

Short Sleep Duration and Poor Sleep Quality Among Migraineurs

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- Conflicts of interest

None

- Acknowledgement



Learning objectives

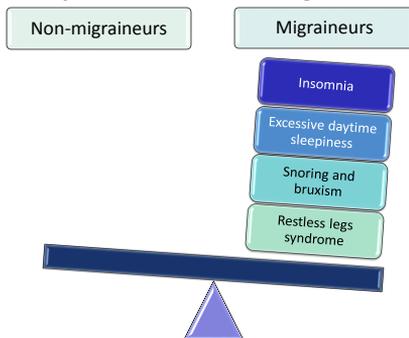
1. To understand the association of short sleep duration and poor sleep quality with migraine.
2. To understand the possible mechanism of relationship between sleep and migraine attack
3. Role of behavior sleep modification to chronic migraine

Sleep as trigger or relieving factor for migraine

- Sleep disturbances are among the common **“triggers” of migraine**, reported in nearly **50%** of sufferers
- **Lack and excess of sleep** – frequent **precipitating** factors for migraine in clinic based study with questionnaire and/or PSG study.
- Sleep may **relieve** pain and terminate migraine attacks in both adults and children and may be used as an **abortive modality** (in clinic based cross-sectional study)
- **Sleep in headache disorders**
International classification of sleep disorders (ICSD) classifies **migraine**, cluster headache, hypnic headache as “sleep-related headaches

Cephalalgia 2014;34(10):725–744

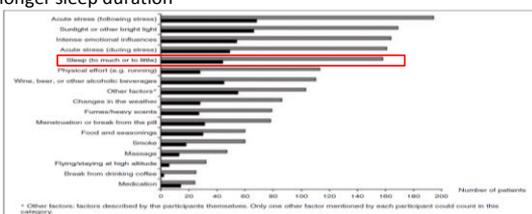
Sleep disturbance in migraineurs



J Headache Pain 2016;17:92, J Headache Pain. 2015;16:554

Short sleep duration and migraine

- Short sleep duration (less than 6 h within a 24 h period): associated with an increased risk of cardiovascular disorders and psychiatric disease
- 1283 migraineurs in tertiary headache clinic: short sleep duration experienced more frequent and severe headaches than those with longer sleep duration



Headache 2005; 45: 904–910, Cephalalgia 2010;30:346–353

Poor sleep quality and migraine

- Both sleep quality and sleep duration(quantity) are important for health and well-being.
- Sleep studies have reported that sleep duration did not differ between migraineurs and non-migraineurs.
- Therefore, the difference in sleep quality may account for higher sleep disturbance among migraineurs.

Comparison between cases and controls – sleep quality and daytime sleepiness.

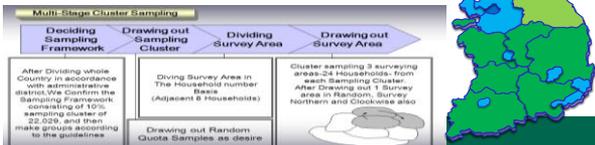
Factors	Cases (n=90)	Controls (n=90)	P value
PSQI ^a (mean)	7.17 ± 3.5	2.09 ± 2.0	0.001
PSQI (≥ 6)	60 (66.7%)	7(7.8%)	0.001
ESS ^a (mean)	6.2 ± 3.6	1.9 ± 1.9	0.001
ESS (≥ 11)	13(14.4%)	1(1.1%)	0.001
Combined PSQI and ESS	64(71.1%)	8(8.9%)	0.001

^a PSQI – Pittsburgh sleep quality index ; ESS – Epworth sleepiness score.

Sleep Breath 2016; 20: 263–269.

