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Report

Identifying Factors Influencing the Interictal Burden of Migraine in Women

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To clarify the factors contributing to the interictal burden of migraine, we conducted a questionnaire survey among women with migraine. A questionnaire survey was conducted on the Internet of 400 women between the ages of 20 and 50 who tested positive on the migraine screener. The subjects were divided into a high burden group (n = 260) and a low burden group (n = 140) according to their Migraine Interictal Burden Scale-4 (MIBS-4) score. Using multivariate stepwise logistic regression analysis, we demonstrated that Headache Impact Test-6 (HIT-6) score, type of migraine, the causes of headaches (weather changes and anxiety) and Epworth sleepiness scale (ESS) score influenced to the interictal burden of migraine. Odds ratios of HIT-6 score, type of migraine, weather changes and anxiety in causes of headaches and ESS score were 3.669 (\leq 55 vs. \geq 56; 95% CI = 1.900 - 7.090), 2.327 (migraine without aura vs. migraine with aura; 95% CI = 1.300 - 4.168), 1.810 (yes vs. no; 95% CI = 1.086 - 3.015), 1.703 (no vs. yes; 95% CI = 1.009 - 2.874) and 1.625 (\leq 10 vs. \geq 11; 95% CI = 1.028 - 2.568), respectively. Our findings suggest that multiple factors independently contribute to the interictal burden of migraine.

Key words migraine, questionnaire, interictal burden, MIBS-4

INTRODUCTION

Migraine is a chronic headache characterized by repeated moderate to severe headache attacks lasting 4 to 72 hours.¹⁾ These attacks are accompanied by symptoms such as nausea, vomiting, photophobia, phonophobia, and osmophobia, and the headache is aggravated by daily activities.^{1,2)} It is also known that migraine patients experience disruptions in their daily life and social activities not only during headache attacks but also the interictal period.³⁾ During the interictal period, migraine patients experience a variety of disease-related symptoms, including cutaneous allodynia, cognitive impairment, photosensitivity, depression, anxiety, worry about the next migraine attack (interictal or anticipatory anxiety), and reduced health-related quality of life (QOL).3) These lead to a decrease in QOL of migraine patients. In recent years, it has become important to evaluate not only the degree of disruption in daily life caused by headaches to evaluate but also the burden during interictal periods in migraine patients.³⁾

Migraine triggers include various factors such as psychological factors (stress, fatigue, too much or too little sleep, etc.), endogenous factors (menstrual cycle), environmental factors (changes in weather and atmospheric pressure, smells, sounds, light, etc.), and dietary factors (hunger, alcohol, etc.). Migraine patients often have comorbid sleep disorders, which may affect the severity and chronicity of migraine.⁴⁾ Moreover, personality traits contribute to the pathogenesis of migraine.⁵⁾ However, there is little research on the factors that contribute to the interictal burden of migraines. If the factors involved in the interictal burden of migraines were revealed, it would contribute to elucidating the pathology and treatment. In this study, we conducted a questionnaire survey of women with migraine to clarify the contributing factors to the interictal burden of migraines.

MATERIALS AND METHODS

Questionnaire Study Using an internet research company (Cross Marketing Co., Ltd.), we conducted a survey targeting women in their 20s to 50s who had experienced headaches within the past three months. Moreover, to select 400 women with migraine, we used the ID migraine screener Japanese version,⁶ which included four items: headache exacerbation during daily activities, nausea, photophobia, and osmophobia, covering the previous 3 months. Based on a previous study by Lipton *et al.*,⁷ we assessed headache exacerbation during daily activities, nausea, photophobia and osmophobia and using the following criteria: "yes" was assigned to response of "less than half the time" or "half the time or more". Those who did not meet the criteria of migraine

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were considered to have other headaches. Participants who answered "yes" to at least two of four questions were considered to have migraines. Furthermore, migraineurs who answered "yes" to the question about visual aura symptoms were considered to have migraine with aura (MA), whereas all other migraines were classified as migraine without aura (MO). Migraine was evaluated according to the International Classification of Headache Disorders, Third Edition (ICHD-3).¹⁾

Request emails were sent to registered monitors (9,187 people), and 1581 people responded. We enrolled 400 women in their 20s to 50s, and the number of women in each age group was set to 100. A sample size of 400 was chosen to ensure that the sampling error remains within 5%. This study excluded people who testes negative on migraine screener, men, teenagers, and people over 60 years old. The response request email was sent on February 5, 2025, and the survey was discontinued on February 6, 2025, when the planned number of responses was reached. As a result, 400 samples were collected. The questionnaire was multiple choice and anonymous to protect the personal information of respondents. In addition to basic attributes, questions included "cause of headache," "impact of headache," "sleep situation," and "personality traits". This survey was conducted after obtaining approval from the Human Subject Research Ethics Committee of Teikyo Heisei University (approval number: 2024-120).

