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BRIEF REPORT

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Filling the data gap on CGRP mAb therapy in low- to middle-income countries in Southeast Asia: insights from a real-world study in Thailand

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Abstract

Background Most real-world data on CGRP mAbs have been published from high-income countries such as the USA, Western countries, Japan, Korea, and Singapore. However, data from low- and middle-income countries in Southeast Asia is lacking. This is the first real-world study from Thailand to describe the efficacy of CGRP mAbs therapy in migraine patients and to analyze the response trends between episodic migraine and chronic migraine.

Methods We conducted a single-center, real-world retrospective chart review study with an observation period of 6 months after CGRP mAbs initiation. We aim to compare treatment responses to CGRP mAbs between EM and CM patients.

Results A total of 47 Thai patients were enrolled (median [IQR] age 37.2 [28.6–50.4] years; 85.1%F, 44.7% EM; 70.2% galcanezumab). There was no difference in baseline characteristics and migraine disability assessment (MIDAS) between EM and CM. The overall ≥ 30%, ≥ 50%, and ≥ 70% monthly migraine day reduction rates at 6 months were 89.0%, 71.6%, and 58.5% with higher responders in EM. There was a significant decrease in monthly headache days (MHDs) over time (adjusted $\beta = -0.42$, $p < 0.001$) and a significant decrease in MIDAS score over time after the initiation of CGRP mAbs (adjusted $\beta = -1.12$, $p = 0.003$). However, there were no differences between the two diagnoses. There was no significant decrease in the number of abortive medication pills used over time after the initiation of CGRP mAbs. CM had a significantly steeper trend compared to those with EM.

Conclusion The first real-world study in Thailand demonstrated that CGRP mAbs therapy had efficacy for migraine treatment, as evidenced by a reduction in MHDs, decreased disability, and reduced use of abortive medications. Additionally, the response pattern to CGRP mAbs therapy was similar between EM and CM in terms of MHDs reduction and MIDAS score improvement.

Keywords CGRP mAbs, Migraine, Treatment response, Real-world data, Low-middle-income counties, Thailand

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Introduction

Migraine is a common primary headache disorder characterized by a unilateral, moderate to severe throbbing headache that disrupts physical activities. Accompanying symptoms often include nausea, vomiting, photophobia, and phonophobia, impacting individuals on personal, social, and economic levels. Migraine is the second most common cause of disability, accounting for 45.1 million years lived with disability (YLD) globally, representing 5.6% of the global disease burden [1]. In Thailand, the overall prevalence of migraine from the community-based survey in Bangkok slum in 1991 was 29.1%, and 32.5% of migraine patients experienced loss of workdays [2]. From this study, the prevalence declined with increasing age and in women. We still lack further updated epidemiological migraine data in Thailand. According to the International Classification of Headache Disorders, 3rd edition (ICHD-3), migraine patients can be classified by the frequency of headache into two groups: episodic migraine (EM), and chronic migraine (CM) [3].

Calcitonin gene-related peptide (CGRP) is a neuropeptide that plays a role in the pathophysiology of migraine. It is elevated during a migraine attack, which has been observed in patients' blood, cerebrospinal fluid, and saliva. Recently, CGRP-targeted therapy has been approved to prevent migraine, including inhibiting CGRP either through its receptor or ligand. It is well established that monoclonal antibodies targeting CGRP (CGRP mAbs), either by inhibiting the receptor, such as erenumab, or by inhibition through the CGRP ligand, such as galcanezumab, fremanezumab, and eptinezumab, have shown strong evidence for the prevention of migraine headaches. This is supported by randomized controlled trials and real-world studies from various countries. CGRP mAbs have been endorsed for migraine prevention in the guidelines of the European Headache Federation in 2022 and the American Headache Society in 2024 [4, 5]. The first CGRP mAbs, erenumab, have been available in Thailand and approved by the Thai Food and Drug Administration (FDA) for migraine prophylaxis in Thailand since 2019. However, most of Thai patients cannot reimburse the CGRP-based treatment from either public coverage or private insurance. Most real-world data on CGRP mAbs have been published from Western countries or other high-income countries in Asia such as Japan, Korea, and Singapore [6–10]. However, data from low- and middle-income countries is lacking, and the response of migraine patients may differ from those in high-income countries.

Therefore, this is the first real-world study from Thailand to describe the efficacy of CGRP mAbs therapy in migraine patients. This study aimed to demonstrate the efficacy of CGRP mAbs in Thailand six months after administration in our clinic setting and to highlight the response patterns between EM and CM.

Method

Study participants

A retrospective electronic chart review study was conducted on migraine patients who attended the comprehensive headache and orofacial pain (CHOP) clinic at King Chulalongkorn Memorial Hospital (KCMH), The Thai Red Cross Society, Bangkok, Thailand, between January 2019 and September 2023. The clinic operates two headache clinic sessions and one orofacial pain clinic session per week, estimated serving over 2,500 visits annually. Our CHOP clinic provided the CGRP mAbs clinic comprised of subcutaneous and intravenous injections as well as the interventional clinic for headache patients requiring interventional treatments such as onabotulinumtoxin A injection and peripheral nerve blocks. However, intravenous CGRP mAbs were not included in this study due to their pending approval by the Thai Food and Drug Administration during the study period.