Short Sleep Duration and Poor Sleep Quality Among Migraineurs

- **The Korean Headache-Sleep Study (KHSS)**
- **Nationwide cross-sectional survey** database of headaches and sleep characteristics among Korean population (adult aged between 19 and 69 years).
- **Two-stage systematic random cluster random** sampling method for all Korean districts, proportion to the nationwide population distribution.
- **Face-to-face interviews** by Gallup Korea
- Average sleep duration, **PSQI (>5)**, Anxiety (Goldberg), Depression (PHQ-9), VAS, HIT-6



Short Sleep Duration and Poor Sleep Quality Among Migraineurs

- The mean sleep duration of all participants was 7.4hr
- **10.3%** participants were classified as having short sleep duration.
- **11.8%** had short sleep duration in migraineurs.
- **Average sleep duration and prevalence of short sleep duration: not-significantly differ** in migraine, non-migraine headache, no-headache
- **Prevalence of poor sleep quality (PSQI >5) was significantly higher** in the migraine group compared with those of non-migraine headache and non-headache groups (47.6% vs. 30.9% vs. 21.0%, p < 0.001).

	Non-headache controls n = 1,422 (52.8%)	Non-migraine headache individuals n = 1,130 (41.9%)	Migraine individuals n = 143 (5.3%)	p value
Subjective sleep quality	1.7 ± 0.8	1.7 ± 0.8	1.7 ± 0.7	0.654
Sleep latency	0.8 ± 0.9	1.0 ± 1.0 ^a	1.3 ± 1.1 ^{1‡}	<0.001
Sleep duration	0.4 ± 0.8	0.5 ± 0.8 ^a	0.5 ± 0.8 ^a	0.015
Habitual sleep efficacy	0.0 ± 1.5	0.0 ± 0.2	0.0 ± 0.0	0.106
Sleep disturbance	0.8 ± 0.6	0.9 ± 0.5 ^a	1.1 ± 0.6 ^{1‡}	<0.001
Use of sleeping medication	0.0 ± 0.3	0.1 ± 0.4 ^a	0.1 ± 0.5 ^{1‡}	0.001
Daytime functioning	0.5 ± 0.7	0.7 ± 0.7 ^a	0.9 ± 0.9 ^{1‡}	<0.001
Total	4.2 ± 1.9	4.9 ± 2.3 ^a	5.6 ± 2.6 ^{1‡}	<0.001

Cephalalgia 2018;38(5):855–864

Short Sleep Duration and Poor Sleep Quality Among Migraineurs

(A)	Migraineurs with short sleep duration n = 17	Migraineurs without short sleep duration n = 126	p value
Headache frequency (per month)	2.0 (1.0-12.0)	1.0 (0.3-4.0)	0.048
Visual analogue scale score	7.0 (4.5-7.5)	6.0 (5.0-7.0)	0.832
Headache Impact Test-6 score	57.0 (49.0-67.5)	53.0 (47.0-60.0)	0.040

(B)	Migraineurs with poor sleep quality n = 68	Migraineurs without poor sleep quality n = 75	p value
Headache frequency (per month)	2.0 (0.6-4.7)	1.00 (0.2-3.0)	0.009
Visual analogue scale score	7.0 (5.0-8.0)	6.00 (5.0-7.0)	0.247
Headache Impact Test-6 score	57.5 (49.0-63.7)	50.00 (44.0-58.0)	<0.001

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Short Sleep Duration and Poor Sleep Quality Among Migraineurs

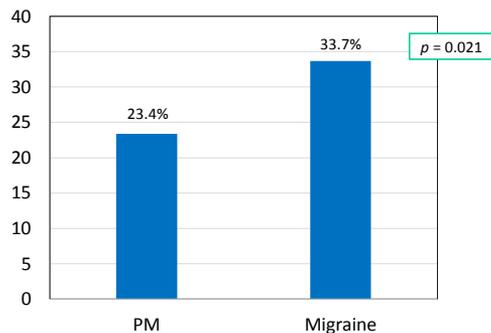
	Unstandardized coefficients B	Standardized coefficients beta	T	p value	Tolerance	VIF
Age	-0.220 0.453	-0.043	-0.486	0.628	0.782	1.279
Sex	1.037 1.141	0.072	0.909	0.365	0.972	1.028
Size of residential area	0.331 0.698	0.038	0.474	0.636	0.970	1.031
Educational level	-1.070 0.611	-0.154	-1.751	0.082	0.782	1.279
Short sleep duration (< 6 h per day)	4.068 1.645	0.210	2.474	0.015	0.842	1.188
Poor sleep quality (PSQI-5)	-0.259 1.168	-0.021	-0.222	0.825	0.701	1.426
Anxiety (GAS≥5)	2.683 1.238	0.196	2.167	0.032	0.740	1.351
Depression (PHQ-9≥10)	1.984 1.499	0.118	1.324	0.188	0.760	1.315
Insomnia symptom (ISI-15.5)	1.804 1.927	0.083	0.936	0.351	0.777	0.186