Measurement The HIT-6 was developed and validated to capture the impact of migraine on a patient's life and its associated disease burden.⁸) Its six items are scored on a five-point Likert scale, with higher scores indicating a more severe burden. The total score ranges from 36 to 78 and can be classified into little or no impact (\leq 49), some impact (50–55), substantial impact (56–59), and severe impact (\geq 60). The cut-off score for the HIT-6 was set at 56 to indicate that headaches have a significant impact on daily life: a score of 56 or higher indicates that headaches are likely to interfere with home, work, school, or social activities.

Daytime sleepiness was measured using the Japanese version of the Epworth Sleepiness Scale (ESS).⁹⁾ ESS score ≥ 11 was used as the cut-off point for ESS-defined daytime sleepiness.

Personality traits were measured using the Japanese version of the Ten-Item Personality Inventory (TIPI-J),¹⁰ which assesses the Big-Five personality dimensions: extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience. Each item was scored from 1 to 7 points, and the scores were summed. The TIPI-J has been validated and tested for reliability in Japan.¹¹

Primary Endpoint The MIBS-4 measures the interictal burden of migraine, i.e., the impact of migraine on a patient's life when they are not experiencing a migraine.¹²⁾ It has a recall period of 4 weeks and contains four items scored on a six-point Likert scale. The total score ranges from 0 to 12, with higher scores indicating a more severe interictal burden. The MIBS-4 total score indicates no interictal burden (0), mild (1–2), substantial (3–4), and severe (\geq 5) interictal burden.

In this study, all the subjects were classified into high burden (substantial and severe interictal burden) and low burden (no and mild interictal burden) groups according to their MIBS-4 score. The primary endpoint was the difference in background between the high-burden and low-burden groups.

Statistical Analysis Data are expressed as mean \pm stand-

ard deviation (SD) or number of respondents (%).We applied univariate analysis using Student's t-test for continuous variables, and χ^2 test for categorical variables. Some data on respondents' backgrounds were compared between high burden and low burden groups. Following this, multivariate stepwise logistic regression analysis was performed to identify independent factors associated with the interictal burden of migraine. Variables with values of p < 0.05 for univariate analysis were included in the multivariate model. Odds ratio and 95% confidence interval (CI) were calculated to evaluate the effects of different factors. P < 0.05 was considered significant. The statistical software used was Excel Statistics ver. 3.21 (Social Information Service).

RESULTS

Background of Respondents We enrolled 260 women in the high burden group and 140 in the low burden group (Table 1). Significant differences were found in the distribution of photophobia (p = 0.005) and osmophobia (p = 0.002) between the high and low burden groups (Table 1). Additionally, 35.4% of women in the migraine classification had MA (p < 0.001, Table 1). Many women also cited stress (p < 0.001) and anxiety (p < 0.001) as the cause of their headaches, and their HIT-6 scores were significantly high (p < 0.001, Table 1). Over 60% of women in both groups cited weather changes as the cause, but this was significantly higher in the low burden group (p = 0.008, Table 1).

Although there was no difference in sleep duration between the two groups, there were more women in the high burden group who had poor sleep quality (defined as an ESS score of 11 or higher) (p = 0.001, Table 2). No significant differences were found in personality traits between the two groups (Table 2).

