

Research Submission

Negative Impact of Episodic Migraine on a University Population: Quality of Life, Functional Impairment, and Comorbid Psychiatric Symptoms

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Background.—Migraine is associated with significant negative impact, including reduced quality of life, impaired functioning, and comorbid psychiatric disorders. However, the impact of migraine on university students is understudied, despite their high prevalence of migraine and psychiatric disorders and their frequent use in research studies.

Objectives.—The aim of this cross-sectional study was to evaluate the impact of migraine among college students on quality of life, functional impairment, and comorbid psychiatric symptoms.

Methods.—Three hundred and ninety-one students (76.73% female, mean age = 19.43 ± 2.80 years) completed well-validated measures of migraine and migraine-related disability, quality of life, and comorbid psychiatric symptoms. They also quantified impairment in school attendance and home functioning and reported the number of medical visits during the preceding 3 months.

Results.—One hundred and one (25.83%) met conservative screening criteria for episodic migraine; their mean score on the Migraine Disability Assessment Questionnaire was 9.98 ± 12.10 . Compared to those not screening positive for migraine, the migraine-positive group reported reduced quality of life on 5 of 6 domains, as well as a higher frequency of missed school days (2.74 vs 1.36), impaired functioning at home (2.84 vs 1.21 days), and medical visits (1.86 vs 0.95). They also reported more symptoms of both depression and anxiety than controls, although differences in functional impairment remained after controlling for these comorbid psychiatric symptoms. These differences were highly statistically significant and corroborated by evidence of clinically significant impairment; the corresponding effect sizes were modest but non-trivial.

Conclusions.—Episodic migraine is associated with negative impact in numerous domains among university students. These findings replicate and extend those of studies on other samples and have implications for future research studies with this population.

Key words: episodic migraine, disability, psychiatric comorbidity, quality of life

Abbreviations: BHS Brief Headache Screen, GAD-7 Generalized Anxiety Disorder 7-item Scale, MIDAS Migraine Disability Assessment Questionnaire, PHQ-9 Patient Health Questionnaire Depression Scale, QoL quality of life, SF-20 Medical Outcomes Study 20-item Short-Form General Health Survey

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Migraine affects nearly 12% of the US population yearly¹ and engenders significant negative impact among its sufferers. The burden of migraine includes reduced quality of life (QoL), impaired functioning, and comorbid psychiatric disorders, among others.

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Population-based studies of adults in various countries have shown consistently that migraineurs report lower QoL than do those without migraine and that these reductions extend to physical health, mental health, and social functioning.^{2,3} Although studied less frequently, similar findings have emerged suggesting that QoL is compromised significantly in both children⁴ and adolescent⁵ migraineurs, with one study finding that the impact of migraine on QoL among pediatric migraine sufferers was similar to that of arthritis and cancer.⁶

In addition to reduced QoL, migraine impairs functioning and performance across multiple domains. Von Korff and colleagues analyzed 3 months of daily diary data to estimate that episodic migraineurs lost the equivalent of 3 days of work during this period because of headache (including missed days and days of reduced productivity).⁷ Findings from the large-scale American Prevalence and Prevention (AMPP) study confirmed that a large proportion of the nearly 19,000 episodic migraineurs surveyed reported that their headaches limited their daily activities, with 25.3% reporting missing at least 1 day of work or school during the preceding 3 months.¹ These impairments in work performance translate into high indirect costs for lost productivity as well as high direct costs associated with frequent visits to physicians and emergency departments.⁸ Impairments in functioning also extend to family domains, such that migraineurs report reductions in productivity pertaining to household work¹ and negative impact on family relationships.⁹

Migraine is associated also with increased rates of psychiatric disorders. In particular, existing studies have found that migraineurs are at 2 to 5 times greater risk to suffer from a depressive or anxiety disorder than are individuals without migraine.¹⁰⁻¹² Both longitudinal and cross-sectional data suggest that the temporal relationships between migraine and these affective comorbidities are bidirectional in nature, such that each disorder increases risk for first onset of the other.¹³⁻¹⁵ Identification of comorbid psychiatric symptoms is of importance because psychiatric comorbidities are associated with increased headache-related impairment, including high medical costs and healthcare utilization,¹⁶ further reduced QoL and

increased disability,^{2,12,17} and persistence and progression of headache over time.¹⁸

