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Depression and anxiety in relation to headache-related disability: A cross-sectional subanalysis of the Philippine Neurological Association One Database (PNA1DB)

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Abstract

Background & Objective: Headache disorders are a leading cause of disability. Beyond attack frequency and intensity, psychological distress may contribute to functional impairment, but data from Filipino populations are limited. The objective of this study is to determine whether depression and anxiety are independently associated with headache-related disability as measured by the Migraine Disability Assessment (MIDAS) in a Filipino clinical cohort; to describe levels of disability and psychological distress; and to examine subgroup differences across selected sociodemographic and clinical characteristics. *Methods:* We conducted a cross-sectional secondary analysis of de-identified adult records from the Philippine Neurological Association One Database–Headache (PNA1DB–Headache) from June 1, 2021 to June 30, 2025. Primary headache cases with complete MIDAS, depression, and anxiety data were included. Demographic and clinical characteristics were summarized descriptively. Because MIDAS scores were non-normally distributed, associations between MIDAS and mood scores were examined using Spearman's rank correlation. Group differences in MIDAS were assessed using Mann–Whitney U and Kruskal–Wallis tests with Dunn–Holm post hoc comparisons. Multivariable linear regression with robust standard errors was used to identify independent predictors of disability, adjusting for age, sex, headache phenotype, monthly headache days, headache severity, and prophylactic medication use. *Results:* Of 1,100 registry records, 527 primary headache cases met inclusion criteria. MIDAS grades were: little/no disability 52.4%, mild 21.8%, moderate 13.5%, and severe 12.3%. Mean depression and anxiety scores were 4.6 ± 4.0 and 5.6 ± 4.6, respectively. MIDAS correlated positively with depression ($\rho = 0.488$, $p < .001$) and anxiety ($\rho = 0.475$, $p < .001$). In multivariable regression, depression ($B = 0.691$, $p < .001$) and anxiety ($B = 0.386$, $p = .031$) were independently associated with higher MIDAS scores. Compared with migraine with aura, migraine without aura and unspecified primary headache were associated with greater disability, while monthly headache days, sex, and prophylactic medication use were not independently significant.
Conclusions: In this registry-based cohort, both depressive and anxiety symptoms were independently associated with greater headache-related disability, with depression demonstrating the stronger effect. These findings support integrating routine mood screening and biopsychosocial management into standard headache care in the Philippines.

Keywords: Headache, migraine, disability, MIDAS, depression, anxiety, Philippines, registry, biopsychosocial model.

INTRODUCTION

Headache disorders are among the most prevalent and disabling neurological conditions worldwide. As of 2021, the World Health Organization estimates that headache disorders—including migraine, tension-type headache (TTH), and medication-overuse headache (MOH)—affect approximately 40% of the global population, or around 3.1 billion people.[1,2] These conditions are particularly burdensome among individuals aged 15 to 49, where they are one of the top three causes of years lived with disability (YLDs).[2] Despite the high burden, headache disorders

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remain widely underdiagnosed and undertreated across both high- and low-resource settings.

In the Philippines, headache disorders are a major cause of personal suffering, productivity loss, and reduced quality of life. In a workplace-based study, Haw *et al*. found that stress or heavy workload and prolonged computer screen exposure were among the most commonly reported migraine triggers among Filipino employees.[3] Higher migraine-related disability was also associated with poorer quality of life and greater productivity costs.[3] Despite this burden, most respondents relied on over-the-counter medications, and only a minority consulted neurologists for migraine-related symptoms.[3] Similarly, Roxas *et al*. reported that although most Filipino neurologists used established international criteria for migraine diagnosis, only 14.67% frequently or always used MIDAS or another validated tool to assess migraine-related disability.[4] These findings highlight the need for more structured disability assessment in local headache care, particularly as psychological comorbidities may further contribute to functional impairment.[3,4]

To quantify functional disability caused by migraine, the Migraine Disability Assessment (MIDAS) scale is among the most validated tools globally.[5] It evaluates the number of days in the past three months that were affected by headache in domains such as work, household chores, and social participation. However, mounting evidence suggests that headache frequency and intensity alone do not fully explain the burden experienced by patients. Psychological factors such as depression and anxiety have emerged as key factors independently associated with headache-related disability.

Depression is among the most common psychiatric comorbidities associated with migraine. Studies show that migraineurs are up to 2.5 times more likely to suffer from depression compared to non-migraineurs.[6] Anxiety disorders—including generalized anxiety disorder (GAD), panic disorder (PD), and obsessive-compulsive disorder (OCD)—are also disproportionately prevalent among those with migraine, especially those with chronic migraine or migraine with aura.[6,7] These psychiatric comorbidities are not just correlates but may increase the risk of migraine chronification, medication overuse, and treatment resistance.[6,8]

This link is evident even in younger populations, where Murphy *et al*. (2025) demonstrated that children and adolescents with self-reported anxiety or depression showed significantly higher disability scores on the Pediatric MIDAS (PedMIDAS) tool.[7] These findings are echoed in adult populations, where psychiatric symptoms and transdiagnostic factors such as stress, anxiety sensitivity, and fear of pain were found to significantly predict disability levels independent of headache frequency or severity.[8]

On the other hand, psychological strengths such as resilience and pain acceptance may mitigate headache-related disability. Hans *et al*. found that higher resilience was associated with lower headache-related disability as measured by MIDAS, with each 1-point increase in resilience score decreasing the odds of severe disability by approximately 4%.[9] Lillis *et al*. similarly showed that improvements in pain acceptance were associated with reductions in headache-related disability, even after controlling for changes in migraine frequency, duration, and pain intensity.[10] These findings suggest that resilience and pain acceptance may serve as protective factors against functional impairment in headache disorders. In the Philippine context, such dimensions remain underexplored but are highly relevant, particularly given the burden of psychological distress and fragmented access to specialized neurological and psychiatric care.

Despite the abundance of global research, studies specifically analyzing the psychological predictors of headache-related disability in Filipino populations are lacking. The Philippine Neurological Association One Database Initiative—Headache (PNA1DB - Headache) provides a unique opportunity to examine this intersection through a large clinical dataset that includes standardized measures for headache impact and mental health symptoms.

This study aims to address this gap by determining whether depression and anxiety scores are significant predictors of headache-related disability among Filipino patients using the PNA1DB. Specifically, the objectives of the study are:

- To describe the level of headache-related disability among patients using the Migraine Disability Assessment (MIDAS) scale and to measure the severity of depression and anxiety using standardized instruments integrated into the PNA1DB.
- To analyze the association between depression and anxiety scores and

headache-related disability as measured by MIDAS.
- To identify demographic and clinical variables that influence or modify the relationship between psychological distress (depression/anxiety) and headache-related disability.

