

Usefulness of the Patient Health Questionnaire-9 for Korean Medical Students

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Abstract

Objective Depression may be highly prevalent among medical students, lowering their functioning and quality of life. Using appropriate extant depression scales to screen for depression and determining factors associated with depression can be helpful in managing it. This study examines the validity and reliability of the Patient Health Questionnaire-9 (PHQ-9) for medical students and the relationship between their scores and sociodemographic variables.

Methods This study surveyed 174 medical students using demographic questionnaires, the PHQ-9, the Beck Depression Inventory (BDI), the Patient Health Questionnaire-15 (PHQ-15), the Beck Anxiety Inventory (BAI), and the Perceived Stress Scale (PSS). It calculated the Cronbach's α for internal consistency and Pearson's correlation coefficients for test-retest reliability and convergent validity of the PHQ-9. In order to examine the relationship between depression and demographic variables, this study performed independent *t* tests, one-way analysis of variance, chi-square, and binary logistic regressions.

Results The PHQ-9 was reliable (Cronbach's $\alpha=0.837$, test-retest reliability, $r=0.650$) and valid ($r=0.509-0.807$) when employed with medical students. Total scores on the PHQ-9 were significantly higher among low-perceived academic achievers than among high-perceived academic achievers ($p<0.01$). Depression was more prevalent in poor-perceived academic achievers than in high-perceived academic achievers. Similarly, poor-perceived academic achievers were at greater risk of depression than were high-perceived academic achievers (odds ratio [95 % confidence interval] 3.686 [1.092–12.439], $p<0.05$).

Conclusions The PHQ-9 has satisfactory reliability and validity in medical students in South Korea. Depression is related to poor-perceived academic achievement when measured with the PHQ-9. Early screening for depression with the PHQ-9 in medical students and providing prompt management to high scorers may not only be beneficial to students' mental health but also improve their academic performance.

Keywords Medical students · Emotional problems · Psychological tests

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Major depressive disorder is a highly prevalent condition that can be debilitating in many areas of life, such as social, occupational, and interpersonal relationships. Lifetime prevalence of major depressive disorder in South Korea was reported as 6.7 % in 2011, and this rate is steadily increasing [1]. Additionally, the socioeconomic burden of depression is severe: depression is the third leading cause of the world's global burden of disease [2]. When the detection and treatment of depression is delayed, the prevalence and duration of illness also increase, leading to a greater burden and likelihood of experiencing it chronically. Therefore, early detection and treatment through proper screening tests are important, and previous studies support the benefit of these screening tests

[3]. The US Preventive Service Task Force (USPSTF) recommends screening for depression at primary care settings [4]. In clinical settings, studies like the Sequenced Treatment Alternatives to Relieve Depression (STAR*D) [5] had emphasized the importance of measurement-based care in depression, which is commonly accepted these days. Hence, appropriate tools for screening for and evaluating the severity of depression are crucial.

Depression may be more prevalent in medical students than the general population [6], perhaps due to context-specific stressors such as high academic workload, expectations, competition [7, 8], and exposure to death and human suffering [9]. Academic burden appears to be the most severe of these stressors [8, 10]. Medical students who fail an examination show significantly higher levels of psychological distress than the ones who pass one [7]. Conversely, poor academic performance can be a consequence of psychological distress [11].

Academic burden of medical student is severe in South Korea. Medical training used to be an undergraduate model, requiring 6 years to complete. However, some colleges have introduced a graduate-level program (4 years) after 4 years of undergraduate study. A typical education schedule of an undergraduate model is described below. The first and second years are a premedical course, with the first year consisting of liberal arts and basic sciences. Most of the subjects are elective and if a student fails a subject, he or she can retake that class. The second-year curriculum consists mostly of essential subjects, such as biochemistry, cell biology, genetics, and physiology. Examinations for these are scheduled only annually for medical students. If a student fails an essential subject, they cannot retake that course until the next year. This situation results in a profound fear of failure among second-year students. Further, when they enter the medical course, portion of the program, the academic burden, and fear of failure increase, especially in their third and fourth years. During this period, all classes are essential and predetermined, consisting of subjects such as anatomy, pharmacology, internal medicine, general surgery, pediatrics, psychiatry, obstetrics, and gynecology. Almost all medical schools in South Korea have adopted an entire-year repetition system for this period; unlike other majors, if medical students fail even one subject, they are unable to advance to the next year and must start the year over again. In the fifth and sixth years, students participate in clinical training at a hospital as student doctors and are free from written tests and thus free from fear of failure. The majority of hospitals take a student's grades in the medical courses into account when they consider a student's application for an internship or residency, and this puts a greater grade-related burden on the students. Although medical students exhibit higher rates of psychological distress than the general population does, they, like doctors, tend to have negative views about depression. Indeed,

