characteristic method of gaining knowledge, skills, and attitudes through study or experiences. ² Moreover, learning is an enjoyable experience. ³ Enjoyment is the very specific arena affected in depression. The two cardinal symptoms of depression including depressed mood or loss of interest or pleasure, are governing the realm of enjoyment in learning. ⁴ To be enjoyed, one should be interested in the learning content including emotional engagement according to the self-regulation theory. So, in United States of America (USA) and Canada, students' engagement in learning has become a key indicator of the quality of courses in higher education. ⁵ On the global level, World Health Organization (WHO) reported depression as one of the leading causes of disability worldwide and is contribute significantly to the overall global burden of disease by 2030. On the undergraduates' level, depression is a top mental health concern. In college students, academic stress may play a crucial role in the development of depression or its symptoms due to e.g. exams or assignments, educational environments, being evaluated, and a variety of academic-related topics. ⁶ Based on a meta-analysis, in 2022, the prevalence of depression symptoms among Chinese college students stands at 24.71% and is increasing. ⁷ According to a systematic review and meta-analysis published in the Journal of the American Medical Association (JAMA), 2016, 27.2% of medical students around the world reported depression or depressive symptoms, and 11.1% experienced suicidal ideation during medical school. Results vary by variables like undergraduate year, gender, and grades. ⁸ On the other hand, studying medicine requires a variety of modes of learning styles and study habits may also predict a medical student's satisfaction or stress. In previous reports, 56.0% to 86.8% of medical students chose multiple modes of learning. ² The experiential Kolb's learning style (KLS) is perhaps the most scholarly influential model that has been used to find associations with medical specialty preferences, residency training programs, and fulfillment on United States Medical Licensing Examinations (USMLE). ⁹ The relationships among learning styles, and mental health require further analysis. Insights about how students learn can result in improved understanding and detection of learners who are at risk of stress-related health problems in medical school. ¹⁰ To our knowledge, no evidence exists regarding association of Kolb learning styles, with depressive symptoms among medical students in Baghdad.

Method

- Setting and study design:

. Place of study was carried out in Baghdad, the capital of Iraq. Baghdad has six governmental colleges of medicine. This study is concerned with two major colleges of medicines in Baghdad University, namely, Baghdad College of medicine, and Al-Kindy College of medicines. ¹¹

. **Time frame:** The collection of data period was 6 weeks from 15/1/2024 to 25/2/2024. Analysis of data period was one week. Writing research period was two weeks.

. Study Design was a cross section design with analytic element.

- **Ethical consideration:** The Central ethical committee at the Arab Board of Health Specialization approval was obtained. The official agreement of Baghdad and Al-Kindy colleges of medicine to conduct the study was secured. The aims of the study were explained to all participants. We stressed that the participation is voluntary without any consequences, data sheet was anonymous, confidential, and would not be used except for research purpose.

- Eligibility Criteria:

Inclusion Criteria: All students at first and fourth stages in Baghdad and Al-Kindy colleges of medicine were eligible.

Exclusion Criteria:

- Students enrolled outside country and then accepted to move to Iraq were excluded.
- Students with psychiatric disorder; diagnosed exclusively by Psychiatric specialist.

- **Study population:** were students at first and fourth stages in Baghdad and Al-Kindy colleges of medicine. This included: for Baghdad college 1,778 (941 first, 837 fourth grades), and for Al- Kindy College 737 (326 for first, and 411 for fourth grades). Further details regarding number of male and female for each grade was acquired. Grand total (N) was 2515 students. ¹²

- **Study sample size¹³ and sampling methods:** Sample Size at 95% confidence interval, 5% margin of error, a desired precision is 5%, and a probability assumed to be 50% (unknown prevalence) was measured by the equation:

$$\text{Sample size} = Z^2 \times (p) \times (1-p) / d^2$$

Where: Z = Z value (1.96 for 95% confidence level), p = percentage picking a choice, d = margin of error (set at 5%). So, the minimum sample size required is: $n_0 = 1.96^2 \times (0.50) \times (1-0.50) / (0.05)^2 = 385$

Two adjustments for sample size should be done:

- Finite Population Correction (FPC) as our sample was with no replacement (hyper-geometric probability) = $n_0.N / n_0 + (N-1) = 334$
- Non-Response bias Adjustment = $1 - (\text{Non-response rate anticipated}) = 1 - 10\% = 0.9$.