At present, studies on the negative impact of migraine among adults are limited primarily to population-based samples of adults aged 30-65 or to clinical samples, wherein disease burden is likely most evident. The few epidemiologic studies on adults aged 21-30 have confirmed that migraine places one at risk for subsequent depression, panic disorder, and suicide attempts, as well as job absenteeism and mental health utilization (independent of comorbid psychiatric disorders).¹⁹⁻²¹ However, these studies did not assess the effects of migraine on QoL or academic performance among these individuals. Only 2 studies have examined the impact of episodic migraine among university students specifically. These studies have found that migraine is highly prevalent among university students (22-25%)^{22,23} and is associated with impaired academic performance²³ but have not employed validated measures of headache-related disability/QoL or assessed comorbid psychiatric symptoms. University students are an important population to study in this regard, because the prevalence of migraine increases precipitously during the college years, because students frequently serve as participants in studies on other aspects of headache, and because they have high rates of mood and anxiety disorders. Specifically, data from the National Comorbidity Survey Replication (N = 9282) indicate that the large majority of lifetime psychiatric disorders begin by the end of the college years (nearly 75% by age 24).²⁴ Similarly, other studies have found that the incidence of migraine for women is highest between the ages of 20 to 24,²⁵ further arguing for the importance of attending to the impact of migraine among this age group.

Problematically, most students²⁶ and a large proportion of adults with migraine²⁷ do not seek or receive medical treatment. Less than half of those who do seek treatment receive a proper diagnosis from their primary care physician.²⁸ Some headache researchers have argued cogently that this latter problem stems from difficulty in adopting the revised migraine diagnostic criteria²⁹ within the confines of high-traffic medical practice settings and limitations on physician contact time.³⁰ Evidence supporting this argument indicates that using abbreviated diagnostic

criteria can indeed facilitate diagnostic accuracy among students and headache patients in clinical settings. Specifically, endorsement of nausea, photophobia, and worsening with activity exhibit positive predictive values of 0.83 to 0.94 across school and clinical settings, with sensitivity and specificity of 0.82 and 0.86, respectively.³⁰ The aim of the present study was thus to examine QoL, functional impairment, and comorbid psychiatric symptoms among university students identified as migraineurs using abbreviated diagnostic criteria. We hypothesized that university students screening positive for episodic migraine would report poorer QoL across multiple domains, evidence greater functional impairment at school, and report higher levels of both depression and anxiety than would students who did not screen positive for migraine. Further, we hypothesized that any observed group differences would be independent of comorbid symptoms of depression or anxiety.

METHODS

Participants.—Three hundred and ninety-one undergraduate students completed a variety of measures assessing headache symptoms and headache-related disability, QoL, functional impairment, and comorbid psychiatric symptoms. Three hundred were female (76.73%). The mean age was 19.43 years (2.80), with ages ranging from 18 to 50. Three hundred and seven (78.52%) were white, 64 were African American (16.37%), 11 were Asian (2.81%), 6 were Hispanic (1.53%), and the remaining 3 were of other ethnicities.

Materials.—*ID Migraine*TM.³¹—The ID Migraine is a widely used 3-item screener for identifying migraine. Each item pertains to a central diagnostic symptom of migraine: nausea, photophobia, and interference with activities. Each question is scored dichotomously with endorsements of 2 or more items suggesting probable migraine. The ID Migraine has demonstrated strong reliability and validity, with positive endorsements of 2 or more items having a sensitivity of 81% and specificity of 75% for identifying migraine (positive predictive value = 0.93).³¹ The ID Migraine has been successfully used in previous studies of university students for the purposes of detecting migraine.²²

