The association between tension-type headache (TTH) and the severity of insomnia

by Hexanto Muhartomo

The association between tension-type headache (TTH) and the severity of insomnia

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ABSTRACT

Introduction: Sleep can reduce headaches, but on the other hand, sleep disturbances can provoke the onset of headaches. Research showed that sleep quality was a complex interaction of people with Tension Type Headache (TTH), due to depression and emotional burden with sleep quality. The study aims to determine the association between the type of tension-type headache and the severity of insomnia.

Methods: This was a cross sectional observational study. The subjects were tension-type headache patients who went to the neurological clinic of dr. Kariadi Hospital and Puskesmas (Primary Healthcare Facility) Pandanaran Semarang who met the inclusion and exclusion criteria. It was conducted from February to July 2020. Insomnia examination was carried out using the ISI questionnaire. Data were analyzed using chi-square significant test. The result was considered significant if the p-value <0.05.

Results: From 29 TTH patients, 5 (17.2%) subjects experienced rare ETTH, 18 (62.1%) had frequent ETTH, 6 (20.7%) had CTTH, and 2 (6.9%) subjects with depression. There was a significant association between TTH type and the degree of insomnia (p 0.034) and between depression and the degree of insomnia (p 0.041). The regression analysis reported that depression and chronic TTH caused an increase in insomnia by 0.366 and 0.410, respectively.

Conclusion: There was an association between the type of TTH and the severity of insomnia, also between depression and the severity of insomnia. Moreover, depression increases the incidence of insomnia in TTH.

Keywords: insomnia, sleep disorders, tension-type headache.
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INTRODUCTION

Insomnia is one of the many types of sleep disorders. It is defined as difficulty starting or maintaining sleep at least three nights per week or three months. Many things can cause insomnia, one of them is headaches.[1]

The association between sleep disturbances and headaches has long attracted the attention of researchers in various studies. Sleep is thought to reduce headaches, but on the other hand, sleep disturbances can also provoke the onset of headaches. The research reported that sleep quality showed a complex interaction in chronic tension-type headaches (TTH), because depression and emotional burden are related to sleep quality.[1,2]

Evidence from cohort and randomized controlled intervention studies suggested that disturbed sleep or insufficient sleep could exacerbate pre-existing pain or cause new pain, which in turn could increase sleep disturbances. Sleep and headache have a substantial relationship both anatomically, clinically, biochemically. and physiologically. The pathomechanism that explains the relationship between the two is unclear. However, melatonin dysfunction and circadian rhythm disturbance by dysfunction of the hypothalamic suprachiasmatic nucleus are strongly thought to underlie these two interplaying phenomena' pathophysiology.[3]

A large-scale, cross-sectional epidemiological study in the general population showed a strong association between sleep, pain, and mood disorders, particularly anxiety and depression. It is estimated that more than 40% of chronic insomnia patients are associated with moderate pain, whereas severe sleep disturbances and depression occur in up to 80% of patients with chronic pain.[2]

In the general population, TTH is a common pain disorder with a global prevalence of 42% and represents an important socio-economic impact, also the second most common disorder in the world. Apart from having a close impact on decreasing quality of life, TTH was also reported to increase the burden of health financing, especially chronic TTH.[2]

It is important to develop a good understanding of the interaction of headaches and sleep. Headache that can be managed well, especially in TTH, is a potential therapy for sleep disorders patients, and vice versa. Hopefully, the

appropriate management can overcome both health problems at the same time.

METHODS

Study design using a cross-sectional study conducted in the outpatient clinic of Kariadi Hospital and Puskesmas Pandanaran, Semarang, starting from February to July 2020.

The subjects were TTH patients. Patients who met the inclusion criteria were asked for written consent on the informed consent sheet. Medical history was taken and physical examination was conducted. The severity of TTH was determined according to the International Classification of Headache Disorders 3rd edition (beta version), both episodic and chronic TTH. The diagnosis of insomnia was carried out using the Insomnia Severity Index (ISI). Screening of depression was conducted using Hamilton Depression Rating Scale (HAM-D), while anxiety screening using the Hamilton Anxiety Rating Scale (HAM-A).