So, **the final sample size** = the effective sample size / 0.9 = **371**.

- **Sampling** carried out by a stratification. Stratification is a method of sampling that eliminates confounders in the design phase. First, the stratification of the two colleges by grades, which considered as first stratum. First and fourth grades in each college were chosen. Second stratum considered the type of gender. Simple probability sampling technique with no replacement was used to choose the participants within each stratum. Layer and sub layer sample size¹⁴ = (size of entire sample/population size) × layer size, diagram 1 of layers stratification below.

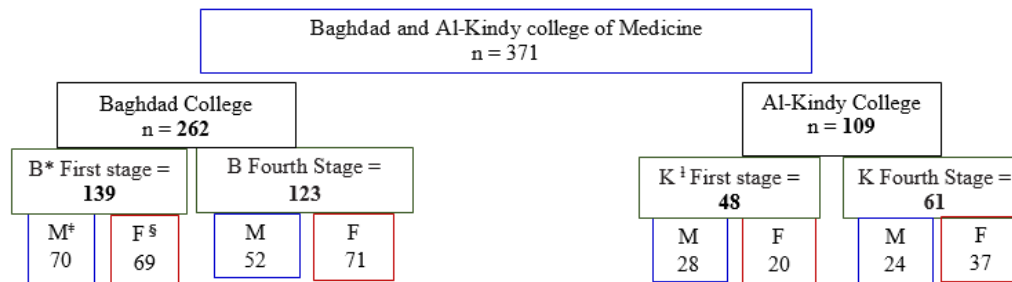


Diagram 1 Stratification of sample according to districts and gender B* Baghdad college of medicine, K † Al-Kindy college, M[♂] Male, F[♀] Female

- Variables:

A. Dependent Variables:

Symptoms of depression were obtained from the Diagnostic Statistical Manual-Version Five (DSM-V) criterion-A that is concerned with symptoms of depression: depressed mood, markedly diminished interest or pleasure, decrease or increase in appetite, insomnia or hypersomnia, psychomotor agitation or retardation, fatigue or loss of energy, feelings of worthlessness or excessive or inappropriate, diminished ability to think or concentrate, recurrent thoughts of death (not just fear of dying), or suicide attempt. ⁴

B. Independent Variables:

- Socio-demographic characteristics: age, gender, college, and grade.
- Kolb Learning Styles (KLS): Four distinct learning styles are Converging, Diverging, Assimilator, and Accommodator:

a. Diverging (Div): When allowed to observe and collect a wide range of information from different perspectives

b. Assimilator (Ass): When presented with sound logical theories

c. Converging (Con): When provided with practical applications of concepts and theories, and apply them to specific problem

d. Accommodator (Acc): When enjoy 'hands on' experience, and flourish in new challenging situations. ¹⁵

- Research Tool:

The questionnaire composed from three parts: first part is the demographic section, second part is the Kolb learning style inventory (KLSI), Arabic Version by Ertahi, Bilal Ahmed, 1993 ¹⁶, and third part is the Patient Health Questionnaire-9 (PHQ-9) which is the depression symptoms exploring tool, Arabic Version (by AlHadi and Al-Sharif et al). ¹⁷

SCORING of Kolb learning style inventory¹⁶: After summation of specific question responses from each column in questionnaire, subtracted following:

Column 1 – Column 3 = a value represented on y axis in diagram 1

Column 2 – Column 4 = a value represented on x axis in diagram 1

Then we draw a rectangle between the values, the rectangle placed in an area of specific learning style (diagram 2).