Patients were included in the study if they were diagnosed with migraine by headache-specialized neurologists according to the diagnostic criteria of the ICHD-3 [3] and were newly treated with one of the available CGRP mAbs comprised of galcanezumab, fremanezumab, and erenumab for at least 6 months. The CGRP mAbs therapy was applied following the Thai migraine guideline, which recommends CGRP mAbs for patients with migraine who have at least 8 migraine days per month and show insufficient effectiveness or intolerance to at least two classes of conventional oral migraine preventatives for at least 6 weeks, including tricyclic antidepressants, antiseizure medication, beta-blockers, calcium channel blockers [11]. Patients whose data were unavailable for at least 6 months of CGRP mAbs treatment were excluded.

Ethical approval

This study was approved by the Institutional Review Board Research Ethics Committee (IRBREC) of the Faculty of Medicine, Chulalongkorn University, Bangkok, and KCMH in October 2023 (IRB number 706/2023). The approval of retrieving retrospective data from electronic medical records (EMR) was made and informed consent was waived by IRBREC. All methods were carried out following relevant guidelines and regulations.

Regimens for CGRP mAbs

Options for CGRP mAbs included galcanezumab, fremanezumab, erenumab. For galcanezumab, a loading dose of 240 mg was administered subcutaneously in the first month, followed by a monthly dose of 120 mg. For

fremanezumab, patients received either 225 mg monthly or 675 mg quarterly, administered subcutaneously. Erenumab was administered subcutaneously at a dose of 70 mg monthly. These protocols followed the FDA approval dose for migraine prevention [12].

Clinical evaluation and outcomes

The patient needed to follow up monthly with headache specialists at our clinic to evaluate the clinical data and refill the medications. We collected information on demographic characteristics, comorbidities, headache characteristics, baseline headache days, and both prior and current abortive and preventive drugs, including the type and number of pills at baseline. Patients were instructed to fill out a paper-based daily headache diary recording duration, severity, associated symptoms, and the type and number of abortive medication pills used. All headache diaries were submitted to the physicians at every visit and uploaded into the EMR for review. Patients were also asked to complete the Thai version of Migraine Disability Assessment (MIDAS) questionnaire at the initiation of CGRP mAbs therapy [13], and again at the 3rd and 6th months following the start of therapy. Medication-overuse headache (MOH) was defined according to the ICHD-3 criteria [3].

The primary endpoints were the ≥50% responder rates, defined as achieving at least a 50% reduction in headache days, in the 3rd and 6th months. Secondary endpoints include the ≥30% and ≥75% responder rates at the 3rd and 6th months, changes in monthly headache days (MHDs), MIDAS score, and the number of abortive medications pills used per month from baseline to the 3rd and 6th months. Additionally, we investigated the effect of CGRP mAbs in each subtype of migraine, including EM and CM, in terms of MHDs change, responder rates, MIDAS score change, and abortive medication pills per month.

Statistical analysis

Demographic characteristics, comorbidities, headache characteristics, and information on medication use were summarized as median (interquartile range [IQR]) and number (percentage) for categorical variables. Characteristics were compared between patients with EM and CM using a Wilcoxon rank-sum test and Chi-square or Fisher's exact test as appropriate. Kaplan-Meier plots were used to show the proportion of ≥30%, ≥50%, and ≥75% responders, and a log-rank test was used to determine the differences between EM and CM. Linear mixed-effects models built on the type of diagnosis (i.e., EM or CM) and months after CGRP mAbs initiation were utilized to estimate the changes in clinical outcomes after CGRP mAbs initiation. These outcomes included MHDs, MIDAS score, and number of abortive medication pills used. Statistical significance was defined as p of <0.05. All analyses used Stata 17.0 (Stata Corp, College Station, TX).

Results

Participants characteristics

Among 47 patients enrolled (median [IQR] age of 37.2 (28.6–50.4) years and 40 [85.1%] were women, 21 (44.7%) were diagnosed with EM and 26 (55.3%) were diagnosed with CM, with 14 (29.7%) had a history of MOH (Table 1). The most common comorbidities were myofascial pain syndrome (36.2%), major depressive disorder (17.0%), and anxiety disorder (12.7%). Galcanezumab, erenumab, and fremanezumab were administered to 33 (70.2%), 11 (23.4%), and 3 (6.3%) patients, respectively. Median MIDAS score at enrollment was 24.0 (10.0–50.4). There was no difference in baseline characteristics between patients with EM and those with CM except for the median number of preventive medications ($p=0.01$).

Responder rates after CGRP mAbs initiation

The proportion of overall responders increased over time in all three responder rate measurements: from 83.5% by month 3 to 89.0% by month 6 for those achieving a ≥30% reduction in MHDs (Fig. 1A), from 65.3% to 71.6% for a ≥50% reduction (Fig. 1B), and from 38.9% to 58.5% for a≥75% reduction (Fig 1C).

There were significant differences in the proportion of responders between patients with EM and CM. As expected, patients with EM had a higher responder rate than those with CM: 95.2% vs. 73.6% by month 3 and 95.2% vs. 86.8% by month 6 for a ≥30% reduction in MHDs ($p = 0.03$), 85.7% vs. 48.0% by month 3 and 90.5% vs. 55.5% by month 6 for a ≥50% reduction ($p = 0.005$), and 42.9% vs. 35.9% by month 3 and 73.8% vs. 42.9% by month 6 for a ≥75% reduction ($p = 0.049$).