Brief Headache Screen (BHS).³²—The 7-item BHS is another screening measure for rapid identification of headache types including migraine, tension-type headache, and medication overuse headache. Question 1, which pertains to the frequency of severe headaches and is relevant for the present study, has a 93% sensitivity for identifying episodic migraine (94% positive predictive value).³² The BHS also has demonstrated high levels of agreement with the ID Migraine in the identification of migraine.³³

Migraine Disability Assessment Questionnaire (MIDAS).³⁴—The MIDAS is frequently used to assess migraine-related disability. Responses to 5 questions assess the number of days during the previous 3 months in which headaches have impaired one's ability to function at school/work, to perform household work, and to participate in leisure activities. Multiple studies have confirmed that the MIDAS has strong internal consistency reliability ($\alpha = 0.83$), strong test-retest reliability (Spearman's $\rho = 0.84$, Pearson's $r = 0.75$), and validity when compared to 90-day diary data and to physician's diagnostic judgments.³⁴

Medical Outcomes Study 20-item Short-Form General Health Survey (SF-20).³⁵—The various SF forms are the most widely used measures of health-related QoL. The SF-20 contains 20 items that assess QoL across 6 physical and mental health-related domains/subscales (Physical Functioning, Role Functioning, Social Functioning, Mental Health, Health Perceptions, and Pain). Subscale scores range from 0 to 100, with higher scores indicating higher QoL. The SF-20 has shown good internal consistency and reliability and strong convergent and divergent validity.³⁵

Patient Health Questionnaire Depression Scale (PHQ-9).³⁶—The PHQ-9 is a 9-item self-report measure of depression. Scores range from 0 to 27, with scores of 5, 10, and 15 indicative of mild, moderate, and severe depressive symptomatology, respectively. The PHQ-9 has shown strong internal consistency reliability ($\alpha = 0.86$) and test-retest reliability ($r = 0.84$), as well as good construct validity.³⁶

Generalized Anxiety Disorder 7-item Scale (GAD-7).³⁷—The GAD-7 is a 7-item self-report measure of anxiety symptoms. Scores range from 0 to

21, with scores of 5, 10, and 15 indicative of mild, moderate, and severe anxiety symptoms. The GAD-7 has demonstrated excellent internal consistency ($\alpha = 0.92$) and good test-retest and procedural reliability ($r = 0.83$). The GAD-7 has also shown good convergent, construct, criterion, procedural, and factorial validity in the assessment of GAD.^{37,38} Although initially designed to assess symptoms of GAD specifically, the GAD-7 also has shown to be effective for identifying other anxiety disorders such as panic disorder, social phobia, and posttraumatic stress disorder.³⁸

In addition to these widely used and well-validated measures, participants also were asked to report the number of school days they missed over the preceding 3 months, the number of days in which their functioning was impaired at home during the previous 3 months, and the number of medical visits (to any physician, urgent care clinic, or emergency room) during the preceding 3 months.

Procedure.—The institutional review board at the University of Mississippi approved this study. Undergraduate participants were recruited using an online research announcement program. They self-selected for participation, provided written informed consent, and completed the aforementioned measures in small group settings in exchange for modest course credit. Responses to both the ID Migraine and BHS dictated group classifications and were based on concordance between their validated uses. A 2-part migraine identification strategy was employed to ensure conservative and accurate group allocation: participants screening positive for migraine on the ID Migraine (2 or more affirmative responses to characteristic symptoms of migraine) *and* screening positive for episodic migraine on Question 1 of the BHS (indicating a frequency of severe headaches that interfered with functioning between “1/month or less” to “2/month to 2/week”) were classified as episodic migraineurs. Those screening positive on the ID Migraine *and* endorsing more frequent severe headaches on the BHS (“3-4 days/week” to “daily”) were classified as having chronic migraine. Participants who did not screen positive for migraine on either the ID Migraine or the BHS comprised the non-migraine control group.