SE: Standard error, VIF: variation inflation factor.
 Results of multiple linear regression analysis that included sociodemographic variables (age, sex, size of residential areas, and education level), short sleep duration (average sleep duration < 6 hours per day), poor sleep quality (Pittsburgh Sleep Quality Index [PSQI]-5) anxiety (Goldberg Anxiety Scale [GAS] ≥5), depression (Patient Health Questionnaire [PHQ]-9≥10) and insomnia symptom (insomnia severity index [ISI]-15.5), with headache frequency set as dependent variable.
 R² = 0.194, adjusted R² = 0.139.

Self-reported short sleep duration (< 6 h per day) is associated with an increased headache frequency among migraineurs in a population-based setting.

Cephalalgia 2018;38(5):855-864

Poor sleep quality prevalence of individuals with probable migraine VS. migraine.



In revision

Results: Analysis of contributing factors related to the headache frequency per month in participants with probable migraine

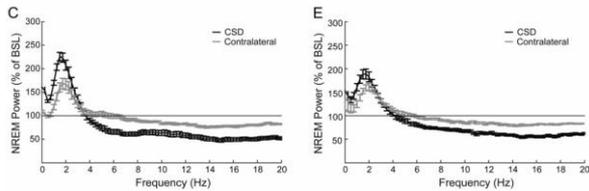
Factor	Unstandardized coefficients		Standardized coefficient	T	p-value	Tolerance	VIF
	B	SE	β				
Age	-0.086	0.085	-0.046	-1.019	0.309	0.810	1.235
Sex	-0.177	0.202	-0.036	-0.877	0.381	0.969	1.032
Size of residential area	-0.086	0.157	-0.022	-0.548	0.584	0.988	1.012
Educational level	-0.082	0.131	-0.028	-0.629	0.529	0.792	1.262
Anxiety (GAS score ≥ 5)	0.231	0.052	0.230	4.438	<0.001	0.602	1.660
Depression (PHQ-9 score ≥ 10)	0.230	0.027	0.426	8.471	<0.001	0.640	1.563
Poor sleep quality (PSQI > 5)	0.039	0.018	0.090	2.166	0.031	0.928	1.077
Short Sleep duration (<6hr)	0.041	0.021	0.160	2.578	0.045	0.819	1.183
VAS score for headache intensity	0.088	0.056	0.065	1.556	0.121	0.923	1.083

$R^2 = 0.194$, adjusted $R^2 = 0.139$.

In revision

Why is sleep associated with migraine?

- Sleep and Cortical Spreading Depression

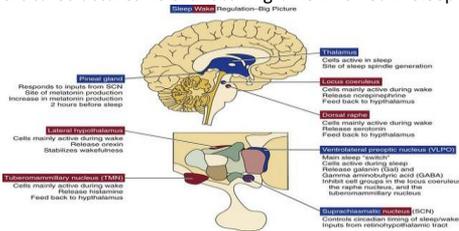


CSD: a state of intense neuronal activity that is known to activate subcortical pathways
NREM (deep sleep): characterized by slow wave thalamocortical oscillatory activity that alters sensory processing
 - Perhaps a **bidirectional** homeostatic relationship exists (**CSD-NREM**)

Cereb Cortex. 2010;20:2939–47.

Why is sleep associated with migraine?