Effect of CGRP mAbs on MHDs

Overall, there was a significant decrease in MHDs over time after the initiation of CGRP mAbs (adjusted β = -0.42, 95%CI -0.61 to -0.23, $p<0.001$). However, there were no significant differences in the trend of changes in MHDs between the two diagnoses. For patients with EM, there was a reduction in MHDs from 10.3 (95%CI 8.5 to 12.5) at baseline to 5.0 (95%CI 3.0 to 7.0) at month 3 and 4.5 (95%CI 2.7 to 6.3) at month 6 post-CGRP mAbs (Fig. 2A), corresponding to a mean reduction of -6.9 (95%CI -5.0 to -8.7) at month 3 and −8.5 (95%CI -4.5 to -12.4) at month 6 post-CGRP mAbs (Fig. 3A). For patients with CM, there was a reduction from 19.9 (95%CI 17.2 to 22.6) at baseline to 15.3 (95%CI 11.7 to 18.9) at month 3 and 17.2 (95%CI 10.3 to 24.1) at month 6 post-CGRP mAbs (Fig. 2B), corresponding to a mean

Table 1 Demographic and clinical characteristics of study participants

	All patients	Episodic migraine (EM)	Chronic migraine (CM)	*p*
Number of patients	47	21	26	
Age (years)	37.2 (28.6, 50.4)	41.7 (31.0, 49.9)	35.1 (23.7, 50.4)	0.35[a]
Female	40 (85.1%)	20 (95.2%)	20 (76.9%)	0.11[b]
Type of CGRP mAbs				0.61[b]
- Galcanezumab	33 (70.2%)	15 (71.5%)	18 (69.2%)	
- Erenumab	11 (23.4%)	4 (19.0%)	7 (27%)	
- Fremanezumab	3 (6.3%)	2 (9.5%)	1 (3.8%)	
Monthly headache days at baseline	12.5 (8, 21)	9 (8, 10)	20 (14, 28)	< 0.01
MIDAS	24 (10, 58)	22 (14, 31)	30 (5, 90)	0.26[a]
Comorbidities				
- Major depressive disorder	8 (17%)	1 (4.7%)	7 (26.9%)	0.06[b]
- Anxiety	6 (13%)	2 (9.5%)	4 (15.4%)	0.55[c]
- Myofascial pain syndrome	17 (36%)	9 (42.8%)	8 (30.8%)	0.39[c]
- Fibromyalgia	2 (4%)	0 (0%)	2 (7.7%)	0.50[b]
- Insomnia	4 (9%)	1 (4.7%)	3 (11.5%)	0.62[b]
Number of preventive medications	1 (0, 3)	0 (0, 1)	2 (1, 3)	0.01[a]
Types of preventive medication				
Tricyclic antidepressants[d]	11 (23%)	3 (14.3%)	8 (30.8%)	0.30[b]
Beta blockers[e]	8 (17%)	4 (19.0%)	4 (15.4%)	> 0.99[b]
Antiseizure medications[f]	11 (23%)	2 (9.5%)	9 (34.6%)	0.08b
Calcium channel blockers[g]	5 (11%)	0 (0%)	5 (19.2%)	0.06[b]

All continuous data is presented as median (IQR). All categorical data is presented as number (percentage)

[a] Wilcoxon rank-sum test

[b] Fischer's exact test

[c] Pearson's Chi-squared test

[d] Amitriptyline or nortriptyline

[e] Metoprolol or propranolol

[f] Topiramate or valproic acid

[g] Flunarizine or cinnarizine

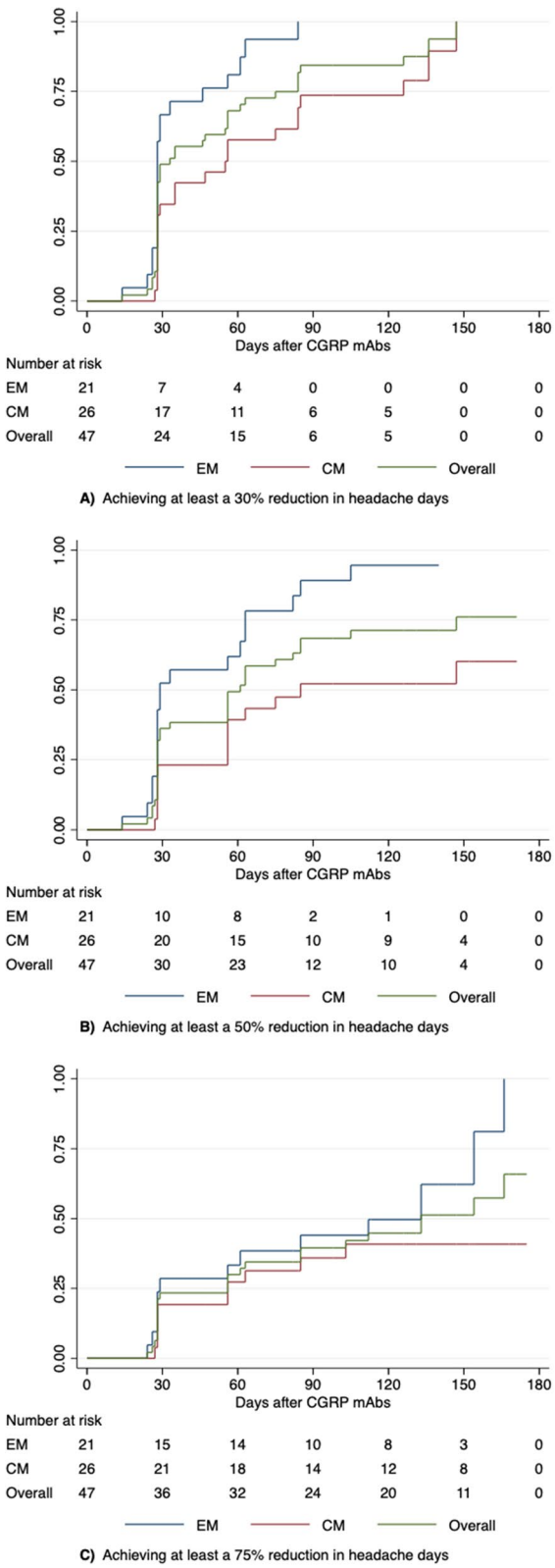
reduction of -5.5 (95%CI -1.7 to -9.3) at month 3 and −5.7 (95%CI 0.9 to -12.3) at month 6 post-CGRP mAbs (Fig. 3B).