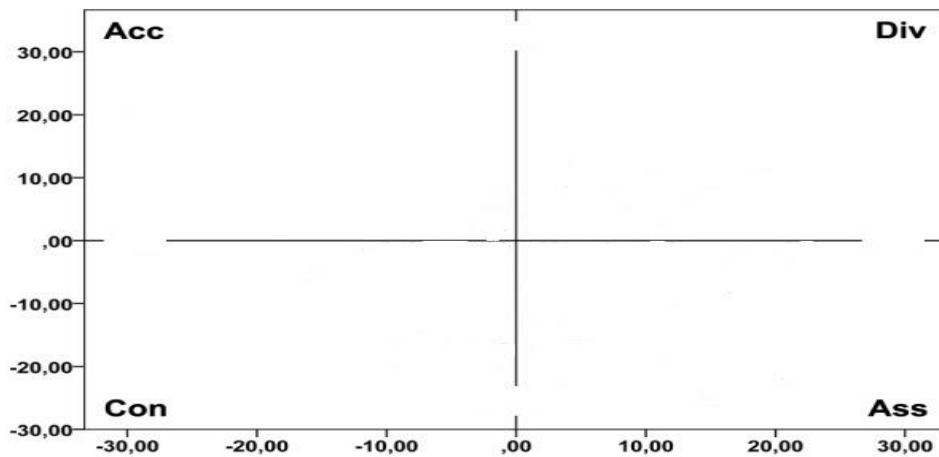


Diagram 2: Scoring and Specifying Kolb learning style

Scoring of PHQ-9: Adding together column scores to get a TOTAL score. Then the original questionnaire provided us with an interpretation to this total score: (1-4) is Minimal, (5-9) is mild, (10-14) is moderate, (15-19) is moderate-severe, and (20-27) is severe degree of depression symptoms. ¹⁷

- **Data Collection:** was done by a self-administered questionnaire by researcher. First mission in data collection was explaining the aim of research and ethical issues to the participants. Verbal consent obtained. Period of answering the tests was 7-15 minutes.

- **Statistical analysis:** We used Statistical Package for Social Sciences (SPSS) version 26 software for data entry and statistical analysis. Statistical analysis was accomplished by using chi-square to test the statistical significance. The P-value considered significant at ≤ 0.05 , and ≤ 0.001 was highly significant. A post hoc analysis was also done, which is a statistical analysis that specified after the data were obtained to measure the strength of association. A post hoc chosen was the standard residuals (SR) for each cells in results. Specific cells that have a standard residual larger than 1.96 viewed as significant (for alpha = 0.05). To eliminate confounders in the analysis phase, the study utilized a Cochran-Mantel-Haenszel method that fit a sample with no replacement (hyper-geometric probability) as it applied in this study. ¹⁸

- **Conflict of Interest:** No conflict of interest, and no funding.

Result:

Response rate was 92.99% (345 participants from 371 sample size). Response rate within each strata was > 90%. Sample demographic distribution illustrated in figure 1.