Statistics.—Statistical analyses were conducted using SPSS version 17.0 for participants who had complete data for all variables of interest. In order to control for familywise Type 1 error and given the conceptual relations between the variables assessing impact of migraine, group differences were first analyzed using a one-way MANOVA. The 6 subscales of the SF-20, the 3 items pertaining to functional impairment, PHQ-9 total scores, and GAD-7 total scores were included as dependent variables. Univariate ANOVAs were then conducted to determine the nature of differences obtained from the omnibus MANOVA. Effect sizes are reported in partial eta-squared (η^2) values, the interpretation of which is similar to R^2 values. Significance of two-tailed tests was interpreted at $P < .05$, although all reported significant univariate findings also met more stringent criteria using Bonferroni corrections for multiple comparisons ($P < .004$).

RESULTS

Migraine Prevalence and Migraine-Related Disability.—Of the 391 participants, 101 (25.83%) met screening criteria for episodic migraine, while 7 (1.79%) met screening criteria for chronic migraine. Of the episodic migraineurs, the large majority were women (84.16%) and the average headache frequency was 9.39 (SD = 10.47) headaches over the last 3 months, or approximately 3 per month. The mean MIDAS score of the episodic migraineurs was 9.98 (SD = 12.10), indicative of mild to moderate migraine-related disability. Although most were classified as having minimal or mild migraine-related disability, 30 (29.70%) had moderate or severe levels of disability (total score >10, MIDAS Grade 3 or 4). By comparison, the mean MIDAS score of those screening positive for chronic migraine was 27.33 (SD = 27.75).

Quality of Life, Functional Impairment, and Comorbid Psychiatric Symptoms.—We next endeavored to compare the episodic migraineurs with the non-migraine controls on variables pertaining to impact of migraine. (Chronic migraineurs were excluded from group comparisons because of restricted sample size.) Data for group comparisons first were analyzed for multivariate assumptions and

found to be normal, linear, and homoscedastic. Ninety-eight episodic migraineurs and 269 non-migraine controls had data for all dependent variables. These 367 participants were checked for multivariate outliers by group using Mahalanobis distance, and 22 outliers (6%) were found using a conservative $P < .001$ chi-square cut-off.³⁹ These outliers were evenly split between the migraineurs (6 participants [6%]) and non-migraine controls (16 participants [6%]). (Six individuals were identified as univariate outliers on the variable of age [ie, over 25 years old]; they were retained in the analyses because they were not multivariate outliers and because their elimination did not alter the obtained results.) After elimination, the final analysis included 92 episodic migraineurs and 253 non-migraine controls (total $N = 345$, or 88% of original sample). Power analyses confirmed that this sample size was sufficient to detect any significant group differences, assuming a small-to-moderate effect size, power of 0.80, and P value of .05.

The Wilks' lambda multivariate criterion for overall group differences was significant, $F(11,333) = 6.90$, $P < .0001$ (partial $\eta^2 = 0.19$), indicating that the migraine and non-migraine participants differed on the combination of variables relevant to impact of migraine. Subsequent univariate ANOVAs confirmed that the episodic migraineurs reported significantly lower QoL on 5 of 6 subscales of the SF-20 (all P values $\leq .003$, partial η^2 s = 0.03-0.06; see Table 1). Differences were clinically significant on the Mental Health, Health Perceptions, and Pain sub-

scales of the SF-20, wherein 45.65%, 41.30%, and 10.87% of migraineurs respectively were classified as impaired using the criteria of Stewart et al³⁵ (ie, lowest 20% of general population scores on Mental Health and Health Perceptions subscales and endorsement of moderate or more severe pain on the Pain subscale). Consistent with these results, episodic migraineurs also reported significant functional impairment in the assessed life domains. Specifically, they reported missing twice as many days of school as compared to their non-migraine counterparts (2.74 days [SD = 2.66] vs 1.36 days [SD = 1.94], $P < .0001$, partial $\eta^2 = 0.07$), over twice as many days in which their functioning at home was impaired (2.84 days [SD = 2.75] vs 1.21 [SD = 2.03], $P \leq .0001$, partial $\eta^2 = 0.09$), and twice as many medical visits (1.86 [SD = 1.68] vs 0.95 [SD = 1.16], $P \leq .0001$, partial $\eta^2 = 0.09$). These differences in functional impairment remained significant after controlling for depression and anxiety scores (although group differences on the SF-20 subscales did not).

