Original Research Article

MEAN DIFFERENCE OF BODY MASS INDEX (BMI) BETWEEN PRIMARY HEADACHE GROUP IN CEMPAKA PUTIH PUBLIC HEALTH CENTRE

ABSTRACT

Headache is the main cause of patient visits to neurologists with a global prevalence of 66% (65% in men and 69% in women). Based on the International classification of headache disorders (ICHD), primary headaches are classified into migraines, tension-type headaches (TTH), trigeminal autonomic cephalgias (TAC), and other primary headaches. Excess body mass index (BMI) and obesity are health problems that are known to be associated with primary headaches. Various studies that have been done before have shown a relationship between excess BMI and obesity with primary headaches.

This study was conducted to look at differences in the mean BMI between groups of primary headache types at the Cempaka Putih District Health Center. This research is an analytic descriptive study with a cross-sectional design. The data were collected from medical records from July to December 2022. The data collected was then analyzed descriptively and analytically.

The results of the Kruskall-Wallis statistical test showed that there was a significant difference in the mean BMI between the three primary headache groups (p-value: 0.022). Further statistical analysis showed that the most significant difference in BMI was found between the migraine and TAC groups (p-value: 0.008) and TTH and TAC (p-value: 0.006).

This study's results indicate a relationship between BMI and the type of primary headache. Further research needs to be conducted to look at other factors besides BMI that may be related to the incidence of primary headaches.

Keywords: *primary cephalgia; body mass index (BMI); migraine; tension-type headache (TTH); trigeminal autonomic cephalgias (TAC)*

1. INTRODUCTION

Based on the study of The Global Burden of Disease (GBD), headache is a global public health problem. Headache is the main cause of patient visits to neurologists and is the third most common cause of reduced productivity.[1,2]

Headache is differentiated into primary and secondary causes. Most of the headache in the community is primary headaches or headaches caused by mild systemic infection. Based on the International Classification of Headache Disorders (ICHD), primary headache is further classified into migraine, tension-type headache (TTH), trigeminal autonomic cephalgias (TAC), and other primary headaches.[3]

Headache is one of the most common nervous system disorders with a global prevalence of 66% (65% in males and 69% in females).[1] TTH is the most common primary headache with a global prevalence of around 46%. The incidence of TTH in a year is around 14-44 per 1000 people. Migraine is the less common type of primary headache with a prevalence of 14%. The annual incidence is around 3 to 18 per 1000 people. Migraine is also more common in women of reproductive age.[1,4]

Overweight and obesity are health problems known to be associated with primary headaches. Previous studies showed a correlation between overweight and obesity with primary headache.

Based on this background, the authors are interested in conducting research on the relationship between BMI and the incidence of primary headaches at Cempaka Putih Public Health Center.

2. METHODS

This is a descriptive-analytic study with a cross-sectional design. This study was conducted at Cempaka Putih Public Health Center from February to March 2023. The population of this study were all patients who were diagnosed with primary headache. The sample of this study were patients with the diagnosis of primary headache who were recorded in the medical records from July 2022 to December 2022 and met the inclusion criteria. The required sample size in this study was 291 respondents (the research power was 80%, Type I error was 5%, and Type II error was 20%). The sampling method used in this study was non-random consecutive sampling. The inclusion criteria were diagnosis of primary headache. Exclusion criteria in this study were respondents under 18 years of age (pediatric patients), missing data in medical records, or secondary headaches.

This research was conducted by first submitting research proposals to related institutions to request legality and research permits. The institution will conduct a proposal review as well as ethical due diligence. After all the requirements have been completed, data collection was carried out from medical records until the number of samples was fulfilled. All data is tabulated and analyzed and accountable to the relevant institutions.

The variables in this study include independent and dependent variables. The independent variable in this study was BMI, measured by looking at data on body weight (kg) and height (cm) in medical records. BMI is measured by a standard formula that has been applied internationally. The dependent variable in this study was the diagnosis of primary headache (Tension-type Headache, Migraine, and Trigeminal Autonomic Cephalgias). Determination of the diagnosis in this study was according to the criteria of The International Classification of Headache Disorders (ICHD).

The statistical analysis used in this study includes descriptive and analytic analysis. Descriptive statistics present data in the form of proportion values (%) for qualitative data and the distribution of data for quantitative data. Analytical statistics used the Kruskall Wallis and Post-Hoc Bonferoni statistical tests according to the normality test performed with the Kolmogorov Smirnov and Shapiro Wilk tests. The significance value of this study was 5%.