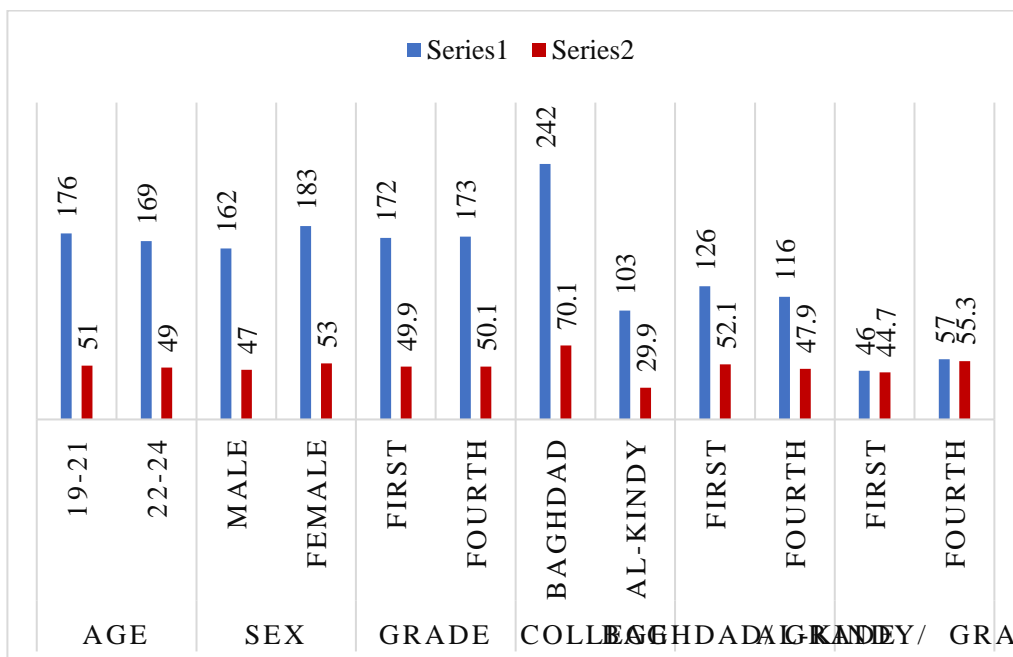


Figure 1 Sample demographic distribution (series 1 numbers, Series 2 percentages)

Maximum percentage scored for depression symptoms was mild degree 35%, followed by moderate degree 28%, and both compose 63%, and severe degree 8% figure 2.

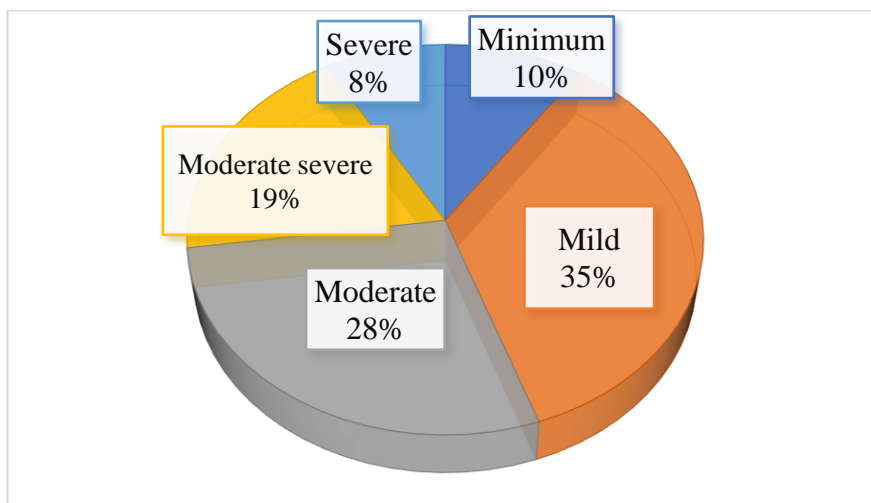


Figure 2 Distribution of depression symptoms according to their severity among participant students

Valid responses for learning styles were 334 from 345 total responses, represented 96.81%. A predominated learning style was the assimilators by 34.5%, followed by converging style 29.9%, diverging 16.5%, and accommodators by 15.9%, respectively, figure 3.

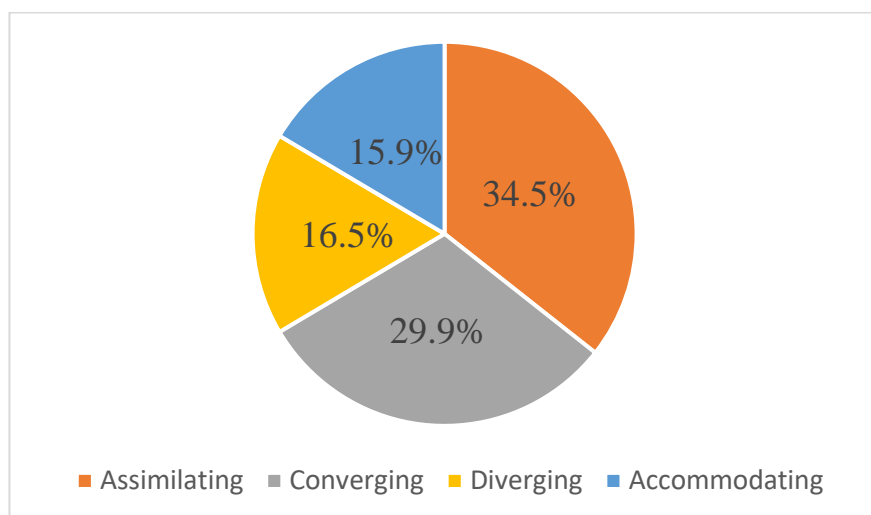


Figure 3 distribution of learning styles among study students (total valid responses 334/345= 96.81%, missing 11 responses)

- Learning styles association with depression symptoms degree and dealing with confounder: Significant association disclosed between Accommodating LS students and severe degree of depression symptoms, p value was 0.033, and a *post hoc* **standard residuals** (SR) was 3.5, table1.