The data were analyzed using the program of SPSS for Windows version 20. Data analysis included descriptive statistics and hypothesis tests using Pearson chi-square test. Bivariate correlation analysis using linear regression test was conducted to assess the association between TTH type and insomnia severity. The p-value is considered significant if $p<0.05$.

RESULTS

This study included 29 subjects who met the inclusion and exclusion criteria. There were no dropped out subjects during the study.

The characteristics of the study subjects were shown in table 1, with the number of infrequent episodic TTH was 5 subjects (17.2%), frequent episodic TTH was 18 subjects (62.1%), chronic TTH was 6 subjects (20.7%).

There was no any significant association between subjects' characteristics with the type of TTH, because all p values > 0.005. In addition, there was no subject who experienced anxiety at all (Table 2).

The results of the analysis showed that the association between the type of TTH and the severity of insomnia was significant (p=0.034). Severe clinically insomnia only

Table 1. The characteristic of the subjects

Variable	Frequency	%
Gender		
Male	9	31.0
Female	20	69.0
Age		
17 – 25 year	1	3.4
26 – 45 year	10	34.5
46 – 65 year	18	62.1
Education		
Low	9	31.0
Moderate	9	31.0
High	11	37.9
Working status		
Working	17	58.6
Not working	12	41.4
Income		
Low	5	17.2
Moderate	11	37.9
High	6	20.7
Very high	7	24.1
Type of TTH		
Infrequent episodic	5	17.2
Frequent episodic	18	62.1
Chronic	6	20.7
The severity of insomnia		
Not insomnia	11	37.9
Mild clinical insomnia	10	34.5
Moderate clinical insomnia	6	20.7
Severe clinical insomnia	2	6.9
Depression		
Yes	2	6.9
No	27	93.1
Anxiety		
Yes	0	0
No	29	100

occured infrequent episodic TTH as much as 1 patient (50%) and chronic TTH as much as 1 patient (50%) (Table 3).

There was a significant association between subjects' characteristics with the severity of insomnia, namely the level of depression (p = 0.041) (Table 4).

Depression and the type of TTH are the dominant factors affecting insomnia. Depression and TTH can cause an increase in insomnia by 0.366 and 0.410, respectively. The R^2 value was 0.364 (Table 5).

DISCUSSION

In this study, there were 29 subjects, in which females were more than men. This is in accordance with Kim et al. which

stated that insomnia was more common in women than men. A case-control study by Sancisi et al.which examined the prevalence of sleep disorders in chronic headaches found that there were more female subjects than men although it was not statistically significant. A literature also stated that women have a lower pain threshold than men, besides they also had a tendency to experience hyperalgesia.[4,13,14]

In terms of age, patients with the range of age 17-25 years, only 1 (10%) had mild clinical insomnia, and none had moderate or severe clinical insomnia, in range of age 26-45 years, 2 (20%) subjects had mild clinical insomnia, 3 (50%) had moderate clinical insomnia and 1 (50%) had severe clinical insomnia, while in range of age 46-