3. RESULTS

This study included 1531 respondents who met the inclusion criteria. The distribution of the data of respondents is presented in Table 1.

Table 1. Data Distribution of Respondents

Parameter	N (%)	Mean (SD)	Med (Min-Max)
Gender • Male • Female	 718 (46,9%) 813 (53,1%)		
Age		42,51 (18,0 – 69,0)	43 (18 – 69)
Marital status • Single • Married • Widow	 407 (26,6%) 1099 (71,8%) 8 (0,5%) 17 (1,1%)		
Occupation			

• Unemployed • Labor • Housewives • Employee of private sector • College student • Merchant • Government employee • Student • Retired • Entrepreneur • Others	22 (1,4%) 209 (13,7%) 685 (44,7%) 337 (22,0%) 17 (1,1%) 10 (0,7%) 53 (3,5%) 69 (4,5%) 28 (1,8%) 78 (5,1%) 23 (1,5%)		
Weight (Kg)		63,24 (13,69)	61 (23,4 – 125)
Height (cm)		157,43 (8,52)	157 (102 – 187)
BMI (kg/m2)		25,51 (5,09)	24,97 (14,42 – 45,92)
Systolic blood pressure		120,94 (14,59)	120 (80 – 220)
Diastolic blood pressure		76,48 (8,27)	78 (54 – 140)
Respiratory Rate		19,63 (1,19)	20 (16 – 20)
Heart Rate		82,11 (5,42)	80 (59 – 122)
Temperature		36,32 (0,32)	36,2 (35,4 – 39,0)
Diagnosis of primary headache • Tension-type Headache • Migraine • Trigeminal Autonomic Cephalgias (TAC)	1014 (66,2%) 501 (32,7%) 16 (1,1%)		

Further analysis was carried out to see if there was a difference in the mean BMI between the three primary headache groups (Tension-type Headache, Migraine, and Trigeminal Autonomic Cephalgias). The analysis was preceded by normality test using Kolmogorov Smirnov and Shapiro Wilk tests. The normality test showed that the BMI values were not evenly distributed in the three primary headache groups (p-value <0.05). Therefore, an alternative statistical test was carried out using the Kruskall-Wallis test. The results of the Kruskall Wallis statistical test showed that there was a significant difference in the mean BMI between the three primary headache groups (p-value: 0.022). (Table 2; Figure 1)

Table 2. Differences in Mean Body Mass Index Between Primary Headache Groups

Parameter	Body Mass Index (Kg/m2)		Mean Rank	P-Value
	Mean (SD)	Med (Min – Max)		
Tension-type Headache	25,48 (4,98)	24,98 (14,42 – 45,92)	766,73	0,022
Migraine	25.67 (5,29)	24,88 (15,56 – 40,35)	774,16	
Trigeminal Autonomic Cephalgias (TAC)	22,49 (4,44)	21,53 (16,65 – 34,55)	464,25	

*. The mean rank is significant at the 0.05 level.