Effect of CGRP mAbs on MIDAS score

Overall, there was a significant decrease in MIDAS score over time after the initiation of CGRP mAbs (adjusted β = -1.12, 95%CI -0.39 to -1.84, $p = 0.003$). However, there were no significant differences in the trend of changes in MIDAS scores between the two diagnoses. For patients with EM, there was a reduction from 21.8 (95%CI 13.6 to 30.0) at baseline to 5.4 (95%CI 0.6 to 10.2) at month 3 and 3.5 (95%CI -0.1 to 7.1) at month 6 post-CGRP mAbs (Fig. 4A), corresponding to a mean reduction of -17.9 (95%CI -8.6 to -27.1) at month 3 and −19 (95%CI -5.8 to -32.2) at month 6 post-CGRP mAbs (Fig. 5A). For patients with CM, there was a reduction from 42.3 (95%CI 25.0 to 59.6) at baseline to 23.0 (95%CI 5.2 to 40.8) at month 3 and 19.2 (95%CI -6.6 to 44.9) at month 6 post-CGRP mAbs (Fig. 4B), corresponding to a mean reduction of -24.4 (95%CI 0.8 to -49.6) at month 3 and −18.6 (95%CI 6.5 to -43.6) at month 6 post-CGRP mAbs (Fig. 5B).

Effect of CGRP mAbs on the number of abortive medication pills used

Overall, there was no significant decrease in the number of abortive medication pills used over time after the initiation of CGRP mAbs (adjusted β = -0.25, 95%CI -0.67 to 0.17, $p = 0.24$). However, patients with CM had a significantly steeper trend compared to those with EM. For patients with EM, there was a reduction from 13.7 (95%CI 7.8 to 18.7) at baseline to 9.0 (95%CI 3.0 to 15.0) at month 3 and 8.4 (95%CI 1.9 to 14.8) at month 6 post-CGRP mAbs (Fig. 6A), corresponding to a mean reduction of -4.6 (95%CI −12.4 to 3.3) at month 3 and −4.3 (95%CI -12.0 to -3.4) at month 6 post-CGRP mAbs (Fig. 7A). For patients with CM, there was a reduction



◀ **Fig. 1** Kaplan-Meier plots showing the proportion of responders among overall migraine patients (green line), episodic migraine patients (blue line), and chronic migraine patients (orange line) over the observation periods (6 months): (**A**) ≥ 30% responder rate, (**B**) ≥ 50% responder rate, and (**C**) ≥ 75% responder rate

from 21.4 (95%CI 12.9 to 30.0) at baseline to 10.9 (95%CI 3.6 to 18.2) at month 3 and 17.4 (95%CI 6.2 to 28.5) at month 6 post-CGRP mAbs (Fig. 6B), corresponding to a mean reduction of -11.1 (95%CI -2.5 to -19.6) at month 3 and −20.2 (95%CI -7.9 to -32.5) at month 6 post-CGRP mAbs (Fig. 7B).

Discussion

Our study showed the efficacy of CGRP mAbs in migraine patients in our single-center, real-world study over 6 months in Thailand. The main findings of our study were as follows: (1) CGRP mAbs demonstrated clinically significant ≥ 30%, ≥ 50%, and ≥ 75% response rates at 3 and 6 months, with a greater effect on episodic migraine (EM) than on chronic migraine (CM); (2) CGRP mAbs significantly reduced MHDs from month 1 to month 6 in overall migraine patients, as well as in both EM and CM patients; (3) CGRP mAbs significantly improved migraine disability scores, as assessed by the MIDAS score, at 3 and 6 months; (4) Abortive medication use was reduced during CGRP administration from month 1 to month 6. Additionally, our study showed that the rate of change (trend) in MHDs and MIDAS scores was not different between EM and CM patients. However, the trend in abortive medication use differed between EM and CM, with CM patients showing a greater decrease in abortive medication use compared to EM patients. This effect might result from the larger number of abortive medications used in CM before the initiation of anti-CGRP treatment.