students may fear the stigma of mental illness more than the general population does, resulting in underdiagnoses and delayed treatment [12].

In the context of medical education, the use of appropriate scales for screening and measuring the severity of depression would be beneficial for early detection and management, thereby preventing functional impairment. The rating scales for depression are divided into two groups: clinician-rated and self-report. Clinician-rated scales are regarded as being highly accurate and objective, but they require a structured interview by a well-trained clinician and take a relatively long period of time to complete (approximately 15–30 min) [13]. In other words, for screening purposes in the general population or in primary care settings, clinician-rated scales may be inappropriate because of the need for well-trained clinicians and their time-consuming nature. Among self-report scales, the Patient Health Questionnaire-9 (PHQ-9) is relatively short, consisting of nine questions that require less than 1 min each to answer [13]. Furthermore, it is easy to answer objectively, as answers are based on frequency and not severity. The questions are based on the diagnostic criteria of the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and may aid in establishing a DSM-IV-based diagnosis of major depressive disorder [14]. Previous studies revealed that the PHQ-9 reflects the severity of depression fairly well, with individuals with a higher score showing decreased functional status and increased symptom-related difficulties, sick days, and health care utilization [14]. Although self-report scales tend to be subjective and can be confounded by respondents' characteristics, the PHQ-9 has been shown to have good sensitivity and specificity in screening for depression when compared with diagnoses by trained interviewers. A meta-analysis concluded that the PHQ-9, using either a score of 10 as a cutoff value or the "diagnostic algorithm" method, has relatively good diagnostic properties and good pooled sensitivity (0.80: 95 % confidence interval [CI]=0.71–0.87) and specificity (0.92: 95 % CI=0.88–0.95) [15]. The PHQ-9 has been translated into multiple languages and appears to be useful in screening for and monitoring treatment of major depressive disorder, with good validity and reliability [16–18]. However, most previous studies were conducted in primary care settings or targeted patients in departments outside of psychiatry [15, 17, 19]. In South Korea, the reliability and validity of the PHQ-9 was examined in the general population, but the sample of that study was limited to elderly adults [16]. Thus, it is necessary to evaluate the psychometric properties of the PHQ-9 in the general population of South Korea, including young adults, before the scale can be applied to medical students or other young-adult groups.

The present study examines the validity and reliability of the PHQ-9 in medical students and explores the association between depression and sociodemographic factors. Identification of specific factors associated with depression in medical

students will inform the development of depression management strategies in that population.

Methods

Subjects

Second-, third-, and fifth-year students from a medical college in Seoul were asked to answer demographic questions on sex, age, school year, type of housemate, and perceived academic achievement, as well as the PHQ-9, Beck Depression Inventory (BDI), PHQ-15, Beck Anxiety Inventory (BAI), and Perceived Stress Scale (PSS). The second, third, and fifth years represent the premedical, medical, and student doctor stages of medical school education, respectively. Although 205 students submitted the questionnaires, only 174 were valid (i.e., contained no missing answers). All subjects who responded were asked to complete distress measures again 2 weeks later. One hundred and thirty-one students answered the second-round questionnaires, used to assess test-retest reliability. This study used a cross-sectional design, and the research protocol was approved by the Institutional Review Board. All subjects gave written consent to participate once the nature of the study and its procedures had been explained.