** Statistical Test using Kruskall Wallis Test

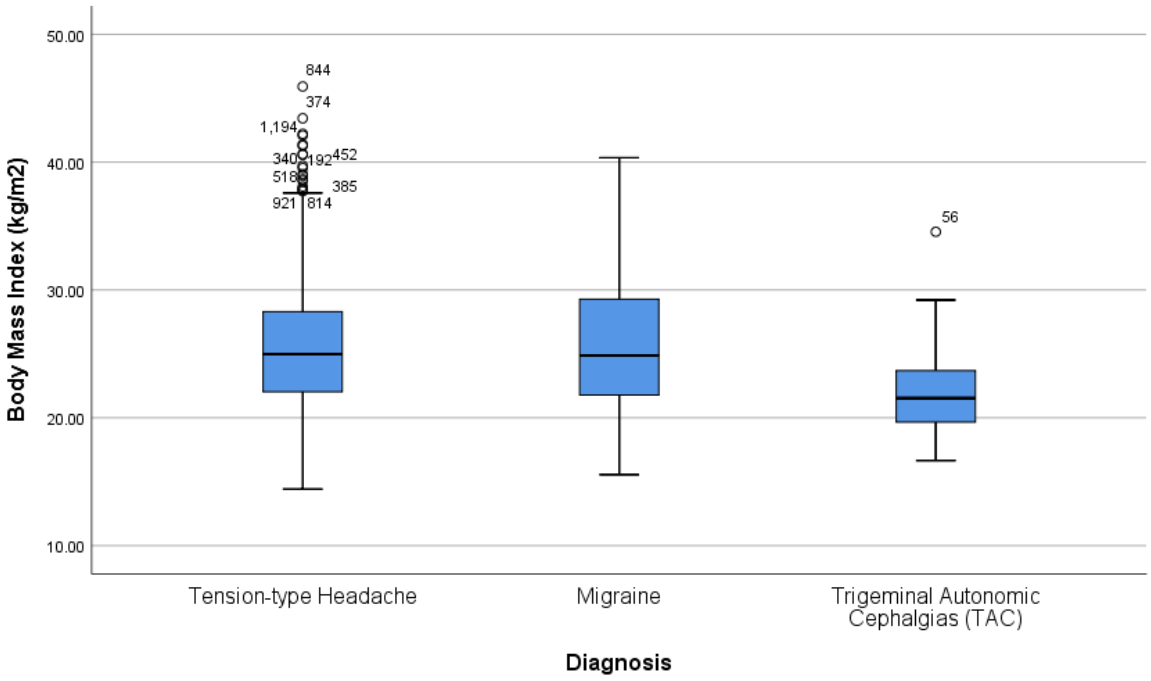

Figure 1. Differences in Body Mass Index between Primary Headache Groups

Analytic tests were then continued to see which group had the most significant difference in the mean BMI. Descriptive test showed that the mean BMI of the Tension-type Headache, migraine, and TAC group were 24.98 (14.42 – 45.92) kg/m2; 24.88 (15.56 – 40.35) kg/m2; and 21.53 (16.65 – 34.55) kg/m^2, respectively. The results of the Post-Hoc Mann Whitney test showed that there was a significant difference in mean BMI between the Tension-type Headache vs Trigeminal Autonomic Cephalgias (TAC) (p-value: 0.006) and Migraine vs Trigeminal Autonomic Cephalgias (TAC) groups (p-value: 0.008)

Table 3. Results of Post-Hoc Mann Whitney Test Between Primary Headache Groups

(I) Diagnosis	(J) Diagnosis	Mean Difference (I-J)	Std. Error	Sig.**	95% Confidence Interval	
					Lower Bound	Upper Bound
Tension-type Headache	Migraine	-0.19048	0.27746	0,752	-0.8554	0.4745
	Trigeminal Autonomic Cephalgias (TAC)	2.99067	1.28017	0,006	-0.0774	6.0588
Migraine	Tension-type Headache	0.19048	0.27746	0,752	-0.4745	0.8554
	Trigeminal Autonomic Cephalgias (TAC)	3.18115*	1.29032	0,008	0.0888	6.2735
Trigeminal Autonomic Cephalgias (TAC)	Tension-type Headache	-2.99067	1.28017	0,006	-6.0588	0.0774
	Migraine	-3.18115*	1.29032	0,008	-6.2735	-0.0888

*. The mean difference is significant at the 0.05 level.
** Statistical Test using Mann WHitney

4. DISCUSSION

Headaches as well as overweight and obesity are global health problems that are often found in society. Various studies that have been done before have shown an association between overweight and obesity with headaches.

A cross-sectional study conducted by Brown in Australia in 2000 showed a relationship between obesity and headache in general. This research was conducted on 14,000 women aged 18-23 years. The results showed that women with obesity (BMI>30) were 47% more likely to experience migraines or headaches compared to the non-obese group (BMI 25 – 29.9). (OR 1.47, 95% CI 1.25-1.73).[5]

Another study was conducted by Scher et al to see the correlation between obesity and headaches. The respondents were 1,192 people aged 18-65 years with episodic headaches (EH) and chronic daily headaches (CDH). Respondents were evaluated at the beginning of the study and 11 months later. At the beginning of the study, obesity was found to be more prevalent in the group with CDH (odds ratio [OR] 1.34, 95% confidence interval [CI] 1.0–1.8), whereas in the 11-month evaluation, those who has obesity in EH group had a 5-times risk of developing into CDH. (OR 5.28, 95% CI 1.3– 21.1).[6]