By quantifying the extent to which depression and anxiety are independently associated with functional impairment in a local cohort, the findings from this study may help guide a more integrated, multidisciplinary approach to headache care in the Philippines. Identifying these modifiable psychological factors will underscore the importance of routine mental health screening and intervention, supporting a paradigm shift toward a comprehensive biopsychosocial model of headache management.

METHODS

Study design and setting

We conducted a cross-sectional analytic study using a secondary analysis of records from the Philippine Neurological Association One Database—Headache (PNA1DB–Headache). The reporting follows STROBE recommendations for observational studies. The registry is multi-center and captures routine clinical care across hospitals and clinics in the Philippines.

Data source and registry description

PNA1DB–Headache is a nationwide clinical registry established by the Philippine Neurological Association in June 2021 to collect standardized patient-reported outcomes and clinician-reported data from neurologists and headache specialists. Variables include demographics, headache phenotype, headache frequency and severity, treatment history (acute/prophylaxis), and validated instruments for disability and psychological distress. For this analysis, we accessed all de-identified entries from June 1, 2021 to June 30, 2025 after formal approval from the PNA Steering Committee and the registry data manager. No direct personal identifiers were accessible to investigators.

Eligibility criteria and sampling

We utilized a census sampling approach, including all registry records that met the following criteria:

1. Inclusion: (1) Filipino adults ≥18 years; (2) clinician-diagnosed primary headache disorder (e.g., migraine, tension-type headache) recorded in the case report form (CRF); (3) complete entries for core variables: MIDAS total score, Depression score, and Anxiety score.
2. Exclusion: (1) Secondary headache disorders (e.g., attributed to trauma, infection, systemic disease); (2) missing/incomplete data for any core variables; (3) records lacking essential demographic/clinical descriptors needed for covariate adjustment.

The final analytic sample size (N) and detailed reasons for exclusion are reported in the Results section and were documented in a cohort flow diagram (Figure 1). We conducted a complete-case analysis. Records with missing MIDAS scores or key covariates were excluded, and no imputation for missing data was performed.

Measures and operational definitions

Primary outcome

The primary outcome was headache-related disability, operationalized by the Migraine Disability Assessment (MIDAS) total score. The MIDAS score is computed as the sum of items Q1 through Q5, quantifying the number of days in the preceding 90 days that were missed or experienced with reduced 50% productivity across three domains: work/school, household work, and family/social activities. Disability was categorized using established MIDAS grades: Grade I (0–5), Grade II (6–10), Grade III (11–20), and Grade IV (≥21). The ancillary items on "headache days" and "average pain intensity" were used as covariates but were not included in the total MIDAS score.

Primary independent variables

Depression and Anxiety were the primary independent variables, assessed using validated 7-item subscales integrated into the PNA1DB. Both scales range from 0 to 21, with higher scores indicating greater symptom severity. Scores were categorized as normal (0–7), borderline abnormal (8–10), or abnormal (>11) for descriptive analyses.

Covariates (a priori)

- Demographic: age (years), sex, marital status, educational attainment, employment status.
- Clinical: headache type (tension-type, migraine with aura, migraine without aura, unspecified primary headache), monthly headache days (frequency), headache severity (faces-type ordinal scale recorded in the registry), duration of headache history, medication use (acute agents; prophylaxis yes/no).

For regression, categorical variables were dummy-coded.

Data management and cleaning

Data cleaning involved a comprehensive range and logic checks to ensure internal consistency and adherence to instrument constraints (e.g., MIDAS item values were constrained to a maximum of 90 days). The primary analysis employed a complete-case analysis approach for all core variables. For the MIDAS total, all five contributing items (Q1–Q5) were required. For the 7-item Depression/Anxiety subscales, scores were computed only when at least six out of seven items were present, with a prorated mean applied to estimate the missing single item; otherwise, the subscale score was set to missing. De-duplication procedures were also performed.

Statistical analysis

Descriptive statistics summarized continuous variables using mean ± standard deviation for approximately normally distributed data and median with interquartile range (IQR) for skewed distributions, while categorical variables were reported as counts (n) and percentages. Because MIDAS, depression, and anxiety scores demonstrated non-normal distributions on visual inspection of Q–Q plots and Shapiro–Wilk tests, nonparametric methods were used for primary analyses. Associations between continuous variables were assessed using Spearman's rank correlation.

Group differences in MIDAS scores were evaluated using Mann–Whitney U tests for two-group comparisons and Kruskal–Wallis tests for comparisons involving more than two groups. Effect sizes were reported as rank-based measures (r for Mann–Whitney and rank epsilon squared [ε^2] for Kruskal–Wallis). Significant omnibus Kruskal–Wallis results were followed by Dunn's post hoc pairwise comparisons with Holm correction.

Multiple linear regression was performed to identify independent predictors of MIDAS total score, including depression score, anxiety score, age, sex, monthly headache days, headache type, and prophylactic medication use. Robust HC3 standard errors were applied to account for heteroscedasticity, and variance inflation factors were examined to assess multicollinearity.

Sensitivity analyses included exclusion of severe disability cases (MIDAS $\geq$ 21) and log-transformation of the outcome variable to assess model stability. Statistical significance was set at a two-tailed α of 0.05. All analyses were conducted using the latest version of JASP (JASP Team).

Ethical considerations

This study complied with the Declaration of Helsinki and relevant national regulations. The protocol (Version 1.1; June 19, 2025) was reviewed and approved by the Makati Medical Center Institutional Review Board (IRB reference: MMCIRB20-25-05-67). The study utilized de-identified and anonymized records from the PNA1DB–Headache; consequently, the IRB granted a waiver of new informed consent for this secondary analysis. Access to the registry data was formally authorized by the PNA1DB Steering Committee. No patients or members of the public were involved in the design or conduct of this secondary analysis.

RESULTS

Patient flow and exclusions

A total of 1,100 patient records were initially retrieved from the Philippine Neurological Association One Database—Headache (PNA1DB). Of these, 573 records (52.1%) were excluded from the final analysis: 273 (24.8%) due to missing core variables (MIDAS total score, depression score, or anxiety score) and 300 (27.3%) due to secondary headache disorders (e.g., cervicogenic headache, post-traumatic headache, or headaches attributed to central nervous system infections, cerebrovascular events, or intracranial masses). We used a complete-case approach; records with missing core variables were not imputed.

The final analytic sample consisted of 527

records from patients with a clinician-diagnosed primary headache disorder (migraine, tension-type, or unspecified primary headache) and complete core data. Participant flow from the registry to the analytic sample is shown in Figure 1.

Demographic profile

A total of 527 participants were included in the study. The largest age group was 30–39 years (31.50%), followed by 18–29 years (26.57%), 40–49 years (16.32%), 50–59 years (13.85%), and ≥60 years (11.77%). The majority were female (71.73%), and most were single (55.03%), with the rest being married (40.23%), widowed (3.61%), or separated (1.14%).