Measures

Patient Health Questionnaire-9

The PHQ-9 is a self-report scale measuring depression developed by Spitzer et al. [14]. Respondents rate nine items, which are based on DSM-IV criteria, on 3-point Likert scales with regard to how they have felt over the past 2 weeks. Total scores range from 0 to 27, with higher scores indicating more severe depressive symptoms. This study employed the Korean version of the PHQ-9, which was translated by Han et al. [16], who also confirmed its reliability and validity. This study calculated the distribution of PHQ-9 scores with 0–4 being normal, 5–9 being mild, 10–14 being moderate, 15–19 being moderate to severe, and 20–27 being severe depression [14]. This study used 10 as a cutoff score for screening for depression [14, 20].

Beck Depression Inventory

The BDI is a widely used self-report scale for screening for depression and assessing its severity in the general population [21]. It consists of 21 items assessing cognitive, emotional, motivational, physiological, and other symptoms. Each item is rated on a 4-point Likert scale (0–3), resulting in total scores ranging from 0 to 63. Higher scores indicate more severe depressive symptoms. This study used the Korean version of

BDI, which was translated by Lee et al. [22], who also confirmed its reliability and validity.

Beck Anxiety Inventory

The BAI is a widely used self-report scale for assessing anxiety. The questionnaire consists of 21 items reflecting how participants felt over the past week. Each item is scored from 0 to 3, with total scores ranging from 0 to 63. Higher scores indicate higher anxiety symptoms [23]. This study used the Korean version of the BAI, which was translated by Kwon [24].

Patient Health Questionnaire-15

The PHQ-15 is a self-report scale developed by Korenke et al. to assess presence and severity of somatic symptoms. It contains more than 90 % of all physical complaints reported by outpatients [25]. Participants report how much they have suffered from the listed somatic symptoms during the last 4 weeks. Each item is rated from 0 to 2, with total scores ranging from 0 to 30. This study employed the Korean version of the PHQ-15, which was translated by Han et al. [26], who also confirmed its reliability and validity.

Perceived Stress Scale

The PSS is a self-report scale developed to assess subjective perception of stress. The initial PSS had 14 items, but was revised into 4- and 10-item versions [27, 28]. This study used the Korean version of the 10-item version [29]. The scale consists of six items on positive cognitions and four items on negative cognitions. Participants respond to each item on 5-point Likert scales (0–4), with total scores ranging from 0 to 40. Higher scores indicate greater perceived stress.

Data Analysis

SPSS for Windows, version 12.0 (SPSS Inc., Chicago, IL, USA) was used for all analyses. This study first calculated the means and standard deviations for the distress measures, for both individual items and overall scores. To assess the internal consistency and test-retest reliability of the PHQ-9, this study calculated Cronbach's α and Pearson's correlation coefficients between the first and second scores. To examine convergent validity, this study calculated Pearson's correlation coefficients between the distress measure scores. In order to assess the relationship between demographic characteristics and scale scores, independent *t* tests were performed for sex, and one-way analyses of variance (ANOVAs) were performed for other variables, such as age, school year, type of housemate, and perceived academic achievement. This study performed a chi-square test to assess the relationship between demographic variables and prevalence of depression. To control for

confounds and to identify risk factors of depression, this study performed a binary logistic regression that included sex, age, school year, type of housemate, and academic achievement as covariates.

Results

Participant Characteristics

A total of 174 subjects completed the survey (age range 19–35 years, mean age 23.29 ± 2.75). Among the subjects, 96 (55.2 %) were male, more than half were in their fifth year of medical schooling (89; 55.1 %), 26 (14.9 %) were in their second year, and 59 (33.9 %) were in their third year. Ninety-six (55.2 %) were living alone, 68 (39.1 %) were living with family, and 10 (5.7 %) were living with friends. Regarding academic performance, 47 (27 %) perceived their performance as good, 80 (46 %) as fair, and 47 (27 %) as poor. Demographic characteristics and their relationships with PHQ-9 scores are shown in Table 1.

Reliability and Validity of the PHQ-9 in Medical Students

The Cronbach's α of the PHQ-9 was 0.837, indicating good internal consistency. No single item largely altered the Cronbach's α upon deletion (see Table 2). The test-retest

reliability coefficient was 0.650 ($p < 0.01$). The BDI score was most closely correlated with the total score of the PHQ-9 ($r = 0.721$, $p < 0.001$), followed by the BAI ($r = 0.712$, $p < 0.001$), PSS ($r = 0.660$, $p < 0.001$), and PHQ-15 scores ($r = 0.604$, $p < 0.001$). All of the distress scales significantly correlated with the PHQ-9.