Table 2. The characteristic of subjects based on the type of TTH

Variable	Type of TTH						p
	Infrequent episodic		Frequent episodic		Chronic		
	n	%	n	%	n	%	
Gender							
Male	1	20	6	33.3	2	33.3	0.842[¥]
Female	4	80	12	66.7	4	66.7	
Age							
17 – 25	1	20	0	0	0	0	0.220[¥]
26 – 45	1	20	6	33.3	3	50	
46 – 65	3	60	12	66.7	3	50	
Education							
Low	1	20	6	33.3	2	33.3	0.608[¥]
Moderate	3	60	5	27.8	1	16.7	
High	1	20	7	38.9	3	50	
Working status							
Working	2	40	11	61.1	4	66.7	0.631[¥]
Not working	3	60	7	38.9	2	33.3	
Income							
Low	1	20	3	16.7	1	16.7	0.759[¥]
Moderate	3	60	6	33.3	2	33.3	
High	1	20	3	16.7	2	33.3	
Very high	0	0	6	33,3	1	16,7	
Depression							
Yes	0	0	1	5.6	1	16. 7	0.519[¥]
No	5	100	17	94.4	5	83.3	
Anxiety							
Yes	0	0	0	0	0	0	–
No	5	100	18	100	6	100	

*Significant (p<0.05); [¥] Pearson chi-square

Table 3. The association between type of TTH and the severity of insomnia

Variable	Insomnia								p
	Not insomnia		Mild clinical		Moderate clinical		Severe clinical		
	n	%	n	%	n	%	n	%	
Type of TTH									
Infrequent episodic	2	18.2	3	30	0	0	0	0	
Frequent episodic	9	81.8	6	60	2	33.3	1	50	0.034[¥*]
Chronic	0	0	1	10	4	66.7	1	50	

*Significant (p<0.05); [¥]Pearson chi-square

65 years, 7 (70%) subjects had mild clinical insomnia, 3 (50%) %) had moderate clinical insomnia and 1 (50%) had severe clinical insomnia. Thus, it can be concluded that as you age, the incidence of insomnia increases. This is also consistent with Kim et al. which reported that the prevalence of insomnia tends to increase with age. A study by Mendoza et al. also showed that healthy middle-aged individuals were more susceptible to sleep disorders caused by stimulation of hormones from the HPA axis, including corticotropin-releasing hormone (CRH/CTRH). This explains the increased incidence of insomnia in elderly physiologically. Also, the guideline for the management of sleep disorders stated that there would be a decrease in the secretion of growth hormone-releasing hormone which caused the NREM phase in the elderly.[4,7,9]

In terms of education level, Kim et al. reported that subjects with lower education were more likely to experience insomnia than higher education subjects. Whereas in this study, the subjects with low education levels had less insomnia than those with higher education. It could be due to the unevenness of subject taking. However, in terms of the severity of insomnia, severe clinical insomnia was only experienced by subjects with low and moderate education, whereas no high education subjects experienced it.[4]

In terms of working, the number of working subjects [17 (58.8%)] was more

Table 4. The characteristic of subjects based on the severity of insomnia

Variable	Insomnia								p
	Not insomnia		Mild clinical		Moderate clinical		Severe clinical		
	n	%	n	%	n	%	n	%	
Gender									
Male	3	27.3	4	40	2	33.3	0	0	0.714[¥]
Female	8	72.7	6	60	4	66.7	2	100	
Age									
17 – 25	0	0	1	10	0	0	0	0	0.761[¥]
26 – 45	4	36.4	2	20	3	50	1	50	
46 – 65	7	63.6	7	70	3	50	1	50	
Education									
Low	3	27.3	5	50	0	0	1	50	0.393[¥]
Moderate	4	36.4	2	20	2	33.3	1	50	
High	4	36.4	3	30	4	66.7	0	0	
Working status									
Working	7	63.6	5	50	5	83.3	0	0	0.190[¥]
Not working	4	36.4	5	50	1	16.7	2	100	
Income									
Low	1	9.1	1	10	2	33.3	1	50	0.435[¥]
Moderate	5	45.5	4	40	1	16.7	1	50	
High	1	9.1	4	40	1	16.7	0	0	
Very high	4	36.4	1	10	2	33.3	0	0	
Depression									
Yes	11	100	10	100	5	83.3	1	50	0.041[¥*]
No	0	0	0	0	1	16.7	1	50	
Anxiety									
Yes	11	100	10	100	6	100	2	100	–
No	0	0	0	0	0	0	0	0	