- Subcortical Structures Relevant to Migraine Involved in Sleep

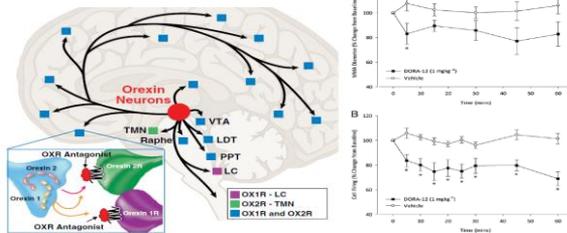


	Positive Pixels	Negative Pixels	Positive Pixels (%)	Density
Vglut2	135,571	1,308,109	9.64	High
TH	124,675	1,323,005	8.61	High
Vgat	106,398	1,341,282	7.35	High
serf	82,190	1,305,490	5.66	High
DBH	46,331	1,401,349	3.29	Moderate
Hist	17,578	1,430,102	1.21	Moderate

Kryger MH. Atlas of clinical sleep medicine. Philadelphia: Saunders; 2010. PLoS One. 2014;9(8):e103929.

Why is sleep associated with migraine?

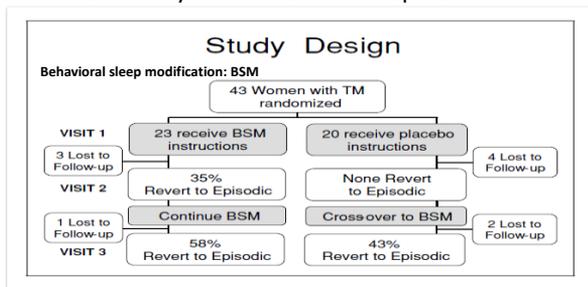
• Orexin Systems in the Brain



1. promote trigeminovascular nociception,
2. the propensity to sleep during migraine,
3. the possibility that migraine could be triggered by stimuli that activate the hypothalamus and increase orexin activity such as stress, fatigue, sleep deprivation or poor sleep hygiene

Curr Pain Headache Rep 2013;17:369, Neurobiology of Disease 2015;74: 137–143

Chronic daily headache with sleep behavior Tx



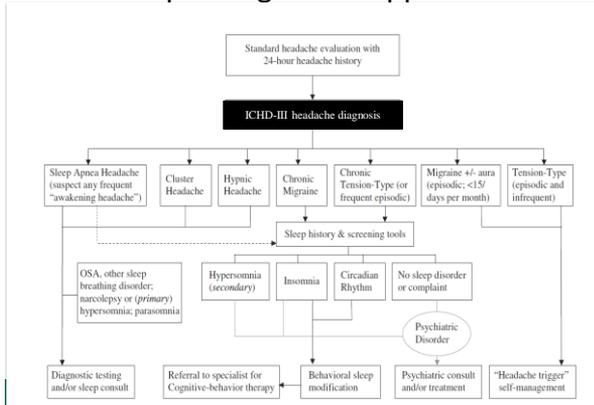
Compared to the placebo behavioral group, the BSM group reported **statistically significant reduction in headache frequency and headache intensity. No member of the control group reverted to episodic migraine by the first postintervention visit.** By the final visit, 48.5% of those who had received BSM instructions had reverted to episodic migraine.

Cephalalgia. 2012;32:1059–70. Headache. 2007 Sep;47(8):1178–83.

Behavioral sleep modification: BSM

- Limiting daytime naps to 30 minutes.
- Avoiding stimulants such as caffeine and nicotine close to bedtime.
- Exercising to promote good quality sleep.
- Steering clear of food that can be disruptive right before sleep.
- Ensuring adequate exposure to natural light.
- Establishing a regular relaxing bedtime routine.
- Making sure that the sleep environment is pleasant.

Sleep in migraine - Approach



Tips and Pearls

1. **Headache has been linked to a wide range of sleep disorders** that may impact headache management.
2. **Short sleep duration (<6hr) and poor sleep quality is associated with increased headache frequency**, intensity, severity, accompanying anxiety and depression in patients with migraine and probable migraine.
3. Cortical spreading depression, hyperexcitability, thalamo-trigeminal tract, Orexin pathway may explain the association of sleep and migraine
4. Collecting **sleep history** in relation to headache patterns and **Screening questionnaires** and prediction equations (PSQI, ESS, Berlin..) are important.
5. Patients who suffer from **chronic migraine** or tension-type headache may benefit from **behavioral sleep modification**.

Special Thanks to