Table 2 displays the group comparisons on the PHQ-9 and GAD-7 measures of depression and anxiety, respectively. Episodic migraineurs reported higher levels of depression ($P < .0001$, partial $\eta^2 = 0.07$) and anxiety ($P < .006$, partial $\eta^2 = 0.03$) than did the students without migraine. Although the mean score was in the mild range, approximately one-quarter of the migraine group obtained PHQ-9 and GAD-7 scores indicative of moderate to severe depression or anxiety, respectively. Compared to the percentage of similar scores in those without migraine,

Table 1.—Group Scores on Quality of Life Subscales From the SF-20

SF-20 Subscale	Migraine (n = 92) M (SD)	Control (n = 253) M (SD)	F Value	P Value
Physical functioning	97.10 (6.70)	97.56 (7.13)	0.29	NS
Role functioning	98.10 (7.63)	99.80 (2.22)	10.29	.001
Social functioning	91.52 (13.34)	96.13 (8.86)	13.63	<.001
Mental health	66.96 (15.87)	75.62 (15.63)	20.56	<.0001
Health perceptions	69.84 (18.55)	76.40 (18.22)	8.58	.003
Pain	72.83 (19.57)	79.68 (17.55)	9.68	.002

Higher scores reflect higher quality of life.

NS = not significant; SF-20 = Medical Outcomes Study 20-item Short-Form General Health Survey.

Table 2.—Group Scores on Measures of Depression (PHQ-9) and Anxiety (GAD-7)

Measure	Migraine (n = 92) M (SD)	Control (n = 253) M (SD)	P Value	% Migraine Group ≥ 10 (Moderate/Severe)	% Control Group ≥ 10 (Moderate/Severe)	P Value of χ^2
PHQ-9	7.42 (4.21)	4.98 (3.99)	<.0001	27.17	10.67	.0001
GAD-7	6.75 (4.06)	4.99 (2.22)	.0006	23.91	15.81	.08

GAD-7 = Generalized Anxiety Disorder 7-item Scale; PHQ-9 = Patient Health Questionnaire Depression Scale.

this difference was highly significant for PHQ-9 scores and approached significance for GAD-7 scores.

Post-hoc analyses were conducted to assess the possible confounding roles of gender and medication use on the obtained results. Separate MANCOVAs were run in which gender and frequency of headache medication use (item 3 on the BHS) were included as covariates. Gender had no significant effect on the aforementioned findings ($P = .42$). Medication use had a significant effect on the linear combination of variables ($P < .03$) but was predictive of only 1 individual variable (negatively related to the Social Functioning subscale of the SF-20; $P < .04$). Frequency of medication use thus did not alter the general pattern of results, as its average effect on existing variance was only 1%. (Medication overuse *per se* was not of concern because individuals with chronic headache were excluded from group comparisons.)

DISCUSSION

The present study examined the negative impact of migraine on a sample of university students, a population of interest because of their high rates of both migraine and psychiatric comorbidities, as well as their frequent use in studies on migraine treatment outcomes and mechanisms. Although our obtained migraine prevalence rates were somewhat higher than those obtained in larger population studies using structured diagnostic interviews,¹ they are strikingly consistent with rates previously reported among similar samples.^{22,23} The presence of episodic migraine was associated with significant headache-related disability, with nearly one-third of those screening positive for episodic migraine receiving MIDAS scores indicative of moderate to severe disability.

In addition to high prevalence and headache-specific disability, each global measure of QoL, functional impairment, and comorbid psychiatric symptoms reflected impairment, consistent with our main hypotheses pertaining to the impact of migraine. Lower scores on the various SF subscales indicated that the episodic migraineurs had lower levels of QoL in numerous domains, most notably poorer (and clinically significant) levels of psychological well-being (Mental Health), stronger beliefs of poor or declining general health (Health Perceptions), and more physical discomfort (Pain) than students without episodic migraine. Impaired functioning was evident in that migraineurs reported twice as many missed days of school, days of impaired home functioning, and medical visits than controls. These differences in functional impairment yielded the largest effect sizes and remained after controlling for depression and anxiety. Given the low frequency of headaches among this sample, the impact on home functioning and medical visits were unexpected but striking. Finally, episodic migraineurs reported significantly more symptoms of both depression and anxiety than did controls, with approximately one-fourth of them reporting moderate or severe levels of psychiatric symptomatology. These comorbid psychiatric symptoms accounted mostly for the group differences in QoL, suggesting that targeting these symptoms in treatment may improve QoL among individuals with episodic migraine. Because of the paucity of research examining the effects of treating psychiatric comorbidity on migraine, treatment implications of these and related findings remain a priority for future research.

