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The effects of sleep patterns on the college students' nutritional status

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ABSTRACT

This study aims to determine the correlation between sleep patterns and nutritional status in students of the Faculty of Medicine, Tarumanagara University. This research employed an analytical observational with a cross-sectional approach and had been permitted by Tarumanagara University. The number of samples in this study was 204 people obtained through calculations using unpaired analytic research formulas. Data were collected using a semi-quantitative food frequency questionnaire (SQ-FFQ) and a Pittsburgh sleep quality index (PSQI) questionnaire. The results of the Chi-square test showed that there was no correlation between gender (p-value = 0.79), class (p-value = 0.94), and food intake (p-value = 0.782) on nutritional status. Moreover, the results of the ANOVA test (p-value = 0.584) indicate no correlation between age and nutritional status in students of the Faculty of Medicine, Tarumanagara University. At the same time, the variable sleep pattern on food intake found a p-value = 0.000 through the Kolmogorov-Smirnov test. It means that there is a correlation between sleep patterns and food intake by these students. In addition, the Kolmogorov-Smirnov test was also carried out on the variable of sleep pattern on nutritional status with p-value = 0.000, which means there was a correlation between sleep patterns and nutritional status. In conclusion, this study indicates a correlation between sleep patterns and nutritional status in the Faculty of Medicine students at Tarumanagara University.

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INTRODUCTION

Nutritional status is the result of a balanced condition of nutritional intake consumed and for nutrients required by the body (Par'i et al., 2017). Nutritional status can be grouped into 2, namely overnutrition or undernutritionm (Huhmann, 2011). Overnutrition is divided into overweight and obesity. Based on the World Health Organization (WHO) in 2016, it shows that more than 1.9 billion people aged 18 years and over experienced overweight and 650 million of them are obese, while data by the Ministry of Health of the Republic of Indonesia (Kemenkes RI) in 2018 showed 13.6%

overweight and 21.8% obesity in the age group of 18 years and over (Kementerian Kesehatan Republik Indonesia, 2018). Overweight and obesity conditions tend to be more dangerous than undernutrition (World Health Organization, 2021a). Based on WHO data in 2014, the prevalence of undernutrition in the adult age group globally was 462 million people. Meanwhile, the prevalence of undernutrition in the adult age group in Indonesia was carried out by Ningrum DAS, et al. Who mentioned that 10.3% of 16,464 people were underweight in 2014 (Ningrum & Bantas, 2019).

There are several factors that can affect nutritional status, such as age, gender, marital status, occupation, eating habits, sleep quality, and smoking habits (Wang et al., 2016). Sleep is one of the needs of human physiology that affects mental and physical health. Healthy sleep is characterized by sufficient time, duration according to age needs, and individual satisfaction so that it can provide several benefits, such as increasing concentration, as well as reducing anxiety, nervousness, and stress (Nachvak S; M, 2016). The adult human have a good sleep duration of about 7-9 hours per day (Vargas et al., 2014). Lack of sleep or sleep disturbance can adversely affect memory and learning and can increase stress and anxiety. In addition, the incidence of metabolic syndrome, weight gain, and inflammatory processes can be affected by sleep disorders (Nachvak S; M, 2016).

Increased overweight (overweight and obesity) tend to occur in individuals who have sleep disorders. This condition can change diet through changes in the regulation of the leptin and ghrelin hormones. Changes that occur in the form of the hormone ghrelin higher levels can make hunger, resulting in an increase in appetite. This increase tends to cause individuals to consume high-calorie foods. In addition, sleep disorders cause reduced physical activity and energy use, resulting in stimulation of the sympathetic nervous system which results in a decrease in insulin secretion and an increase in cortisol. This will lead to reduced glucose tolerance which can increase the risk of insulin resistance (Bayon et al., 2014). Several studies have shown that college students are one of the groups that have poor sleep patterns, such as sleeping less than 7 hours. Research by Azad MC, et al. M pointed out that the worst sleep patterns are found in medical school students. However, the other faculty students can also have poor sleep patterns as well. Poor sleep patterns in medical school students can result from heavy academic loads, device use, lifestyle, and crowded campus activities (Hershner & Chervin, 2014). Therefore, this study aims to find out how sleep patterns affect nutritional status in medical students of Tarumanagara University.