In terms of employment status, more than half (58.64%) were employed, while 22.01% were unemployed, 13.85% were self-employed, 4.18% were retired, and 1.33% fell into other categories. Most participants were employed in managers/professionals/associate professionals (44.4%), followed by clerical/sales (21.1%) and manual/elementary occupations (17.6%); 6.6% were homemakers and 10.3% had no recorded occupational data (Table 1).

For BMI category, 41.37% were classified as obese, 24.86% had a normal BMI, 19.55% were overweight, and 7.02% were underweight, while 7.21% had no available BMI data.

Baseline comparison between included and excluded cases

To evaluate potential differences between included and excluded records, baseline demographic and clinical characteristics were compared (Table 2).

Excluded patients were significantly older than those included in the final analysis (mean ± SD: 47.41 ± 14.91 vs. 39.99 ± 13.96 years; $p < .001$).

Sex distribution also differed significantly between groups ($p < .001$), with a higher proportion of females among included patients (71.7%) compared to excluded patients (58.8%).

Significant differences were observed across BMI categories ($p < .001$). Included patients had a markedly higher prevalence of obesity (41.4%) compared to excluded patients (6.5%), whereas excluded patients more frequently had missing BMI data (23.6% vs. 7.2%).

Employment status differed significantly between groups ($p < .001$). Included patients were more commonly employed (58.6% vs. 43.8%), while excluded patients more often had missing employment information (23.4% vs. 0%).

Occupational grouping likewise demonstrated significant differences ($p < .001$). Included patients were more likely to belong to managerial and professional categories (44.4% vs. 16.4%), whereas excluded patients had a substantially higher proportion of missing occupational data (38.9% vs. 10.2%).

These findings indicate measurable baseline differences between included and excluded records, particularly in age and socioeconomic indicators.

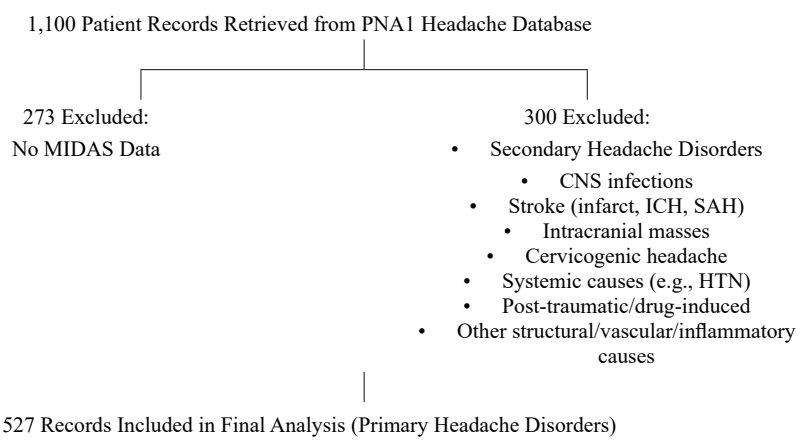

Figure 1. Participant-flow diagram (Headache sub-analysis registry)

Table 1: Demographic profile of patients

Variable	Category	n	%
Age group (years)	18 – 29	140	26.57
	30 – 39	166	31.50
	40 – 49	86	16.32
	50 – 59	73	13.85
	≥ 60	62	11.77
Gender	Female	378	71.73
	Male	149	28.27
Civil status	Single	290	55.03
	Married	212	40.23
	Widowed	19	3.61
	Separated	6	1.14
Employment Status	Employed	309	58.64
	Retired	22	4.18
	Self Employed	73	13.85
	Unemployed	116	22.01
	Others	7	1.32
Occupational Categories	Managers / Professionals / Associate Professionals	234	44.4
	Clerical/Sales	111	21.1
	Manual / Service / Elementary / Armed Forces	93	17.6
	Homemakers / Not in paid employment	35	6.6
	No Data	54	10.25
BMI Category	Obese	218	41.37
	Normal	131	24.86
	Overweight	103	19.55
	No data	38	7.21
	Underweight	37	7.02

Clinical characteristics

Among the 527 participants, the most common headache type was migraine without aura (32.83%), followed by unspecified primary headache (22.96%), tension-type headache (22.20%), and migraine with aura (22.01%) (Figure 1). Full distribution data are available in Supplement Table 1.

In terms of headache severity, nearly half of respondents (49.15%) reported experiencing "much more pain," 24.67% described "even more pain," and 11.77% reported "a little more pain." Less frequent responses included "worst pain" (10.82%), "little bit pain" (2.47%), and "no pain" (0.19%) (Figure 3). Detailed counts and percentages are provided in Supplementary Tabel 1.

Regarding preventive treatment, only 18.41% of participants had tried prophylactic medications, whereas 81.59% had not (Figure 4).

For health-seeking behavior, the most common response to headache episodes was self – medication (72.68%), followed by consulting a physician (11.77%), do nothing (9.49%), and other measures (5.88%) (Figure 5). One response was missing and was excluded from the analysis.

Headache-Related Disability (MIDAS) and psychological distress scores

The mean number of monthly headache days

Table 2: Comparison of baseline characteristics between included and excluded cases (N = 1100)

Variable	Excluded (n = 573)	Included (n = 527)	p-value
Age, years (mean ± SD)	47.41 ± 14.91	39.99 ± 13.96	< .001†
Sex, n (%)			< .001‡
Female	337 (58.8%)	378 (71.7%)	
Male	236 (41.2%)	149 (28.3%)	
BMI Category, n (%)			< .001‡
No data	135 (23.6%)	38 (7.2%)	
Normal	235 (41.0%)	131 (24.9%)	
Overweight	149 (26.0%)	103 (19.5%)	
Obese	37 (6.5%)	218 (41.4%)	
Underweight	17 (3.0%)	37 (7.0%)	
Employment Status, n (%)			< .001‡
Employed	251 (43.8%)	309 (58.6%)	
Unemployed	105 (18.3%)	116 (22.0%)	
Self-employed	51 (8.9%)	73 (13.9%)	
Retired	26 (4.5%)	22 (4.2%)	
Other	6 (1.0%)	7 (1.3%)	
No data	134 (23.4%)	0 (0.0%)	
Occupational Group, n (%)			< .001‡
Managers/Professionals/Associate Professionals	94 (16.4%)	234 (44.4%)	
Clerical/Sales	142 (24.8%)	111 (21.1%)	
Manual/Service/Elementary/Armed Forces	71 (12.4%)	93 (17.6%)	
Homemakers / Not in paid employment	43 (7.5%)	35 (6.6%)	
No Data	223 (38.9%)	54 (10.2%)	

† Independent samples t-test ‡ Chi-square test; Excluded patients were due to missing MIDAS data (n = 273) or secondary headache causes (n = 300).

among participants was 6.79 (SD = 9.19), with values ranging from 0 to 30 days. Based on the MIDAS classification, more than half of the respondents (52.37%) experienced little to no disability. Mild disability was reported by 21.82% of participants, while 13.47% had moderate disability and 12.33% had severe disability.