Multivariate Analysis Table 3 shows the results of the logistic multivariate analysis using photophobia and osmophobia in migraine screener, type of migraine, the cases of headaches (stress, anxiety and weather changes), HIT-6 score and Epworth sleep scale. Logistic stepwise regression analysis identified the interictal burden of migraine HIT-6 score, type of migraine, weather changes and anxiety in causes of headaches and ESS score as significant factors that independently contributed to the interictal burden of migraine. Odds ratios of HIT-6 score, type of migraine, weather changes and anxiety in causes of headaches and ESS score were $3.669 (\leq 55 \text{ vs.} \geq 56; 95\% \text{ CI} = 1.900 - 7.090), 2.327 (MO vs. MA; 95\% \text{ CI} = 1.300 - 4.168), 1.810 (yes vs. no; 95\% \text{ CI} = 1.086 - 3.015), 1.703 (no vs. yes; 95\% \text{ CI} = 1.009 - 2.874) and 1.625 (\leq 10 vs. \geq 11; 95\% \text{ CI} = 1.028 - 2.568), respectively.$

DISCUSSION

Using multivariate stepwise logistic regression analysis, we demonstrated that HIT-6 score, type of migraine, the causes of headaches (weather changes and anxiety) and ESS score influenced to the interictal burden of migraine. In our study, respondents tested positive on the migraine screener, and women with migraine with aura accounted for 28.3%, which is similar to previous studies conducted in Japan.^{2,13} Since doctors do not conduct interviews or diagnoses, it is possible that headaches other than migraine may be included. Despite this, in the present study, women with migraine had the character-

Table 1. Clinical Characteristics of Respondents.

	Total 		High burden n=260		Low burden n=140		<i>p</i> value	
	n	%	n	%	n	%	_	
Age								
Mean \pm S.D.	39.9 ± 10.7		39.7 ± 10.9		40.4 ± 10.5		0.552	
Headache exacerbation during daily activities								
Never	42	10.5	22	8.5	20	14.3	0.060	
Rarely	42	10.5	22	8.5	20	14.3		
Less than half the time	234	58.5	160	61.5	74	52.9		
Half the time or more	82	20.5	56	21.5	26	18.6		
Nausea								
Never	50	12.5	29	11.2	21	15.0	0.518	
Rarely	74	18.5	49	18.8	25	17.9		
Less than half the time	207	51.8	133	51.2	74	52.9		
Half the time or more	69	17.3	49	18.8	20	14.3		
Photophobia								
Never	52	13.0	25	9.6	27	19.3	0.005	*
Rarely	47	11.8	29	11.2	18	12.9		
Less than half the time	209	52.3	135	51.9	74	52.9		
Half the time or more	92	23.0	71	27.3	21	15.0		
Osmophobia								
Never	91	22.8	48	18.5	43	30.7	0.002	*
Rarely	63	15.8	39	15.0	24	17.1		
Less than half the time	165	41.3	108	41.5	57	40.7		
Half the time or more	81	20.3	65	25.0	16	11.4		
Visual aura (flickering lights, spots or lines, and loss of vis	ion)							
Never	173	43.3	86	33.1	87	62.1	< 0.001	*
Rarely	114	28.5	82	31.5	32	22.9		
Less than half the time	90	22.5	74	28.5	16	11.4		
Half the time or more	23	5.8	18	6.9	5	3.6		
Type of migraine								
MA	113	28.3	92	35.4	21	15.0	< 0.001	*
МО	287	71.8	168	64.6	119	85.0		
Current treatment for headaches (multiple answers possib	ole)					-		
using over-the-counter drugs	269	67.3	171	65.8	98	70.0	0.390	
using prescription drugs	108	27.0	78	30.0	30	21.4	0.066	
no drugs used	52	13.0	33	12.7	19	13.6	0.803	
Causes of Headaches						-		
Stress	309	77.3	218	83.8	91	65.0	< 0.001	*
Anxiety	149	37.3	114	43.8	35	25.0	< 0.001	*
Lack of sleep	242	60.5	163	62.7	79	56.4	0.222	
Excessive sleep	62	15.5	39	15.0	23	16.4	0.707	
Menstruation	181	45.3	117	45.0	64	45.7	0.891	
Weather changes (changes in air pressure)	275	68.8	167	64.2	108	77.1	0.008	*
Noise	114	28.5	79	30.4	35	25.0	0.255	
Bright light	145	36.3	101	38.8	44	31.4	0.141	
Flashing lights	87	21.8	61	23.5	26	18.6	0.258	
Odors (bad smells, cigarettes, perfume, etc.)	129	32.3	90	34.6	39	27.9	0.168	
Crowds	139	34.8	90	34.6	49	35.0	0.939	
Other	27	6.8	16	6.2	11	7.9	(-)	
HIT-6 Score (36-78)							()	
Severe	282	70.5	214	82.3	68	48.6	< 0.001	*
Substanial (56-59)	65	16.3	29	11.2	36	25.7	01001	
Some (50-55)	37	93	15	5.8	22	15.7		
Little of no (≤ 49)	16	4.0	2	0.8	14	10.0		
$\frac{1}{\text{MIBS-4 Score (0-12)}}$	10			0.0	T 1	10.0		
Severe (≥ 5)	195	48.8	195	75.0	0	0.0	(-)	
Moderate (34)	65	16.3	65	25.0	0	0.0	()	
Mild (1.2)	51	12.8	0	0.0	51	36.4		
None (0)	89	22.3	0	0.0	89	63.6		
	07		~	0.0	07	05.0		