Table 1 significant association between learning style and depression symptom degree with **Standardized Residual**

Variable	Depression symptom degree										P value
	Minimum		Mild		Moderate		Moderate Severe		Severe		
	No	%	No	%	No	%	No	%	No	%	
Diverging LS*	4	7	22	38.6	19	33.3	11	19.3	1	1.8	0.033
	SR†	-.8		.5		.8		.2		-1.7	
Assimilating LS	11	9.2	37	31.1	38	31.9	24	20.2	9	7.6	
	SR	-.3		-1.4		1.0		.7		.2	
Converging LS	10	9.7	44	42.7	30	29.1	15	14.6	4	3.9	
	SR	-.1		1.7		.1		-1.2		-1.6	
Accommodating LS	8	14.5	17	30.9	9	16.4	11	20	10	18.2	
	SR	1.3		-.8		-2.2		.4		3.5	

*Learning Style, † Standardized Residual

To overcome confounder in the analysis phase, Cochran-Mantel-Haenszel (CMH) Method or three way cross analysis was adopted. CMH test is effective in dealing with a hyper-geometric probability as in this study. When dealing with confounder, a proper categorization principle was performed, which is a statistical process that decreases the number of categories of variables to maintain validity of results. So, depression symptoms degrees categorized into two categories (mild, and moderate to severe degrees).

Results revealed that students with accommodating learning style in age group (19-21) years old, first grade, and Baghdad College of medicine, were more prone to develop 'moderate to severe' degree of depression symptoms, p value 0.042, 0.002, and 0.002 in order; table 2.

Table 2 Significant association of accommodating learning styles according to colleges, age groups, and grade in association with depression symptoms degree

Variable			Depression symptom degree				P value
			Mild		Moderate to severe		
			NO.	%	NO.	%	
Accommodating LS*	College ¹	Baghdad	17	38.6	27	61.4	0.042
		Al-Kindy	8	72.7	3	27.3	
	Age group	19-21	8	26.7	22	73.3	0.002
		22-24	17	68.0	8	32.0	
	Grade	First	8	26.7	22	73.3	0.002
		Fourth	17	68.0	8	32.0	
	Gender	Male	12	54.5	10	45.5	0.269
		Female	13	39.4	20	60.6	

*Learning Style

¹College of medicine

- College association with depression symptom degree:

There was no significant association between colleges per se with depression symptom degree, p value 0.133, table 3:

Table 3 Association of college variable with depression symptom degrees

College	Depression symptom degree										P value
	Minimum		Mild		Moderate		Moderate Severe		Severe		
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%	
Baghdad	18	7.4%	83	34.3%	68	28.1%	52	21.5%	21	8.7%	0.133
Al-Kindy	15	14.6%	38	36.9%	29	28.2%	13	12.6%	8	7.8%	

- Demographic criteria association with depression symptoms degree and dealing with confounder

Significant associations were reported between (19-21) age group, and first grade level, with severe degree of depression symptoms, p values were 0.023, 0.015, and SR 2.4, 2.5 in order. Lastly, female group registered a significant association with a moderate-severe degree of depression symptoms, p value 0.029, SR 2.4, table 4.