The mean anxiety score among participants was 5.61 ± 4.64 (range: 0–21), while the mean depression score was 4.60 ± 4.03 (range: 0–21).

Boxplot analysis (Figure 7) demonstrated that both anxiety and depression scores were right-skewed, with visible outliers at the upper extremes of each distribution. For anxiety, the median score was 5, with an interquartile range (IQR) of 2 to 8, and a small number of participants reaching the maximum possible score of 21. Depression scores showed a median of 4 and an IQR of 1 to 7, with fewer high-score outliers compared to anxiety. Overall, these patterns indicate that most participants reported relatively low to moderate levels of psychological distress, although a subset exhibited markedly elevated anxiety and depression scores.

Correlation of depression and anxiety with MIDAS scores

Spearman's rank correlation revealed significant positive associations between MIDAS scores and both anxiety ($\rho = 0.475$, $p < .001$) and depression scores ($\rho = 0.488$, $p < .001$). Anxiety and depression scores were also strongly and positively correlated ($\rho = 0.766$, $p < .001$). This indicates that higher anxiety and depression

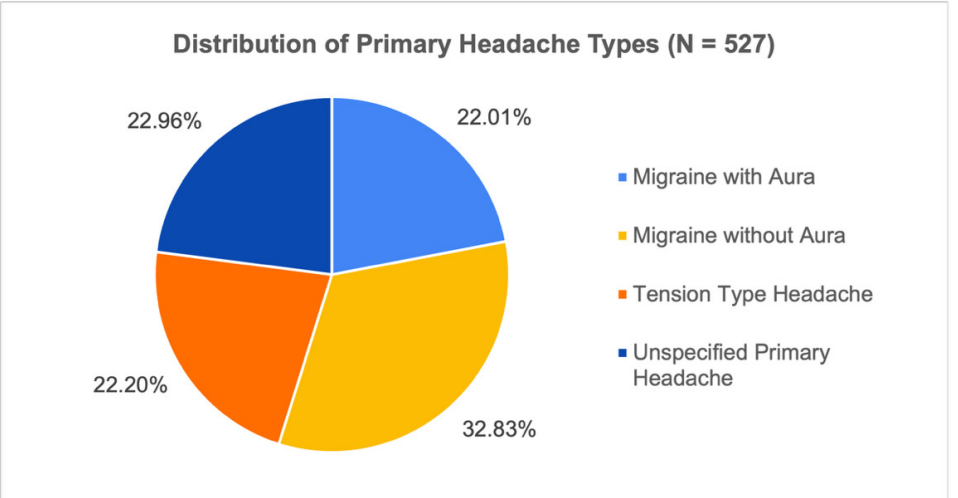

Figure 2. Distribution of primary headache types (N = 527). Migraine without aura was most common (32.83%), followed by unspecified primary headache (22.96%), tension-type headache (22.20%), and migraine with aura (22.01%).

levels are associated with greater headache-related disability, and that anxiety and depression tend to co-occur in this sample.

Group comparisons of MIDAS scores

Group comparisons of MIDAS scores were conducted for sex, type of primary headache, occupation, employment status, and use of prophylactic medication (Table 4). Given the non-normal distribution of MIDAS scores, nonparametric tests were applied.

A Mann–Whitney U test revealed a statistically significant difference in MIDAS scores between males and females (U = 32,440.50, p = .006), with females (mean rank = 275.32) exhibiting

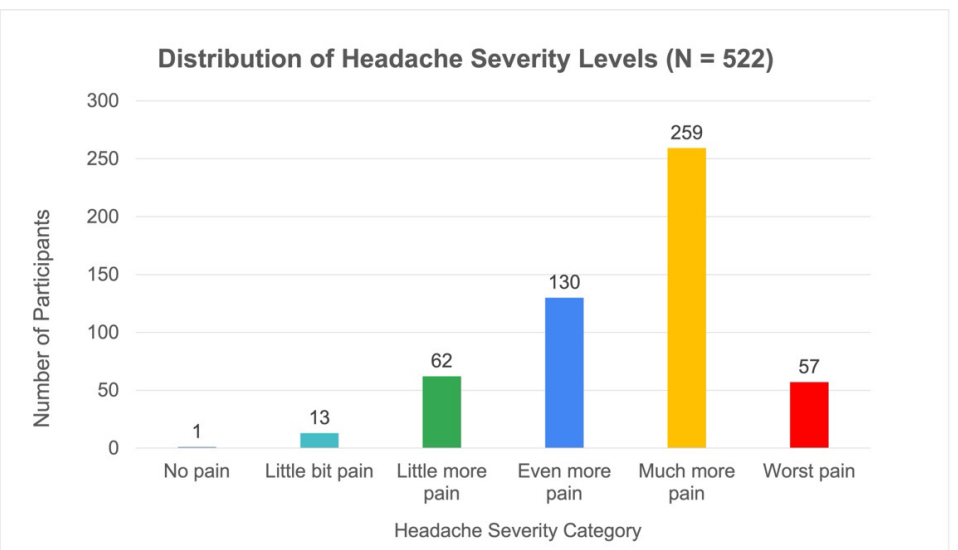

Figure 3. Distribution of headache severity levels (N = 522). Majority reported “much more pain” (n = 259) or “even more pain” (n = 130), with fewer selecting “little more pain” (n = 62), “little bit pain” (n = 13), “worst pain” (n = 57), or “no pain” (n = 1). Five responses were missing and excluded from the analysis.

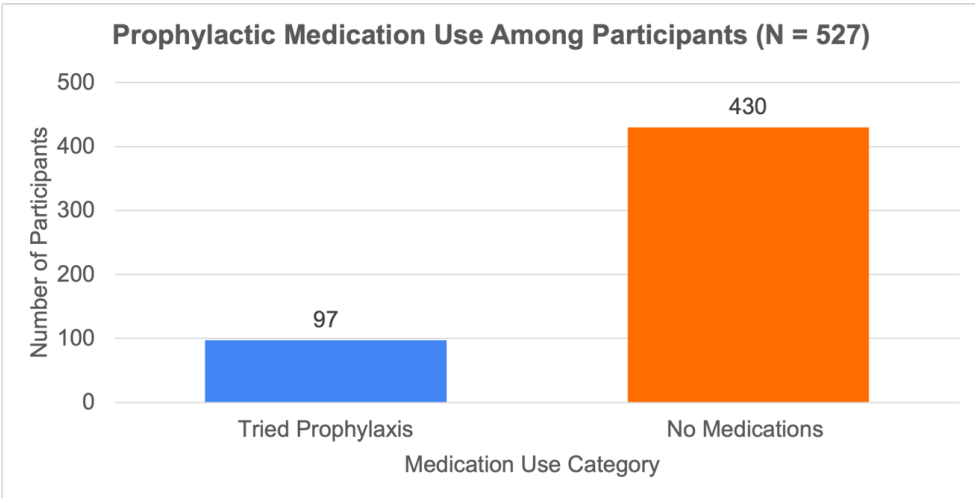

Figure 4. Prophylactic medication use among participants (N = 527). A total of 97 participants (18.41%) reported prior use of prophylactic therapy, while 430 (81.59%) had not used prophylaxis.

greater headache-related disability compared to males (mean rank = 235.28).