Our results confirm those of population-based studies of older adults showing significant negative

impact of migraine across multiple domains,¹⁻³ as well as studies indicating school-related impairments in younger children with migraine.⁴⁰ Importantly, they extend these findings to a subset of individuals for whom both migraine and psychiatric disorders approach peak incidence, but who have not been studied using validated measures of QoL or comorbid psychiatric symptoms. Our results confirm that depression and anxiety symptoms are commonly comorbid with migraine but exert independent influences on functional impairment.^{2,12} Because the average frequency of headache in this sample was 3 headaches per month, these results also lend support to the notion that reductions in QoL and functional impairment extend even to generally healthy samples with infrequent episodic attacks. The infrequency of their attacks indirectly suggests that current head pain was unlikely to influence obtained results, although this was not directly assessed in the present study.

Potential limitations of this study pertain to issues of diagnostic classification and sample generalizability. Regarding the former, migraine classification in this study was based on a conservative strategy wherein participants had to screen positive on both the ID Migraine and the BHS, measures with well-established psychometric properties,^{31,32} diagnostic concordance,³³ and utility in previous studies of college students.²² Episodic migraineurs had to endorse an episodic frequency of severe headaches causing functioning impairment (positive screen on the BHS) plus at least 2 of the following 3 symptoms: nausea, photophobia, and resulting impairment in completing daily activities (positive screen on the ID Migraine). This dual requirement corresponds to criteria C and D of the migraine diagnostic criteria (Code 1.1) outlined in the current edition of the International Classification of Headache Disorders,²⁹ as well as the 3-variable optimal model described by Martin and colleagues.³⁰ However, the lack of interview data did preclude characterization of aura symptoms in this sample. The consistency between our observed prevalence rates of migraine and those of other studies^{22,23} with similar samples suggests that our approach to participant classification was accurate. The high levels of statistical significance (all significant *P* values <.004), small but non-trivial effect

sizes,⁴¹ and prevalence of clinically significant impairment provide further credence to our classification strategy. As one aim of this study was to extend previous work on abbreviated diagnostic criteria to individuals whose migraine remains undertreated and underdiagnosed, our results provide further criterion validity for the use of abbreviated diagnostic criteria with this population²² and comport well with findings on the negative impact of migraine from studies that have used structured diagnostic interviews.

Regarding generalizability, the characteristics of our sample are quite representative of and consistent with those obtained in larger-scale studies of migraine. For instance, participants in this study had a similar frequency of headache (ie, majority 1-4/month) as did those in the large-scale AMPP study¹ and reported similar levels of headache-related disability (ie, majority MIDAS scores of Grade 1 or 2). Demographically, ethnic distribution was strikingly similar to that reported both in the AMPP study and the epidemiologic study of young adults by Breslau and Davis²⁰ (79% vs 85% vs 81%, respectively). The preponderance of female participants is emblematic of continuing trends in higher education, wherein the overwhelming majority of students are female.⁴² Compared to existing studies on college students specifically,^{22,23} participants' mean age and frequency of headache were similar. Considered in conjunction with existing literature, our findings appear generalizable to typical college adults; replication with structured diagnostic interviews and at universities from other geographical regions is nevertheless warranted. Given the significant impact of episodic migraine on this sample, future studies should endeavor to assess the viability of prevention and early intervention efforts among young adults. Because the majority of migraineurs in university settings do not currently receive treatment, these findings can be used to effect change in rates of both migraine identification and consultation.

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