In our study, among the three CGRP mAbs, galcanezumab was the most frequently used due to cost considerations. In Thailand, CGRP therapy is not covered by public health coverage or private health insurance; therefore, cost is a major concern for nearly all patients who are self-payers. Among the three CGRP mAbs in our study, galcanezumab is the least expensive (~$4,007 per year), which explains its frequent use at our center, compared to fremanezumab and erenumab, which costs approximately $4,762 per year. In contrast, the costs of galcanezumab, fremanezumab, and erenumab in the USA and Canada are $7,603, $8,143, and $8,598 per year, respectively [14]. Despite the significantly lower price of CGRP mAbs in Thailand, the gap in adjusted net national income per capita remains considerable (Thailand vs. USA: $5,403 vs. $59,006, according to

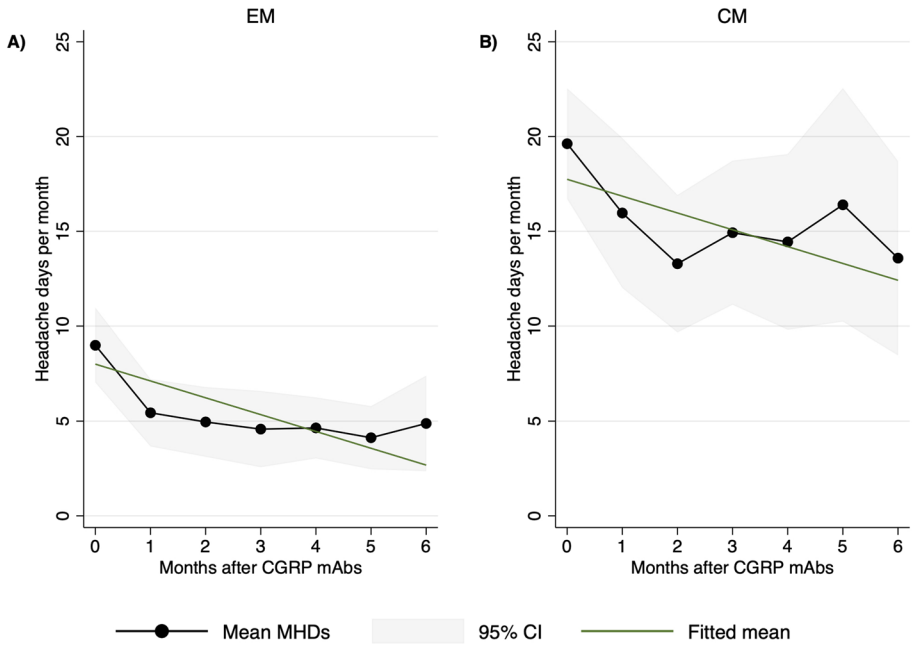


Fig. 2 Changes in monthly headache days in episodic migraine (EM) (**A**) and chronic migraine (CM) (**B**) from baseline to six months after CGRP mAbs treatment

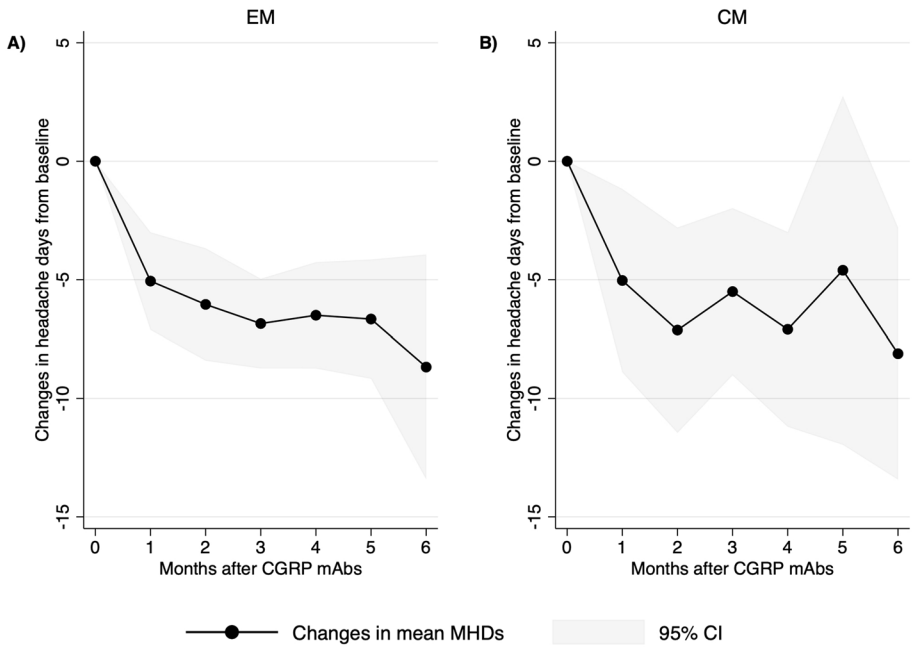


Fig. 3 Changes in monthly headache days in relation to baseline in episodic migraine (EM) (**A**) and chronic migraine (CM) (**B**) from baseline to six months after CGRP mAbs treatment

World Bank data in 2021). Consequently, only a few patients are currently treated with CGRP mAbs in Thailand, even within a tertiary care university hospital setting. This highlights the disparity and inequity of headache treatment between low- and middle-income countries and high-income countries. In conclusion, patients in low- and middle-income countries often experience 'underuse' of these medications due to various factors, including unaffordable new standard treatments, underutilization, intolerable/failed conventional