*:p<0.05, High burden group vs. Low burden group MA: migraine with aura, MO: migraine without aura

Table 2. Sleep Patterns and Personality Traits.

	Total n=400		High burden n=260		Low burden n=140		
							<i>p</i> value
	n	%	n	%	n	%	_
Average sleeping time							
Weekdays (hours, mean \pm S.D.)	6.3 ± 1.3		6.3 ± 1.3		6.3 ± 1.4		0.229
Weekend (hours, mean \pm S.D.)	7.2 ± 1.5		7.1 ± 1.5		7.2 ± 1.6		0.435
Epworth Sleepiness Scale							
Score (mean score \pm S.D.)	11.0 ± 5.7		11.8 ± 5.8		9.6 ± 5.3		<0.001 *
11 points or more (strong sleepiness during the day)	196	49.0	143	55.0	53	37.9	0.001 *
Personality traits							
Extraversion (mean score \pm S.D.)	3.2 ± 1.3		3.2 ± 1.3		3.3 ± 1.4		0.811
Agreeableness (mean score \pm S.D.)	4.6 ± 1.3		4.6 ± 1.2		4.6 ± 1.3		0.715
Conscientiousness (mean score \pm S.D.)	3.7 ± 1.4		3.7 ± 1.4		3.7 ± 1.4		0.854
Neuroticism (mean score \pm S.D.)	4.8 ± 1.2		4.8 ± 1.3		4.9 ± 1.2		0.842
Openness (mean score \pm S.D.)	3.4 ± 1.2		3.4 ± 1.2		3.3 ± 1.2		0.171

*:p<0.05, High burden group vs. Low burden group

Table 3.	Multivariate A	Analysis of	Factors Affecting	Interictal	Migraine	Burden.
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Variable	β	OR	95% Confidence interval	p value
HIT-6 score	1.300	3.669 ¹⁾	1.900-7.090	< 0.001
Type of migraine	0.845	2.3272)	1.300-4.168	0.005
Weather changes	0.593	1.810 ³⁾	1.086-3.015	0.023
Anxiety	0.517	1.7034)	1.009-2.874	0.046
Epworth Sleepiness Scale	0.485	1.6255)	1.028-2.568	0.038

MA: migraine with aura, MO: migraine without aura

OR, odds ratio = $\exp(\beta)$

 $^{1)} \leq 55 \text{ vs.} \geq 56$

²⁾ MO vs. MA

³⁾ yes vs. no

⁴⁾ no vs. yes ⁵⁾ ≤ 10 vs. ≥ 11

istics of general migraine patients. Additionally, the present study limited the age of the subjects to those in their 20s to 50s, the age at which migraines often occur, and was conducted over the Internet; thus, there may have been bias.

Hubig *et al.* demonstrated a moderate positive correlation between the burden of migraine attacks, as assessed by the HIT-6, and the interictal burden, as measured by the MIBS-4.¹²) They reported that patients who experience a greater impact during migraine attacks also tend to have a higher burden during the interictal period¹², which is consistent with the findings of this study. Sensory hypersensitivities commonly occur and overlap in patients with migraine and that multiple sensory hypersensitivity symptoms have a significant impact on headache-related disability.⁴) In fact, this study also found that the high burden group reported more cases of photophobia and osmophobia.