A Kruskal–Wallis test demonstrated a significant difference in MIDAS scores across the four primary headache types ($H(3) = 19.451$, $p < .001$, $\varepsilon^2 = 0.038$). Post hoc Dunn tests with Holm correction indicated that patients with migraine without aura had significantly higher MIDAS scores compared to those with tension-type headache ($p < .001$), and that MIDAS scores also differed between tension-type headache and unspecified primary headache ($p = .009$). No other pairwise comparisons remained significant after adjustment.

MIDAS scores also differed significantly across occupational groups classified under the ISCO framework ($H(11) = 29.407$, $p = .002$, $\varepsilon^2 = 0.057$). Post hoc Dunn tests with Holm correction revealed significant differences between clerical workers and elementary occupations ($p =$

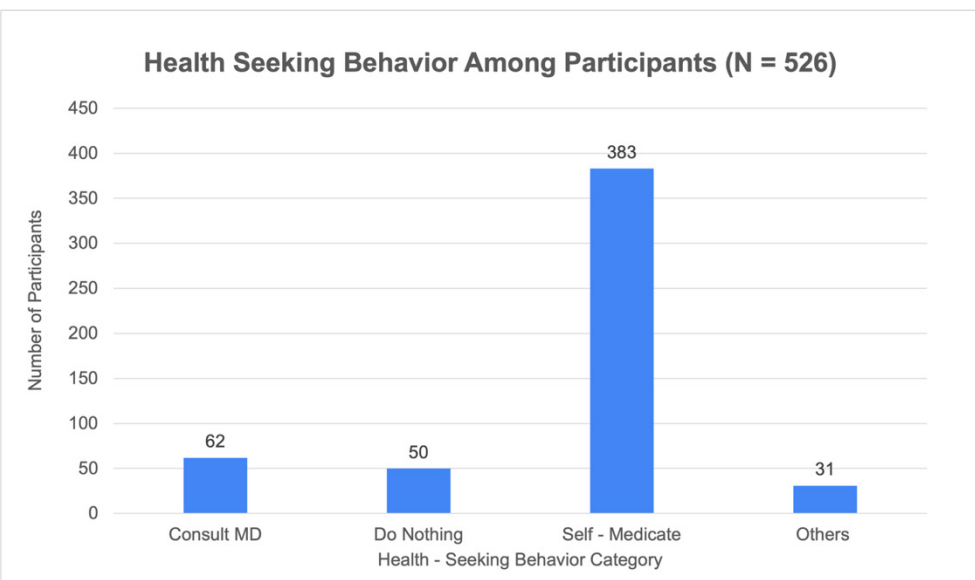

Figure 5. Health-seeking behavior among participants (N = 526). Most participants self medicated (n = 383), while others consulted a physician (n = 62), do nothing (n = 50), or used other approaches (n = 31). One response was missing and was excluded from the analysis.

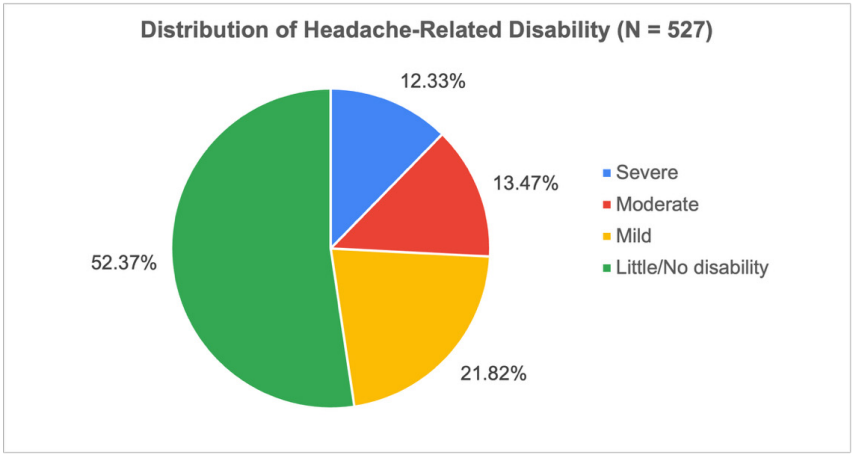

Figure 6. Distribution of headache-related disability among participants (N = 527). The majority reported little or no disability (52.37%), followed by mild (21.82%), moderate (13.47%), and severe disability (12.33%).

.011), and between elementary occupations and professionals (p = .022). No other pairwise comparisons remained significant following adjustment.

Similarly, a significant difference in MIDAS scores was observed across employment status categories (H(4) = 14.894, p = .005, ε^2 = 0.029). Post hoc Dunn tests with Holm correction indicated that MIDAS scores differed significantly between self-employed and unemployed participants (p = .033), while other comparisons were not statistically significant after correction.

For prophylactic medication use, a Mann–Whitney U test demonstrated a significant difference in MIDAS scores between participants

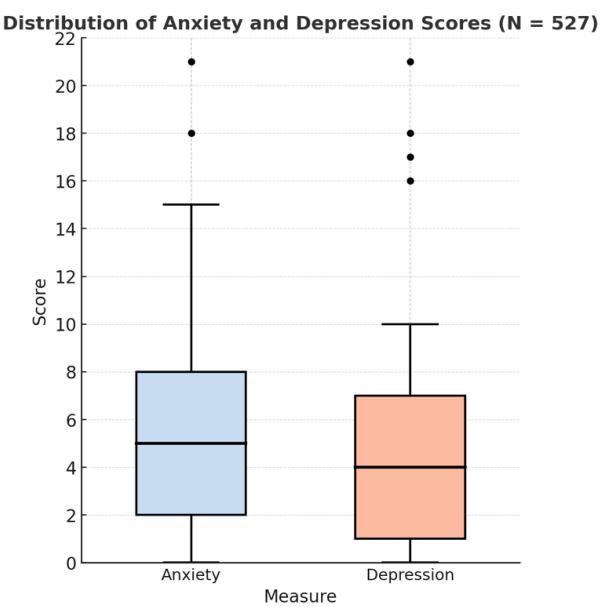

Figure 7. Boxplots showing the distribution of anxiety and depression scores among 527 participants. Both measures demonstrated right-skewed distributions with a median anxiety score of 5 (IQR 2–8) and median depression score of 4 (IQR 1–7). A subset of participants exhibited markedly elevated scores, particularly for anxiety.