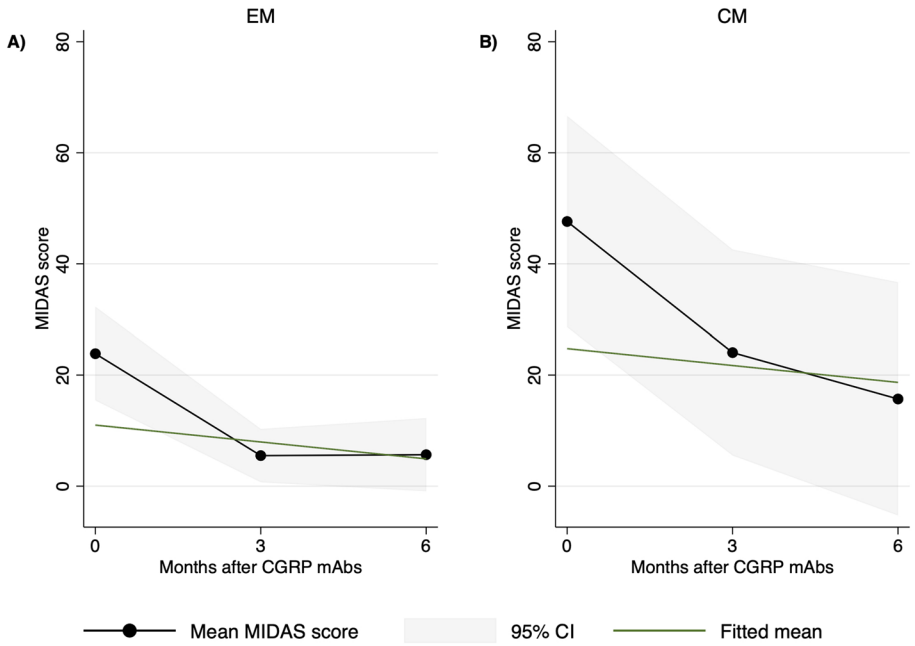


Fig. 4 Changes in MIDAS score in episodic migraine (EM) (**A**) and chronic migraine (CM) (**B**) from baseline to six months after CGRP mAbs treatment

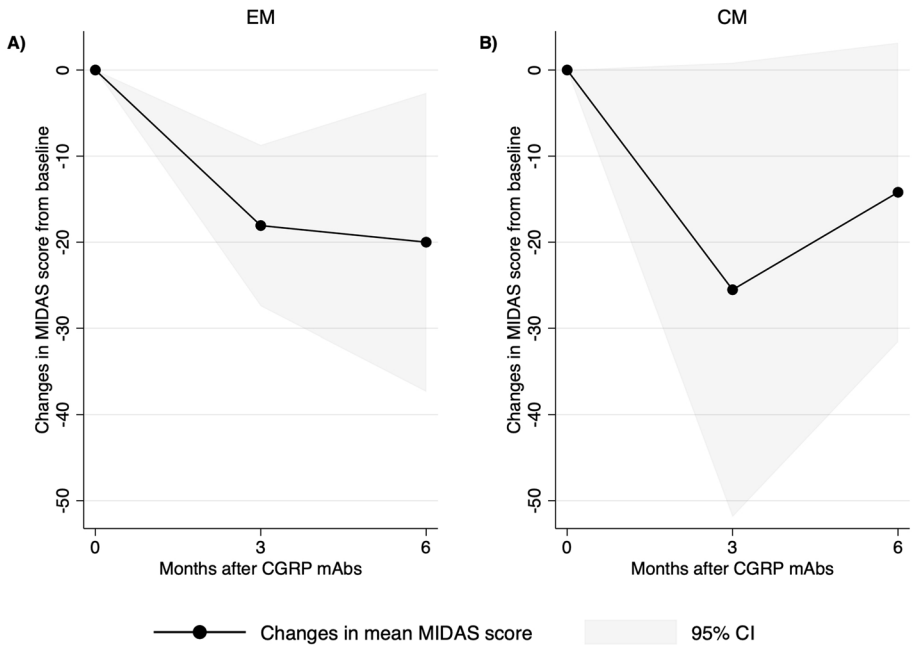


Fig. 5 Changes in MIDAS score in relation to baseline in episodic migraine (EM) (**A**) and chronic migraine (CM) (**B**) from baseline to six months after CGRP mAbs treatment

prophylactic medications, and delayed initiation of CGRP-based therapy [14, 15].