It has been reported that 26.0% of migraine patients experience burden during the interictal period, and 10.6% of patients feel anxiety.¹⁴⁾ It is known that interictal anxiety increases in proportion to the intensity and frequency of headaches.¹⁴⁾ Migraine patients often experience anxiety about not knowing when the next attack will occur. Similarly, the presence of aura can increase fear and anxiety about the next attack, resulting in a greater psychological burden. Therefore, it is speculated that for these reasons, the proportion of MA and portion of patients reporting anxiety was higher in the high burden group. Additionally, it is known that women having MA often experience depression with comorbid anxiety disorder, in contrast MO.¹⁵⁾ Comorbidities associated with mental illness, such as depression, are known to worsen migraine.¹⁶⁾ This study did not investigate psychiatric disorders, which are comorbidities of migraine, so further investigation is required.

More than 60% of women in both groups cited weather changes as a cause of headaches. However, weather changes are a relatively predictable factor, and by checking the weather forecast, people can learn about changes in air pressure and temperature in advance, making it easier to take measures. Therefore, women in the low burden group might feel that it is easier to manage weather changes as a trigger for migraines compared to other less predictable factors. Additionally, if countermeasures against weather changes (such as taking medication to respond to changes in atmospheric pressure) are effective, it is possible to manage migraine attacks well, thereby reducing the burden during the interictal period.

It has been shown that migraine patients with photophobia have significantly poorer sleep quality.¹⁷⁾ In this study, photophobia was more prevalent in the high burden group, suggesting that this may be related to poor sleep quality. Moreover, it is known that migraine patients are prone to poor sleep quality.⁴⁾ Poor sleep quality increases daytime sleepiness.⁴⁾ Patients with frequent and severe migraine are more likely to feel chronic fatigue, which may cause daytime sleepiness.¹⁸⁾ In addition, it may be thought that chronic fatigue is a factor that not only increases ESS scores but also reduces QOL during interictal periods. Moreover, sleep disorders are a risk factor for the severity of migraine and tension-type headaches.¹⁹ Our findings suggest that poor sleep quality may be a risk factor for increased interictal migraine burden.

It has been said that symptoms in migraine interictal periods are difficult for patients themselves to recognize, and difficult to communicate to those around them, including medical professionals. In this study, we were able to use MIBS-4 to identify multiple factors that are independently involved in the burden of migraine interictal periods. However, this study did not examine the effects of therapeutic drugs (migraine medications, sleeping pills, and anti-anxiety drugs). Recently, Ooba *et al.* reported that the use of acute medications and preventive medications for migraine reduces the interictal burden of migraine attacks.²⁰⁾ In the future, it will be necessary to identify factors involved in the interictal burden of migraine attacks from multiple angles, including therapeutic drugs, and use this information to improve treatment.

Conclusion We clarified that several factors, such as HIT-6 score, migraine type, headache causes (weather changes and anxiety), and ESS score, independently contribute to the interictal headache burden of migraine. To accurately understand the burden on migraine patients and connect it to treatment, evaluating the interictal burden of migraine using MIBS-4 is useful.

Conflict of interest The authors declare no conflict of interest.

REFERENCES

- The Japanese Headache Society the International Classification of Headache Disorders. Third Edition (ICHD-3) https://www.jhsnet.net/kokusai_new_2019.html
- Sakai F, Igarashi H. Prevalence of migraine in Japan: a nationwide survey. *Cephalalgia*, 17, 15–22 (1997).
- Matsumori Y, Ueda K, Komori M, Zagar AJ, Kim Y, Jaffe DH, Takeshima T, Hirata K. Burden of Migraine in Japan: Results of the ObserVational Survey of the Epidemiology, tReatment, and Care Of MigrainE (OVERCOME [Japan]) Study. *Neurol. Ther.*, **11**, 205–222 (2022).
- Suzuki K, Suzuki S, Haruyama Y, Funakoshi K, Fujita H, Sakuramoto H, Hamaguchi M, Kobashi G, Hirata K. Associations between the burdens of comorbid sleep problems, central sensitization, and headache-related disability in patients with migraine. *Front. Neurol.*, 15, 1373574 (2024).
- Ishii M, Shimizu S, Sakairi Y, Nagamine A, Naito Y, Hosaka Y, Naito Y, Kurihara T, Onaya T, Oyamada H, Imagawa A, Shida K, Takahashi

J, Oguchi K, Masuda Y, Hara H, Usami S, Kiuchi Y. MAOA, MTHFR and TNF- β genes polymorphisms and personality traits in the pathogenesis of migraine. *Mol. Cell. Biochem.*, **363**, 357–366 (2012).