Table 3: Bivariate Spearman correlations among MIDAS, anxiety, and depression scores (N = 527)

Variable	MIDAS Score	Anxiety Score	Depression Score
MIDAS Score	—		
Anxiety Score	0.475***	—	
Depression Score	0.488***	0.766***	—

Note. Values represent Spearman's rho; ***$p < .001$.

receiving prophylactic treatment and those not receiving prophylaxis (U = 16,693.00, p = .020), with higher MIDAS scores observed among those on prophylactic medication.

Multivariable predictors of Headache - Related Disability (MIDAS)

A multiple linear regression was conducted to identify predictors of MIDAS scores, with anxiety score, depression score, monthly headache days, and age entered as continuous predictors and sex, primary headache type, prophylactic medication use, and headache severity entered as categorical predictors. The model was statistically significant, $F(14, 493) = 5.817$, $p < .001$, explaining 14.2% of the variance in MIDAS scores ($R^2 = 0.142$; adjusted $R^2 = 0.117$). Higher depression scores were independently associated with higher MIDAS scores (B = 0.691, SE = 0.206, $\beta = 0.202$, $p < .001$). Anxiety scores were also a significant predictor (B = 0.386, SE = 0.179, $\beta = 0.133$, p = .031). Relative to migraine with aura, migraine without aura (B = 3.197, p = .040) and unspecified primary headache (B = 3.520, p = .041) were associated with higher MIDAS scores. Age, monthly headache days, sex, prophylactic medication use, tension headache, and headache severity categories were not statistically significant predictors in this model (all $p > .05$).

DISCUSSION

This study examined psychological predictors of headache-related disability among Filipino patients with primary headache disorders using data from the Philippine Neurological Association One Database (PNA1DB). The findings demonstrate that both depression and anxiety scores are significant independent predictors of MIDAS-measured disability, even after adjustment for demographic and clinical covariates. These results provide novel evidence from a Southeast Asian clinical cohort and align with international literature highlighting psychiatric comorbidity as a major contributor to headache-related functional impairment.

The demographic characteristics of this cohort reflect the established epidemiology of primary headache disorders. Women comprised the majority of participants, and peak representation occurred in the third to fourth decades of life. Global Burden of Disease data indicate that years lived with disability due to headache are more than twice as high in females and highest among working-age adults.[11] Sex-based disparities have been attributed to hormonal influences, differences in central pain processing, and psychosocial stressors.[12] Consistent with

Table 4: Comparative analysis of MIDAS scores across demographic and clinical subgroups

Variable	Test	Statistic	p	Effect Size	Notes
Sex	Mann–Whitney U	U = 32,440.50	.006	—	Females > Males
Type of Primary Headache	Kruskal–Wallis	H(3) = 19.451	< .001	$\varepsilon^2 = 0.038$	See post hoc (Dunn-Holm)
Occupation (ISCO classification)	Kruskal–Wallis	H(11) = 29.407	.002	$\varepsilon^2 = 0.057$	See post hoc (Dunn-Holm)
Employment Status	Kruskal–Wallis	H(4) = 14.894	.005	$\varepsilon^2 = 0.029$	Self-employed ≠ Unemployed
Prophylactic Medication Use	Mann–Whitney U	U = 16,693.00	.020	—	On prophylaxis higher

Table 5: Multiple linear regression analysis predicting headache-related disability (MIDAS Scores)
Model: $F(14, 493) = 5.817$, $p < .001$; $R^2 = .142$; adjusted $R^2 = .117$.

Predictor	B	SE B	β	t	p	95% CI for B	VIF
Continuous Variables							
Anxiety Score	0.386	0.179	0.133	2.162	.031	0.035, 0.737	1.471
Depression Score	0.691	0.206	0.202	3.360	< .001	0.287, 1.095	1.441
Monthly Headache Days	0.055	0.063	0.038	0.870	.385	−0.069, 0.178	1.035
Age	−0.078	0.043	−0.082	−1.822	.069	−0.162, 0.006	1.076
Categorical Variables							
Sex (Male)	−0.092	1.301	—	−0.071	.944	−2.649, 2.465	1.060
Migraine without Aura	3.197	1.550	—	2.062	.040	0.151, 6.243	1.041
Tension Headache	0.643	1.759	—	0.366	.715	−2.814, 4.100	—
Unspecified Primary Headache	3.520	1.720	—	2.047	.041	0.141, 6.899	—
Tried Prophylaxis (Yes)	2.453	1.509	—	1.625	.105	−0.512, 5.418	1.030
Headache Severity (little bit pain)	3.420	3.755	—	0.911	.363	−3.958, 10.798	1.029
Headache Severity (little more pain)	−0.154	1.979	—	−0.078	.938	−4.042, 3.734	—
Headache Severity (much more pain)	0.190	1.403	—	0.135	.892	−2.567, 2.946	—
Headache Severity (no pain)	−2.931	12.646	—	−0.232	.817	−27.778, 21.916	—
Headache Severity (worst pain)	3.305	2.068	—	1.598	.111	−0.758, 7.368	—

B = unstandardized coefficient; SE B = standard error; β = standardized coefficient (computed for continuous predictors only). Reference categories: sex = female; primary headache type = migraine with aura; tried prophylaxis = no; headache severity = "even more pain." VIF values indicate no evidence of problematic multicollinearity.

these reports, female participants in the present study demonstrated significantly higher MIDAS scores, reinforcing the disproportionate burden of headache disability among women.

A substantial proportion of participants were classified as obese. Obesity has been consistently linked to greater migraine frequency, severity, and risk of chronification. A meta-analysis reported a pooled prevalence ratio of 1.29 for migraine among individuals with obesity[13], while cohort data show that severe obesity is associated with more frequent and intense attacks.[14] Although body mass index was not an independent predictor in the multivariable model, the high prevalence of obesity likely contributes to overall disease burden and may interact with psychological factors. Future investigations should explore whether obesity mediates or moderates the relationship between emotional distress and disability.

Migraine without aura was the most common diagnosis, consistent with global patterns. Migraine remains the leading contributor to headache-attributed disability worldwide.[11] Significant differences in MIDAS scores across headache types were observed, with migraine without aura associated with greater disability compared with tension-type headache. This pattern is clinically expected, as migraine attacks tend to be longer, more severe, and accompanied by sensory hypersensitivity, leading to greater cumulative functional limitation.