Correlations Between Sociodemographic Factors and PHQ-9 Score

The distribution of PHQ-9 scores is shown in Table 3. The mean PHQ-9 score was 5.80 ± 4.59 ; 13.7 % of participants scored above 10 on this scale. Total scores on the PHQ-9 did not significantly differ with respect to sex, age, school year, and type of housemate. Mean PHQ-9 scores were slightly higher in females (female 5.85 ± 3.65 vs. male 5.76 ± 5.25) and tended to be lower in later years of medical education, but these results were not statistically significant. Perceived academic achievement correlated significantly with the mean score of the PHQ-9 ($p = 0.007$). The prevalence of depression was significantly higher ($p = 0.023$) in poor-perceived academic achievers (25.5 %) than in high- (8.5 %) and fair-perceived academic achievers (10.0 %). Depression prevalence did not significantly differ with respect to sex ($p = 0.437$), age ($p = 0.277$), school year ($p = 0.968$), and type of housemate ($p = 0.294$). The odds of having depression were 3.686 times higher (95 % CI = 1.092–12.439, $p = 0.036$) in poor-perceived academic achievers than in high-perceived academic achievers. Perceived academic achievement was the only factor that significantly related to the odds of having depression.

This study also tested whether sociodemographic variables influenced the distributions of the BDI, BAI, PHQ-15, and PSS. Mean scores on PHQ-15 were significantly higher among females than among males (7.05 ± 4.59 vs. 4.70 ± 4.88 , respectively; $p = 0.001$). The mean scores of the PSS differed significantly between school years, with the highest scores in third-year students (20.76 ± 5.45) and the lowest scores in fifth-year students (18.33 ± 5.97 , $p = 0.038$). None of the scales significantly differed with respect to age or type of housemate. The mean scores on all distress scales—BDI (good 5.32 ± 5.09 , fair 7.49 ± 6.46 , poor 11.13 ± 9.19 , $p < 0.001$), BAI (good 5.81 ± 5.73 , fair 7.04 ± 7.22 , poor 11.15 ± 12.36 , $p = 0.007$), PHQ-15 (good 4.21 ± 3.97 , fair 5.65 ± 4.53 , poor 7.47 ± 5.75 , $p = 0.005$), and PSS (good 16.02 ± 4.59 , fair 19.85 ± 5.90 , poor 22.19 ± 5.88 , $p < 0.001$)—significantly differed by perceived academic achievement, with distress scores increasing as academic achievement decreased.

Table 1 Sociodemographic variables and the score distributions of the PHQ-9

Variables		Frequency (%) (N=174)	PHQ-9	
			Mean (SD)	<i>p</i> *
Sex	Male	96 (55.2)	5.76 (5.249)	0.903
	Female	78 (44.8)	5.85 (3.654)	
Age	≤24	116 (66.6)	6.15 (4.942)	0.208
	25–29	55 (31.5)	5.25 (3.777)	
	≥30	3 (1.8)	2.33 (0.577)	
School year	Second year	26 (14.9)	6.81 (6.203)	0.324
	Third year	59 (33.9)	6.03 (4.000)	
	Fifth year	89 (51.1)	5.35 (4.406)	
Type of housemate	None	96 (55.2)	5.87 (4.793)	0.969
	Family	68 (39.1)	5.69 (4.460)	
	Friends	10 (5.7)	5.80 (3.795)	
Academic achievement	Good	47 (27)	4.38 (4.23) ^a	<0.001
	Fair	80 (46)	5.73 (3.87) ^{ab}	
	Poor	47 (27)	7.34 (5.59) ^b	

Tukey's HSD multiple comparison test was performed when $p < 0.05$, and the same letters indicate a non-significant difference between groups.