- Saisu A, Tatsumoto M, Hoshiyama E, Aiba S, Hirata K. Evaluation of olfaction in patients with migraine using an odour stick identification test. *Cephalalgia*, **31**, 1023–1028 (2011).
- Lipton RB, Dodick D, Sadovsky R, Kolodner K, Endicott J, Hettiarachchi J, Harrison W. A self-administered screener for migraine in primary care. The ID Migraine[™] validation study. *Neurology*, **61**, 375– 382 (2003).
- Kosinski M, Bayliss MS, Bjorner JB, Ware JE Jr, Garber WH, Batenhorst A, Cady R, Dahlöf CG, Dowson A, Tepper S. A six-item short-form survey for measuring headache impact: the HIT-6. *Qual. Life Res.*, **12**, 963–974 (2003).
- 9) Takegami M, Suzukamo Y, Wakita T, Noguchi H, Chin K, Kadotani H, Inoue Y, Oka Y, Nakamura T, Green J, Johns MW, Fukuhara S. Development of a Japanese version of the Epworth Sleepiness Scale (JESS) based on Item Response Theory. *Sleep Med.*, 10, 556–565 (2009).
- Gosling SD, Rentfrow PJ, Swann WB. A very brief measure of the Big Five personality domains. J. Res. Pers., 37, 504–528 (2003).
- Oshio A, Abe S, Cutrone P. Development, reliability, and validity of the Japanese version of Ten Item Personality Inventory (TIPI-J). *Jpn. J. Pers.*, **21**, 40–52 (2012).
- 12) Hubig LT, Smith T, Williams E, Powell L, Johnston K, Harris L, L'Italien G, Coric V, Lloyd AJ, Lo SH. Measuring interictal burden among people affected by migraine: a descriptive survey study. J. Headache Pain, 23, 97 (2022).
- 13) Ishii M, Ito I, Katoh H. Survey on headache during COVID-19 infection in people with chronic headache. *BPB Reports*, 6, 62–67 (2023).
- 14) Lampl C, Thomas H, Stovner LJ, Tassorelli C, Katsarava Z, Laínez JM, Lantéri-Minet M, Rastenyte D, Ruiz de la Torre E, Andrée C, Steiner TJ. Interictal burden attributable to episodic headache: findings from the Eurolight project. J. Headache Pain, 17, 9–18 (2016).
- 15) Oedegaard KJ, Neckelmann D, Mykletun A, Dahl AA, Zwart JA, Hagen K, Fasmer OB. Migraine with and without aura: association with depression and anxiety disorder in a population-based study. The HUNT Study. *Cephalalgia*, **26**, 1–6 (2006).
- 16) Onaya T, Ishii M, Katoh H, Shimizu S, Kasai H, Kawamura M, Kiuchi Y. Predictive index for the onset of medication overuse headache in migraine patients. *Neurol. Sci.*, 34, 85–92 (2013).
- 17) Sharp N, Burish MJ, Digre KB, Ailani J, Fani M, Lamp S, Schwedt TJ. Photophobia is associated with lower sleep quality in individuals with migraine: results from the American Registry for Migraine Research (ARMR). J. Headache Pain, 25, 55 (2024).
- 18) Ravindran MK, Zheng Y, Timbol C, Merck SJ, Baraniuk JN. Migraine headaches in chronic fatigue syndrome (CFS): comparison of two prospective cross-sectional studies. *BMC Neurol.*, **11**, 30 (2011).
- Lyngberg AC, Rasmussen BK, Jørgensen T, Jensen R. Prognosis of migraine and tension-type headache: a population-based follow-up study. *Neurology*, 65, 580–585 (2005).
- 20) Ooba S, Ooba H. The evaluation of each migraine treatment using Migraine Interical Burden Scale-4 (MIBS-4). *Jpn. J. Headache*, **51**, 164–168 (2024). (text in Japanese with English abstract)