A notable finding was the high prevalence of self-medication and the relatively low use of preventive therapy. Although many patients with episodic migraine are candidates for prophylaxis, only a small minority receive it in routine practice.[15] In the Philippines, widespread self-care behaviors and fragmented access to specialist services likely contribute

to this gap. National policy analysis estimate that three to six in ten Filipinos self-medicate for common conditions.[16] Underutilization of preventive strategies may promote chronification and medication-overuse headache. Current international recommendations emphasize earlier initiation of prophylaxis, particularly in resource-limited settings, to reduce long-term disability.[17]

The distribution of MIDAS scores showed that more than half of participants reported little or no disability. This likely reflects the registry-based design capturing patients across the severity spectrum, including those presenting early in their disease course. In contrast, digital platform cohorts such as the HeAD-US study reported predominantly moderate to severe disability, probably due to self-selection of more symptomatic individuals.[18] The comparatively lower baseline disability in this cohort underscores the importance of early psychological screening and intervention, as even mild impairment may progress without appropriate management.

The principal finding was that both depression and anxiety independently predicted greater headache-related disability, with depression demonstrating the stronger effect. This mirrors international data. In the HeAD-US study, depressive symptoms were associated with larger increases in MIDAS scores than anxiety alone, and combined symptoms conferred the greatest burden.[18] Similarly, registry data from the American Registry for Migraine Research showed that depression severity was significantly associated with disability, whereas anxiety had weaker independent effects after adjustment.[19] Depression may exert a stronger influence through mechanisms such as fatigue, reduced motivation, impaired coping, and social withdrawal, which compound the functional restrictions imposed by headache attacks.

Correlation analyses further demonstrated moderate positive associations between MIDAS scores and both anxiety and depression, as well as strong intercorrelation between the two psychological domains. Comparable findings have been reported in Chinese clinical cohorts, where anxiety and depression were independently associated with migraine frequency, pain intensity, and disability indices.[20] The close co-occurrence of these conditions highlights the need for routine dual screening in headache clinics and suggests that overlapping symptomatology may partially attenuate individual effect estimates in multivariable models due to shared variance.

Beyond risk factors, emerging evidence suggests that psychological strengths may be associated with lower headache-related disability. Hans et al. found that higher resilience scores were associated with lower MIDAS scores and reduced odds of severe disability.[10] Although resilience did not directly moderate the relationship between attack frequency and impairment, it appears to operate through broader psychosocial pathways. The absence of resilience or coping measures in the present registry represents an important area for future Filipino research, particularly given the potential protective influence of family and community support systems.

The regression model explained a modest proportion of variance in MIDAS scores, consistent with the multifactorial nature of headache-related disability. In the present cohort, monthly headache frequency was not independently associated with disability after adjustment, whereas depression and anxiety remained significant predictors. These findings suggest that headache burden cannot be fully captured by frequency alone and support a biopsychosocial framework that incorporates mood, behavior, coping, and quality of life alongside clinical metrics.

Patients who had tried prophylactic medications demonstrated higher MIDAS scores than non-users. This likely reflects indication bias, wherein individuals with more severe disease are preferentially prescribed preventive therapy. Such patterns are commonly observed in registry-based cohorts and suggest that prophylactic use may function as a marker of baseline severity rather than treatment inefficacy. Longitudinal follow-up would help clarify whether preventive therapy reduces disability over time.

Baseline comparisons between included and excluded records demonstrated significant differences in age and socioeconomic indicators, including employment and occupational grouping. Excluded patients were older and more likely to have incomplete socioeconomic data, reflecting differences related to registry completeness and diagnostic classification. These discrepancies suggest the potential for selection bias and may limit the generalizability of findings to the broader registry population.

Collectively, these findings have important implications for headache care delivery in the Philippines. The independent associations of

depression and anxiety with disability support routine integration of validated mental health screening tools into neurological assessments. Training primary care providers to recognize psychological comorbidity and adopting multidisciplinary, biopsychosocial management strategies, including pharmacologic prophylaxis, behavioral therapy, and stress-modifying interventions, may substantially reduce functional burden. Current international practice recommendations emphasize that treatment decisions should be guided not only by attack frequency but also by the broader personal and social impact of migraine, reinforcing the clinical relevance of systematic disability and mental health evaluation.[17]

In conclusion, in this cross-sectional analysis of Filipino patients with primary headache disorders, psychological distress was independently associated with greater functional impairment as measured by the Migraine Disability Assessment (MIDAS) scale. Both depressive and anxiety symptoms were independently associated with higher headache-related disability, with depression demonstrating the stronger effect after adjustment for demographic and clinical covariates.

Among headache phenotypes, migraine without aura and unspecified primary headache were associated with greater disability relative to migraine with aura in the adjusted model, while monthly headache days and other clinical covariates were not independently significant predictors. Overall, these findings support the view that headache-related disability reflects not only headache characteristics but also coexisting psychological distress.

These results highlight the need for a multidisciplinary, biopsychosocial approach to headache care in the Philippines. Routine assessment of depressive and anxiety symptoms may help clinicians better characterize the overall burden of disease and identify patients at higher risk of disability. Future research should prioritize longitudinal designs and interventional studies to clarify causal pathways and to evaluate whether targeted treatment of psychological comorbidity leads to sustained improvements in headache-related functional outcomes.

This study has several limitations. First, its cross-sectional design precludes causal inference and limits the ability to determine the temporal direction between psychological distress and headache-related disability. Second, a complete-case approach was employed: only 527 of 1,100 records (47.9%) were included in the final analysis. Although exclusions were primarily due to missing MIDAS data or the presence of secondary headache disorders, significant baseline differences were observed between included and excluded cases, particularly in age and socioeconomic indicators. These differences suggest the potential for selection bias and may affect the generalizability of the findings.

Third, key variables—including headache-related disability and psychological symptoms—were self-reported, introducing the possibility of recall bias and shared method variance. Fourth, the registry is based on neurology specialty settings and may not fully represent patients managed in primary care or community contexts. Finally, several potentially relevant covariates (e.g., sleep disturbance, medication overuse, and other psychosocial stressors) were not systematically captured in the registry. Residual confounding, including confounding by indication for prophylactic therapy, therefore cannot be excluded.

As for recommendations, the findings of this study support an integrated, biopsychosocial model of headache care. Routine screening for depression and anxiety using brief validated tools should be incorporated into standard headache evaluation, with clear referral pathways for psychological or psychiatric support when indicated. Given the independent association of psychological distress with disability, mood assessment and management should be considered a core component of headache care.