According to real-world CGRP studies in the Asian population, such as those conducted in Japan and Korea, the ≥ 50% responder rate in migraine patients is reported as 44.2–55.7% at 3 months and 61.0% at 6 months. In the EM group, the ≥ 50% responder rate is 54.5–66.3% at 3 months and 81.0% at 6 months. In the CM group, the ≥ 50% responder rate is 39.3–41.5% at 3 months and 49.0% at 6 months [8–10, 16, 17]. In comparison

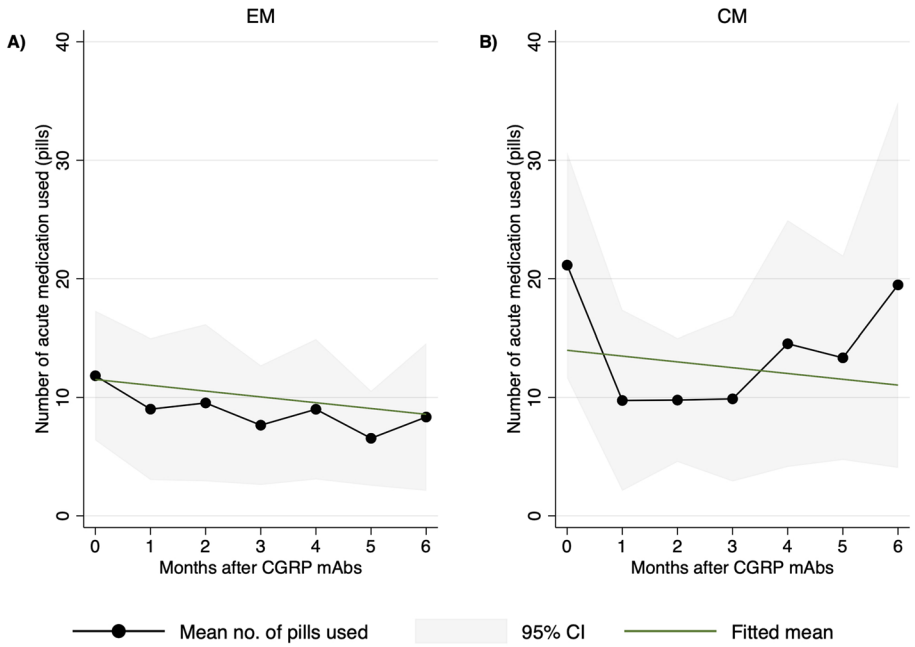


Fig. 6 Changes in the number of abortive medication pill used in episodic migraine (EM) (**A**) and chronic migraine (CM) (**B**) from baseline to six months after CGRP mAbs treatment

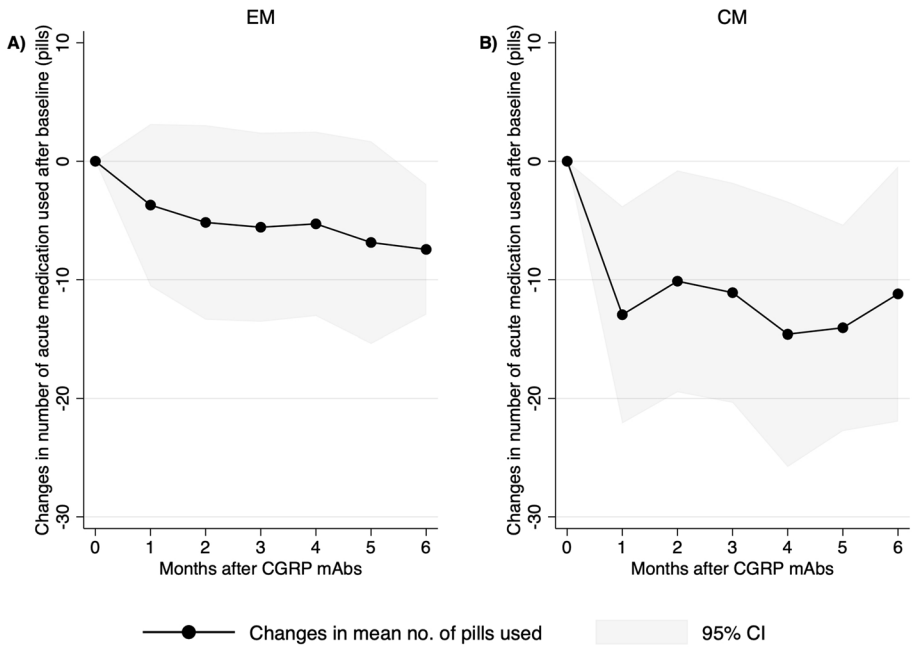


Fig. 7 Changes in the number of acute abortive pill used in relation to baseline in episodic migraine (EM) (**A**) and chronic migraine (CM) (**B**) from baseline to six months after CGRP mAbs treatment

with our study, there is a slightly higher proportion of ≥ 50% responder rates at 3 months and 6 months in both overall and subpopulations compared to previous Asian real-world data. We propose that the higher proportion of EM patients in our study—nearly half of the population—contributes to this difference, and we also encountered selection bias related to the cost of CGRP mAbs initiation. Predictors of a good response to CGRP mAbs therapy included fewer baseline MHDs or monthly migraine days, fewer previously failed prophylactic

medications, and the absence of comorbid MOH [18, 19]. Our study demonstrates a higher proportion of ≥50% responder rates compared to previous studies, likely because our participants had fewer baseline MHDs, fewer previously failed prophylactic medications, and a lower proportion of MOH compared to those in earlier real-world studies of the Asian population. Our study demonstrates a higher proportion of ≥50% responder rates compared to previous studies, likely because our participants had fewer baseline MHDs, fewer previously failed prophylactic medications, and a lower proportion of MOH compared to those in earlier real-world studies of the Asian population. In comparison with a similar middle-income country like Thailand, a Brazilian study that included 104 migraine patients (EM 62 vs. CM 42) reported a ≥50% responder rate of 57.7% at 3 months, which is slightly lower than in our cohort. This difference might result from the higher proportion of CM and MOH in the Brazilian cohort compared to ours [20].