PHQ-9 Patient Health Questionnaire-9, N total respondents, SD standard deviation

*Independent sample *t* test was performed for sex and one-way ANOVAs for age, school year, type of housemate, and academic achievement

Discussion

Previous studies suggest that medical students suffer from psychological distress more frequently than the general

Table 2 A factor loading matrix of the PHQ-9 scale

Item	Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Squared multiple correlation	Alpha if item deleted
Q1	5.05	17.027	0.591	0.452	0.816
Q2	5.16	16.675	0.624	0.51	0.812
Q3	4.79	16.049	0.525	0.321	0.826
Q4	4.4	16.044	0.553	0.41	0.821
Q5	4.89	15.582	0.613	0.436	0.813
Q6	5.48	17.465	0.592	0.479	0.817
Q7	5.52	17.685	0.515	0.365	0.824
Q8	5.58	18.696	0.4	0.27	0.834
Q9	5.54	17.695	0.592	0.529	0.818

Cronbach's α coefficient=0.837
 PHQ-9 Patient Health Questionnaire-9

population [6]. In this study, the prevalence of depression calculated with the PHQ-9 was 13.7 %. According to the 2011 epidemiological survey of mental disorders among Korean adults, the 1-year prevalence of depression in people between the ages of 18 and 29 was 2.4 % in men, 5.7 % in women, and 4.0 % in total, as assessed using the Composite International Diagnostic Interview (CIDI) [1]. A number of previous studies including a meta-analysis have shown that the PHQ-9 has good sensitivity and specificity with a cutoff score of 10 when compared with a diagnosis confirmed by the CIDI [15, 30, 31], and thereby, depression prevalence may be higher in medical students than in the general population in the same age group. Our study also revealed a higher prevalence of depression than did community-based studies with the PHQ-9 from Brazil (8 %) [32] and Germany (9.2 %) [18]. Depression may be highly prevalent in medical students, thus impairing their function; furthermore, the fear of the stigma of being mentally ill may result in a delay or avoidance of treatment. Screening for depression with available self-report scales such as the PHQ-9 can be helpful in these situations.

This study confirmed the validity and reliability of the PHQ-9 for medical students. The high internal consistency of the PHQ-9 in this study (Cronbach's α =0.837) is consistent with that found in other studies conducted in South Korea with other populations (Cronbach's α 0.81, 0.86) [16, 33] and with another study by Kroenke et al. (Cronbach's α =0.86) [14]. The scores of the BDI, another self-rated depression scale, had the strongest correlations with scores on the PHQ-9, indicating that

the PHQ-9 has satisfactory external validity. Interestingly, scales measuring psychological distress other than depression (the BAI, PSS, and PHQ-15) also showed significant correlations with the PHQ-9. This result supports the findings from previous studies that more than half of all depressed patients have comorbid depression, anxiety, and somatic symptoms [34]. Because functional deterioration seems to be more severe in such groups, it is important to check for and manage symptoms apart from depressive ones [34].

A comprehensive understanding of the relationships between sociodemographic factors and depression helps in managing depression. This study analyzed the association between depression and some important factors among medical students, such as sex, age, school year, type of housemate, and perceived academic achievement. In the case of sex, women showed higher PHQ-9 mean scores than did men, but the difference was non-significant. The PHQ-15 was the only measure to show significantly higher mean scores among female. In the general population, women exhibit a higher lifetime prevalence of depression and anxiety and tend to complain of somatic symptoms more than men do [35]. As in the present study, previous studies have reported a weaker predominance of depression in female medical students than in women in the general population. Many cross-sectional studies found no significant sex differences in depression [8, 36, 37]. Two longitudinal studies on depression also showed heterogeneous results [38, 39]. This lack of female predominance of depression when compared with the general population may be specific to medical students.