Clinical management should aim to improve both symptoms and function through optimized acute and preventive therapies, supplemented by evidence-based behavioral interventions (e.g., cognitive behavioral therapy and stress-management strategies). Clinicians should monitor disability outcomes (e.g., MIDAS or similar measures) alongside attack frequency to guide treatment escalation and identify patients who may benefit from multidisciplinary care, including workplace or school accommodations when functional impairment is substantial.

Future longitudinal studies and pragmatic trials should evaluate whether integrated care and targeted treatment of psychological distress lead to sustained reductions in headache-related disability, while incorporating additional drivers such as sleep disturbance, medication overuse, coping strategies, and social support, and standardizing outcomes (e.g., MIDAS, HIT-6) for benchmarking across Filipino cohorts.

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REFERENCES

1. World Health Organization. (2024). Migraine and other headache disorders. Retrieved from https://www.who.int/news-room/fact-sheets/detail/headache-disorders
2. Meng W, Sui L. Headache disorders: A persistent public health challenge for the under 50s. *Front Neurol* 2024; 15: 1501749. https://doi.org/10.3389/fneur.2024.1501749
3. Haw NJ, Cabaluna IT, Kaw GE, Cortez JF, Chua MP, Guce K. A cross-sectional study on the burden and impact of migraine on work productivity and quality of life in selected workplaces in the Philippines. *J Headache Pain* 2020;21(1):125. doi:10.1186/s10194-020-01191-6.
4. Roxas AA Jr, Quiles LE, Diamante PA. The practice patterns of migraine management among neurologists in the Philippines - A cross-sectional survey. *Neurol Asia* 2022;27(3):717-24. doi:10.54029/2022azf.
5. Soares AA, Fortes YML, Souza WPO, Silva-Néto RP. Questionnaires used to assess the quality of life of patients with headache disorders: An integrative review. *Headache Med* 2024; 15(3): 123-30. https://doi.org/10.48208/HeadacheMed.2024.27
6. Minen MT, Begasse De Dhaem O, Kroon Van Diest A, *et al*. Migraine and its psychiatric comorbidities. *J Neurol Neurosurg Psychiatry* 2016; 87: 741-9. https://doi.org/10.1136/jnnp-2015-312233
7. Murphy C, Ladak A, Szperka CL, *et al.* Anxiety, depression, and headache-related disability in a large pediatric clinic-based sample. *Headache* 2025; 65(3): 420-9. https://doi.org/10.1111/head.14849
8. McCracken HT, Lee AA, Smitherman TA. Headache and psychological variables as predictors of disability in individuals with primary headache disorders. *Headache* 2023; 63(9):1259-70. https://doi.org/10.1111/head.14633
9. Lillis J, Thomas JG, Lipton RB, *et al.* The association of changes in pain acceptance and headache-related disability. *Ann Behav Med* 2019;53(7):686-90. doi:10.1093/abm/kay076.
10. Hans A, Stonnington CM, Zhang N, Butterfield R, Friedman DI. The impact of resilience on headache disability as measured by the Migraine Disability Assessment (MIDAS). *Headache* 2023;63:743-50. doi:10.1111/head.14518.
11. GBD 2023 Headache Collaborators. Global, regional, and national burden of headache disorders, 1990–2023: a systematic analysis for the Global Burden of Disease Study 2023. *Lancet Neurol* 2025;24:1005-15. doi: 10.1016/S1474-4422(25)00402-8.
12. Rossi MF, Tumminello A, Marconi M, *et al.* Sex and gender differences in migraines: a narrative review. *Neurol Sci* 2022;43:5729-34. doi:10.1007/s10072-022-06178-6.
13. Saffari TM, Kavanagh K, Ormseth B, Palettas M, Janis JE. Severe obesity is associated with increased migraine severity and frequency: a retrospective cohort study. *J Clin Neurosci* 2023;115:8-13. doi:10.1016/j.jocn.2023.07.007.
14. Hatami M, Soveid N, Lesani A, Djafarian K, Shab-Bidar S. Migraine and obesity: is there a relationship? A systematic review and meta-analysis of observational studies. *CNS Neurol Disord Drug Targets* 2021;20:1–8. doi:10.2174/1871527320666210713114840.
15. Kumar A, Kadian R. Migraine prophylaxis. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 [updated 2023 Aug 28].
16. Jaminola L III, Negre JM, Pepito VCF, Loreche AM, Dayrit MM. The policy environment of self-care: a case study of the Philippines. *Health Policy Plan* 2023;38:205–217. doi:10.1093/heapol/czac095.
17. Puledda F, Sacco S, Diener HC, *et. al.* International Headache Society global practice recommendations for preventive pharmacological treatment of migraine. *Cephalalgia* 2024;44(9): 3331024241269735. doi: 10.1177/03331024241269735.
18. Sarkar AK, Ghanbarian E, Fanning KM, *et al.* Impact of anxiety and depression on migraine-related disability: results from the Headache Assessment via Digital Platform in the United States (HeAD-US) study. *Clin Neurol Neurosurg* 2025;258:109172. doi:10.1016/j.clineuro.2025.109172.
19. Pearl TA, Dumkrieger G, Chong CD, Dodick DW, Schwedt TJ. Impact of depression and anxiety symptoms on patient-reported outcomes in patients with migraine: results from the American Registry for Migraine Research (ARMR). *Headache* 2020;60:1–10. doi:10.1111/head.13911.
20. Duan S, Ren Z, Xia H, *et al*. Associations between anxiety, depression with migraine, and migraine-related burdens. *Front Neurol* 2023;14:1090878. doi:10.3389/fneur.2023.1090878.

Supplementary Table 1. Clinical characteristics of patients			
Variable	**Category**	**n**	**%**
Type of Primary Headache	Migraine with Aura	116	22.01
	Migraine without Aura	173	32.83
	Tension Type Headache	117	22.20
	Unspecified Primary Headache	121	22.96
Headache Severity	Even more pain	130	24.86
	Little bit pain	13	2.66
	Little more pain	62	11.95
	Much more pain	259	49.34
	No pain	1	0.19
	Worst pain	57	11.01
	Missing	5	0.94
Use of Prophylactic Medications	Tried prophylaxis	97	18.41
	No medications	430	81.59
Health Seeking Behavior	Consult MD	62	11.77
	Self-medication	383	72.68
	Nothing	50	9.49
	Others	31	5.88
	Missing	1	0.19

Supplementary Table 2: Distribution of headache-related disability (MIDAS Categories)			
Variable	**Category**	**n**	**%**
MIDAS	Little/No disability	276	52.37
	Mild	115	21.82
	Moderate	71	13.47
	Severe	65	12.33
Anxiety	Normal Anxiety	380	72.11
	Borderline Anxiety	68	12.90
	Probable Anxiety	79	14.99
Depression	Normal Depression	428	81.21
	Borderline Depression	54	10.25
	Probable Depression	45	8.54