*Significant ($p<0.05$); [¥] Pearson chi-square

Table 5. The result of linear regression test of insomnia

Variable	Beta	p
Occupation	0.161	0.322
Depression	0.366	0.031
Type of TTH	0.410	0.016

R^2 value = 0.364

than non-working subjects [12 (41.4%)]. There were 5 (50%) working subjects with mild clinical insomnia, 5 (83.3%) with moderate clinical insomnia, but none having severe clinical insomnia. Whereas, 5 (50%) non-working subjects had mild clinical insomnia, 1 (16.7%) had moderate clinical insomnia, and 2 (100%) had severe clinical insomnia. Stressful events or conflicts at work probably influenced this. While, a study by Yeung et al. stated that TTH with insomnia was more common in subjects who did not work or as housewives.[10]

In terms of income, subjects with less income were more common to have insomnia with a higher degree. One of them (10%) had mild clinical insomnia, 2 (33.3%) had moderate clinical insomnia, and 1 (50%) had severe clinical insomnia. Kim et al. stated that the incidence of TTH was not significantly different between low and high-income subjects.[4]

In terms of the level of depression, 2 out of 29 subjects who experienced TTH had depression. Each (16.7%) subject had moderate clinical insomnia and (50%) severe clinical insomnia significantly ($p=0.041$). This is according to a review by Magazi et al., which stated that psychiatric conditions, especially depression, were often associated with TTH. It was associated with hypothalamic pituitary adrenal (HPA) and sympathetic adrenal medullary axis. CRH/CTRH and cortisol were products of the hypothalamus and adrenals, and catecholamine, which was the sympathetic system product, was known to cause wakefulness and sleep difficulties in humans. Univariate analysis by Chen et al. showed that insomnia was closely related to depression and it was one of the factors in the occurrence of insomnia. Depression has a positive correlation with hypothalamic disorder, as evidenced by the presence of CRH hypersecretion that has functions to trigger alertness and inhibit the NREM phase.[5,6,8]

In terms of anxiety level, there were no subjects who had anxiety in this study. Thus, the association between anxiety with the degree of insomnia and the type of TTH could not be analyzed.

The association between the type of TTH with the severity of insomnia was

significant (p=0.034). Severe clinical insomnia only occurred infrequent episodic TTH by 1 (50%) and chronic TTH as much as 1 (50%). It could illustrate that a more frequent and longer TTH (>3 months) would cause more severe insomnia. This is different from the study by Hwan et al. which stated that the type of TTH did not affect the occurrence of sleep disturbances. Kim et al. also reported that the incidence of insomnia was significantly higher in subjects with TTH attacks 1-10 times per month, compared with TTH attacks <1 times per month, while the incidence of insomnia was not significant in subjects with TTH attacks > 10 times per month compared with attacks < 1 times per month. The data suggested that the pathophysiology of sleep and headache involved hypothalamus, serotonin, and melatonin. Serotonin has been known to play a role in headaches. Melatonin level decreases in several types of primary headaches, migraines, cluster headaches, and hypnic headaches. The anatomical communication between suprachiasmatic nuclei, nucleus raphe, and serotonin may explain the association between sleep and headache.[5,11,12]

The results of the linear regression analysis showed that the incidence of depression and type of TTH caused an increase in insomnia by 0.366 and 0.410, respectively. The R^2-value was 0.364 (36.4%), which means that the two variables affect insomnia by 36.4% and the remaining 63.6% is influenced by factors other than these two variables.

CONCLUSION

There was a significant association between frequent and chronic TTH with the severity of insomnia, between depression with the severity of insomnia by 0.366 (36.6%), between chronic TTH with the severity of insomnia by 0.410 (41.0%). Meanwhile, there was no association between gender, age, education, occupation, income level, and anxiety on insomnia severity.

ETHICAL APPROVAL

CONFLICTS OF INTEREST

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AUTHOR CONTRIBUTIONS

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