Table 4 the significant association results between age, grade, and gender with depression symptom degree

Variable		Depression symptom degree										P value
		Minimum		Mild		Moderate		Moderate Severe		Severe		
		No.	%	No.	%	No.	%	No.	%	No.	%	
Age	19-21	18	10.2	50	28.4	55	31.3	32	18.2	21	11.9	0.023
	SR*	.4		-2.6		1.3		-3		2.4		
	22-24	15	8.9	71	42.0	42	24.9	33	19.5	8	4.7	
	SR	-.4		2.6		-1.3		.3		-2.4		
Grade	First	17	9.9	49	28.5	55	32.0	30	17.4	21	12.2	0.015
	SR	.2		-2.6		1.6		-.7		2.5		
	Fourth	16	9.2	72	41.6	42	24.3	35	20.2	8	4.6	
	SR	-.2		2.6		-1.6		.7		-2.5		
Gender	Male	18	11.1	57	35.2	55	34	22	13.6	10	6.2	0.029
	SR	.9		.0		2.3		-2.4		-1.4		
	Female	15	8.2	64	35.0	42	23	43	23.5	19	10.4	
	SR	-.9		.0		-2.3		2.4		1.4		

*Standardized Residual

Again, to control confounder in the analysis phase, CMH test was carried out considering age, gender, and grade variables as input to the outcome variable (depression symptoms degrees), and college variable as controlling for confounder. No significant associations were found i.e. these input variables were independent in regard to the outcome variable even with different college effect, table 5.

Table 5 Statistical stratification of variables (age, gender, and grade) according to colleges, with depression symptoms degrees

Variable		Depression symptom degree								P value	
		Mild				P value	Moderate-Severe				
		College					College				
		Baghdad		Al-Kindy		Baghdad		Al-Kindy			
No.	%	No.	%	No.	%	No.	%				
Age	19-21	46	67.6	22	32.4	0.632	84	77.8	24	22.2	0.156
	22-24	55	64.0	31	36.0		57	68.7	26	31.3	
Gender	Male	49	65.3	26	34.7	0.949	65	74.7	22	25.3	0.798
	Female	52	65.8	27	34.2		76	73.1	28	26.9	
Grade	First	44	66.7	22	33.3	0.807	82	77.4	24	22.6	0.214
	Fourth	57	64.8	31	35.2		59	69.4	26	30.6	

Discussion:

Mental health is fundamental for learning. Depression and its symptoms are a global trend especially among students.¹⁹

1. Mild and moderate degrees of depressive symptoms reported highest in frequencies:

Mild and moderate degrees of depression symptoms were ubiquitous among students, and this figure can be explained by two reasons, general and specific. General issue is that the depressive symptom is a common mental health problem that affects general population. It has a worldwide prevalence of 17.3% when using self-reporting instruments assessment.²⁰ Depression symptoms can happen to anyone but it more favors people under stress, and adult (>19 years old).²¹ Specific factors might be attributed to college stress especially in medicine domain, and unrealistic academic expectation, that create an additional stress on students. Stress can create a strong sense of rejection and can lead to deep disappointment that predispose to many depressive symptoms.²² Moreover, studies pointed that medical students report higher levels of psychological distress than their same-age. This suggests that medical education itself contributes to student distress.²³

A study was undertaken in Saudi Arabia to inspect prevalence of depression symptoms degree among students of medical colleges in 2018. The prevalence of mild–moderate depression was 55.9%, and 11.2% for severe category.²⁴

2. Accommodating LS registered a significant association with severe degree of depression symptoms (especially in younger age group, first grade, and in Baghdad College of medicine):

Medical teaching do not permit for trial in dealing with patients unless after excessive instructions and rigorous rules to minimize any error. Accommodators are frustrated if *forced to read lots of instructions and rules*. They enjoy to take risks and often solve problems through ‘trial and error’.¹⁵ This discrepancy between “minimizing errors depending on lectures and instructions”, and “on hand preference learning style of accommodators”, made a negative impact on students' satisfaction and generating stress, that making them more liable for depression symptoms.²⁵

In Psychology, older adults are more able to regulate emotions and to preserve higher coping strategies to confront poor outcome of stress like depression symptoms.²⁶ In addition younger adult possess less experience to cope with different life events particularly in first stage of college when facing new life change.

Despite that Baghdad College of medicine has been adopted an integrated curriculum,¹¹ lectures and teachers still the main sources of information in many occasions. The ratio of students to teachers in Baghdad College is 19.62 students per teacher (4532 student/231 teacher)²⁷, which is more than the documented ratio in Al-Kindy college of medicine; 16.16 student per teacher (1713/106).²⁸ This ratio make large group learning and lectures more realistic methods in Baghdad College, that is not fit the accommodators.²⁹ From other stand point, a more ratio of students per teacher a more pressure on teachers, infrastructure, resources, and affect times spent per student.