Study conducted by Keith et al on more than 200,000 participants aged 16-90 years showed an increased risk of headaches in obese participants. Participants with obesity had a 35% increased risk of experiencing headaches compared to participants with normal BMI. Participants with morbid obesity had an increased risk of headaches by up to 80%. This study also shows that there is a stronger relationship between obesity and chronic headaches than episodic headaches.[7]

The study conducted by Huang et al showed that there was a link between headaches with overweight and obesity, but this depends on the type of primary headache. Patients with chronic migraines tend to have excess BMI or obesity compared to those with episodic migraines, whereas in TTH group, excess BMI and obesity were found to be more common in episodic TTH.[8]

A meta-analysis was conducted by Martami et al in 2022 to see the relationship between BMI and the type of primary headache. Analysis was carried out on 41 observational studies that examined the association between BMI with various types of primary headaches. This study showed that there was a significantly increased risk of migraine in the group with low BMI (OR 1.21, 95% CI: 1.09 – 1.34) and the obese group compared to normal BMI. (OR 1,28, IK 95%: 1.15 – 1.43).[9]

Various studies that have been done previously have also shown a correlation between excess BMI and obesity with migraines in particular. Study conducted by Peres et al in 2005 showed that primary headaches were more common in the obese group than the control group with migraine being the most common diagnosis.[10] A cross-sectional study conducted by Ford et al in 2008 through the National Health and Nutrition Examination Survey (NHANES)) showed an association between BMI and the prevalence of severe headaches or migraines (OR 1.37, 95% CI 1.09–1.72). This study shows that groups with BMI <18.5 or >30 have a risk of experiencing headaches compared to groups with BMI 18.5-<25.[11] Further research was conducted by Peterlin et al in 2010, this study compared the risk of migraine in the obese group with the non-obese group. This study also showed that the risk of migraine in the obese group was also influenced by age, where the age group <55 years was more at risk than those >55 years.[12]

Another study conducted by Westgate et al in 2021 showed that obesity can increase migraine morbidity and weight loss is known to improve headaches.[13] Study conducted by

Verotti et al showed that the prevalence, frequency and severity of migraines were known to be related to BMI. While the study conducted by Bigal showed that migraine prevalence was not related to BMI, but the frequency of attacks and the degree of severity is associated with BMI.[14,15] A meta-analysis conducted by Gelaye et al in 12 previous studies involving 288,981 individuals showed that obesity and underweight were associated with an increased risk of migraine. The study also showed that age and gender also affect the risk of migraine.[16]

A meta-analysis conducted by Ornello et al in 15 studies showed an increased risk of migraine in the obese group compared to the normal BMI group. The obese group also has an increased risk of experiencing chronic migraine.[17] Iqbal et al conducted a case-control study at the Shalamar Institute of Health Science in Pakistan from January 2020 to March 2021. This study showed that primary headache is known to be significantly associated with BMI. ($P<0.05$), especially migraines which were found to be more common in individuals with BMI > 23 compared to TTH.[18]

Ravid et al's study on 181 pediatric patients with headache complaints showed that the prevalence of obesity was higher in the study group compared to the general population. Migraine was closely related to excess body weight, but not TTH. Although obesity is known to be more associated with migraine than TTH, it is known to be associated with increased headache frequency and disability regardless of headache type.[19]

Studies on the relationship between obesity and TTH is more limited to this date. A cross-sectional study was conducted by Kristoffersen et al on 18,191 female and 14,985 male respondents aged 19-96 years. From all respondents, 4290 (12.9%) were known to experienced migraine and 4447 (12.4%) experienced TTH. This study showed that obesity is associated with a higher prevalence of migraine when compared to a control group that does not experience headaches. However, an insignificant correlation was found between obesity and TTH, while a study conducted by Robberstand et al showed an increased risk of TTH by 40% in adolescents aged 13-18 years with excess body weight or obesity (OR 1.4, 95% CI 1.1–1.6).[20,21]

5. CONCLUSION

From the descriptive data, it can be seen that the group with migraines has a higher mean BMI compared to other types of primary headaches. Previous studies have shown a significant association between excess BMI and obesity with migraine, whereas research on excess BMI and obesity with TTH or TAC is still limited.

The results of this study indicated that there was a significant difference in BMI between the migraine and TAC groups (p-value: 0.008) and TTH and TAC (p-value: 0.006).

Further research is needed to look at other factors associated with an increased risk of primary headache besides body mass index.

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