This study assessed second-, third-, and fifth-year medical students. The PHQ-9 mean score was high in the second and third years and lowest in the fifth year, though these differences were not statistically significant. The mean score of the PSS showed similar tendencies to that of the PHQ-9 but with statistically significant differences. As described above, second-year students start studying the subjects in their major and may have a fear of failing to advance in these medical courses. Third- and fourth-year students suffer from a heavy academic workload, frequent written tests, and a fear of

Table 3 The distribution of PHQ-9 scores

Severity levels	PHQ-9 score	Frequency (%) (N=174)
Normal	0–4	77 (44.3)
Mild	5–9	73 (42.0)
Moderate	10–14	14 (8.0)
Moderate to severe	15–19	6 (3.4)
Severe	20–27	4 (2.3)

PHQ-9 Patient Health Questionnaire-9, N total number of respondents

failure, as failing would require them to repeat an entire year. In the fifth year, students participate in clinical training at a hospital and are free from written tests and, thus, are mostly free from fear of failure. This specific curriculum for medical schools may affect students' depression, and second-, third-, and fourth-year students should be considered separately from students in the fifth year and above.

Of the sociodemographic factors, only perceived academic achievement was significantly related to the mean PHQ-9 score, and the prevalence of depression was significantly higher in poor-perceived academic achievers than in good or fair achievers. Additionally, poor-perceived academic achievement was the only variable that significantly increased the odds of depression. Furthermore, it was associated with higher mean scores in other scales measuring depression (BDI), anxiety (BAI), somatic symptoms (PHQ-15), and perceived stress (PSS). Han et al. compared depression between students majoring in medicine and those majoring in engineering and found major stressors to be related to academic problems (70.9 %) in the former and employment seeking (68.1 %) in the latter [8]. As mentioned above, these differences may result from the specific characteristics of medical training, such as overwhelming workloads and the entire-year repetition system. Psychological distress could be the cause or the result of the relationship between depression and academic achievement [7, 11]. The present study used subjective academic achievement rather than exact examination results. This may reflect not only the actual grade students received but also their high expectations, perfectionism, or low confidence. Moreover, because this study is cross-sectional and correlational, the causal relationship cannot be directly determined. Further, it could not determine whether poor academic achievement resulted from psychological distress symptoms (e.g., decreased motivation, psychomotor retardation, cognitive problems, or poor attention) or influenced them. Although the direction of the relationship was impossible to ascertain, this study demonstrated that perceived academic achievement and depression were significantly related. This relationship may be bidirectional, building a vicious cycle. Knowing students' perceived academic achievement and understanding its relationship with depression are important in counseling and managing depression. The findings suggest that depression adversely affects the academic achievement of medical students and that screening for depression using the PHQ-9, along with prompt management if symptoms are found, can improve students' academic achievement. Future research should collect data on actual academic grades and could use a longitudinal or quasi-experimental design to confirm this hypothesis.

This study has some limitations. First, it included students from a single college of medicine in South Korea, which cannot represent the entirety of medical students. Second, there is a risk of selection bias because those who did not complete the questionnaire may have had been experiencing greater

psychological distress (e.g., severely ill students unable to attend school). Third, as this study is cross-sectional in nature, the comparison between different school years may be confounded by cohort effects, differences in educational experiences, and possible changes in other variables not considered, such as relationship status or history of mental illness. Fourth, there was no structured interview by a trained clinician. A score of 10 on the PHQ-9 is widely used as a cutoff for depression screening, and the PHQ-9 was found to have good specificity and sensitivity when compared with a clinical interview in previous studies [14, 17, 30–32], including a meta-analysis [15], a study conducted in Korea [40], and a study with medical students [20]. However, some studies suggest a different cutoff score for specific populations [16], so further studies using a structured clinical interview would be beneficial for defining the cutoff value for depression as measured by the PHQ-9 and for confirming the diagnosis and prevalence of depression in this group. Finally, we did not include a control group.

In conclusion, depression may be significantly related to students' perceived academic achievement in Korean medical students because they experience an overwhelming workload and face the possibility of repeating an entire academic year. Appropriate assessment and management of depression might lead to students' adjustment and functional improvements in academic performance. The PHQ-9 showed satisfactory reliability and validity in South Korean medical students and might be useful for assessment and symptom management in this group.

Implications for Academic Leaders

- Policymakers may use this material as support for the necessity of depression screening in medical students, especially in the second, third, and fourth years.
- In terms of public health, the PHQ-9 could be considered a tool for screening for and assessing the severity of depression in medical students.
- Knowing and managing an individual's perceived academic achievement might be important in counseling and managing depression.

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