Interestingly, our study showed conflicting results with the real-world data in Asia. While data from Korea indicated that CM is a predictor of a poor response to CGRP mAbs therapy [17], we found no difference in the rates of decreased monthly headache days (MHDs) and MIDAS scores in Thailand. This discrepancy may be because our CM group had less severe symptoms compared to the populations in previous real-world studies [16, 17]. Additionally, our study showed that the use of abortive medication pills after CGRP mAbs therapy in the CM group tended to decrease more compared with the EM group. This suggests that CGRP mAbs therapy is substantially beneficial for CM, which often has comorbidity with MOH. Therefore, the decreased use of abortive medication indicates that both CM and MOH are being effectively treated [21, 22].

Our study had several strengths. This is the first real-world study of CGRP mAbs therapy from Thailand that describes the characteristics of CGRP mAbs therapy response in migraine patients, including both EM and CM patients. This reflects the realistic situation in low- and middle-income countries especially in the South-East Asian Population which might differ from the East Asian population or high-income Asia countries. Another strength of our study is that it is the first to employ a trending change method to compare treatment responses between EM and CM. This approach revealed that EM and CM might exhibit a similar trend in response to CGRP mAbs therapy.

Our study has some limitations. This study has a rather small number of patients, a single-center setting, a single ethnic group (Thai), and a short duration of follow-up data (only 6 months). Even with the rather short duration compared with the previous larger real-world data, we could still demonstrate the effect of the CGRP-based therapy in the very first months after initiation. In the resource-limited setting, we proposed that the shorter course of CGRP-based therapy followed by adjusting the prophylaxis regimen might be more applicable in clinical practice. However, this result and concept are needed to be confirmed in the larger population or the other study designs. Moreover, the outcomes of our real-world clinical study, including MHDs and abortive medication pills used, are slightly different from the previous studies using the monthly migraine days and abortive medication days as the outcomes. This resulted from the clinical case record form in our clinic by using the headache diaries. Thus, it might affect the interpretation and comparison with other studies. Therefore, we used linear mixed-effects models to estimate the changes in clinical outcomes after CGRP mAbs initiation and to compare the rate of decreased MHDs, MIDAS, and the number of abortive medication pills between the EM and CM groups. Our study was the retrospective EMR review design; therefore, we might face unintentionally missing data, selection bias, and recall bias. However, we have not found these issues during the data collection process. Lastly, we lack a record of minor adverse drug events in our clinical case record form. Although, we have not faced any serious adverse drug reactions from the CGRP-based treatment.

Despite the limitation, our real-world study in low- and middle-income countries settings demonstrates the variation in treatment response to CGRP mAbs among EM and CM. Interestingly, we found no difference in the rate of MHDs and MIDAS reduction between EM and CM. Our results support the idea that the 15-day threshold does not adequately reflect substantial differences across the full spectrum of headache frequency [23]. The low-frequency CM (15–23 headache days per month) and high-frequency EM (8–14 headache days per month) shared similar pain intensity, work productivity and activity impairment, pain interference, patient health questionnaire-4, and generalized anxiety disorder-7 except MIDAS [23]. We rigorously encouraged the investigators in the field to study the new cut-off by using the number of headache days per month to differentiate the spectrum of CM patients. Further external validation of this concept in the longer follow-up study or other well-designed research is warranted.

Conclusion

This 6-month real-world study, the first from Thailand, confirms the efficacy of CGRP mAbs for the prophylactic treatment of migraine patients with both EM and CM. Patients receiving CGRP mAbs showed a significantly higher proportion of those achieving the primary

endpoint of ≥50% response rates, as well as some secondary endpoints including ≥30% and ≥75% responder rates, reductions in MHDs, decreased MIDAS scores, and decreased use of abortive medications. The rate of decrease in MHDs and MIDAS scores did not differ between the EM and CM groups in Thailand, while the CM group showed a greater reduction in the rate of abortive medication use than the EM group. Moreover, the spectrum of low-frequency CM should be further studied.

Abbreviations

CGRP	Calcitonin gene-related peptide
CGRP mAbs	Calcitonin gene-related peptide monoclonal antibodies
CM	Chronic migraine
EM	Episodic migraine
EMR	Electronic medical records
ICHD-3	International Classification of Headache Disorders, 3rd edition
IQR	Interquartile range
MHDs	Monthly headache days
MIDAS	Migraine disability assessment
MOH	Medication-overuse headache
YLD	Years lived with disability

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Conflict of interest
Authors report no significant conflict of interest related to this topic.

Authors' contributions
All authors designed the study, conceptualized the study, and acquired the data. PA, AH, and TP drafted the manuscript for intellectual content, created the figures, analyzed data, and interpreted of data. WR and ST revised the manuscript for intellectual content.

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Availability of data and materials
The original data was kept with the first and corresponding author. Data could be shared upon request.

Declarations

Ethics approval and consent to participate
Approval was obtained from the ethics committee of Chulalongkorn University (IRB no. 706/2023). The procedures used in this study adhere to the tenets of the Declaration of Helsinki. The approval of retrieving retrospective data from electronic medical records (EMR) was made and informed consent was waived by IRBREC.

Competing interests
The authors declare no competing interests.

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