This study result is similar to the study that was conducted among 140 first-year medical students of Chiang Mai University, Thailand in 2014. The study associated LS with interpersonal difficulties and satisfaction that were affected by college details.² Interpersonal difficulties related to more sadness, loss of interest, and less self-esteem which are parts of depression symptoms.³⁰

3. Younger age group (19-21) year old, and first grade had a significant association with severe degree of depression symptoms:

College students are faced with multiple stressors like meeting new people, some living on their own for the first time, taking astringent course load, fear of poor grade, new methods of exam and assessment, wrong expectations from the university and course, studying in a non-native language, and guilt from making mistakes. All of these changes happen at one time and are culminating in younger, and initial stage of graduation (first grade) groups causing major stress and more liability to develop depression symptoms like low self-esteem and self-confidence.³¹

Similar results obtained from narrative review on several studies released by MEDLINE until 2018. This review published in 2021. It showed that depression or their symptoms were more among medical students of younger age, lower-class years, living in Middle East, and female groups. ³²

4. Finally, being female was significantly associated with ‘moderate-severe’ degree of depression symptoms

According to WHO, female experience depression at a higher rate than males. ²¹ A complex mix of social, psychological, and biological variables led to depression and its symptoms:

From socio-psychology view, the term "sociotropy" describes those who prioritize "pleasing others to avoid disapproval" in order to establish attachments. They have a strong need for interpersonal interaction. Adding to the all traumatic life events, they suffer from stress of being ‘socially disapproved’. Women are particularly vulnerable to the depressing impacts of interpersonal issues with others in their close social circle. ³³

From psychological perspective, individuals are more susceptible to depression or its symptoms when living through abuse, **unequal power and status, more** domestic obligation, an increased risk of physical abuse, low income, or other unfavorable events. These aforementioned persistent difficulties, prevailed in female. ³⁴

Biologically, depression patients have often been shown to have elevated cortisol levels and chronic difficulties can be associated with increased cortisol. Elevated cortisol -induced by stress- increases serotonin uptake. Serotonin is a brain neurotransmitter that play a primary role in controlling mood. In addition, persons with difficulties tend to have a lowered plasma tryptophan levels (a precursor of serotonin). Under normal condition, once the stress response has been initiated, and cortisol enters the circulation, the hypothalamus and pituitary can be affected by cortisol itself, as it can prevent the release of corticotropin-releasing hormone (CRH) and adrenocorticotrophic hormone (ACTH). This is called a negative feedback loop. Studies showed that female gender hormones sluggish this ‘cortisol-feedback’ on the brain. ³³ Beside, premenstrual problems may raise depression or its symptoms. It's feasible that serotonin and other brain chemicals are affected by cyclical fluctuations in estrogen, progesterone, and other hormones. ³⁵

Similar results to this study outcome was acquired in a cross-sectional study that was done at Al-Kindy College of medicine studying depression symptoms ‘only’, among students of all grades of college, in 2021. They found that the highest percentage of depressive symptoms was seen among students of the first, third, and fourth grades, and being a female. ³⁶

Study Limitations: An inherent characteristic of cross section design of study which is the assessment of the cause-effect at the same time as it is a non-longitudinal type of study design. But at the same time, our study objective was concerned with an association and not with a causal issue.

Conclusion

The prevalent degree of depression symptoms among students in Baghdad and Al-Kindy Colleges of medicine, were mild and moderate degrees; they affect over half of students. Only quarter of students suffered from moderate severe, and severe degrees. The dominant learning styles among students was assimilation. Although accommodating LS ranked last, but it associated significantly with severe degree of depression symptoms especially if accommodators were in younger age group (19-21) old year, first grade, and in Baghdad college of medicine. Younger age group (19-21) old year, and first grade, were associated with severe degree of depression symptoms as well. Being female was related to ‘moderate-severe’ degree of depression symptoms.

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