RESEARCH METHOD

This study is an observational analytical study with a cross-sectional study design. This study was conducted at the Faculty of Medicine, Tarumangara University from January to September 2022. Respondents involved 204 people, but based on calculations with a comparative formula of 2 unpaired categories, a minimum sample number of 190 people were obtained. The assessment method was used to assess sleep patterns and nutritional status. The free variable in this study is sleep patterns, while the dependent variable is nutritional status. The data collection was proceed using the Pittsburgh Sleep Quality Index (PSQI) Questionnaire and the Semi-Quantitative Food FrequencynQuestionnaire (SQ-FFQ). Data on weight and height of respondents were obtained through filling out questionnaires by each respondent.

RESULTS AND DISCUSSIONS

Results

The number of respondents who filled out the questionnaire was 224 participants, but only 204 met the inclusion criteria. The median age of these respondents was 20 years old with a women-dominated gender. The majority of respondents had poor sleep patterns and normal nutritional status (Table 1). 20 years old respondents were the largest group of the respondents who had poor sleep patterns. Women respondents experienced more poor sleep patterns rather than the men

group. In addition, based on the year of the college class, it is known that respondents in the class of 2020 experienced the most bad sleep patterns (Table 2).

The results of this study showed that there was no correlation between the age, gender, college class, and food intake of respondents with the nutritional status of each respondent (Table 3). However, based on statistical tests conducted by (Kolmogorov-Smirnov test), there was a orrelation between sleep patterns and the number of respondents' food intake (Table 4). The Kolmogorov-Smirnov test was also performed on variables of sleep patterns and nutritional status. The results of this test showed a correlation between sleep patterns and the nutritional status of respondents (Table 5).

Table 1. Distribution of Respondents' Characteristics based on Age, Gender, College Class, Food Intake, Sleep Patterns, and Nutritional Status

Characteristics of Respondents	Amount (%)	Median (IQR)
Age (Years)		20 (1)
Gender		
• Men	55 (27)	
• Women	149 (73)	
College Class		
• 2019	33 (16,2)	
• 2020	121 (59,3)	
• 2021	50 (24,5)	
Amount of Food Intake		
• Excess food intake	36 (17,6)	
• Adequate food intake	24 (11,8)	
• Less food intake	144 (70,6)	
Sleep Patterns		
• Good sleep patterns	5 (2,5)	
• Poor sleep patterns	199 (97,5)	
Nutritional Status (BMI)		
• Underweight	27 (13,2)	
• Normal	99 (48,5)	
• Overweight	78 (38,2)	

Table 2. Characteristics of Respondents' Sleep Patterns based on Age, Gender, and College Force

Respondent's Character	Bad Sleep Patterns (%)	Good Sleep Patterns (%)	Total
Age (Years)			
17	2 (100)	0 (0)	2
18	15 (93,8)	1 (6,3)	16
19	62 (98,4)	1 (1,6)	63
20	75 (98,7)	1 (1,3)	76
21	25 (96,2)	1 (3,8)	26
22	12 (100)	0 (0)	12
23	5 (83,3)	1 (16,7)	6
24	2 (100)	0 (0)	2
27	1 (100)	0 (0)	1
Gender			
Men	54 (98,2)	1 (1,8)	55
Women	145 (97,3)	4 (2,7)	149
Force			
2019	32 (97)	1 (3)	33
2020	119 (98,3)	2 (1,7)	121
2021	48 (96)	2 (2)	50

Table 3. The Correlation Between Age, Gender, College Class, and Food Intake with Respondents' Nutritional Status

Characteristics	Overnutrition (n, %)	Normal Nutrition (n, %)	Malnutrition (n, %)	Total	*P*
Age (Years)					
17	2 (100)	0 (0)	0 (0)	2	
18	5 (31,3)	10 (62,5)	1 (6,3)	16	
19	21 (33,3)	32 (50,8)	10 (15,9)	63	
20	31 (40,8)	36 (47,4)	9 (11,8)	76	0,584**
21	11 (42,3)	11 (42,3)	4 (15,4)	26	
22	4 (33,3)	8 (66,7)	0 (0)	12	
23	3 (50)	1 (16,7)	2 (33,3)	6	
24	0 (0)	1 (50)	1 (50)	2	
27	1 (100)	0 (0)	0 (0)	1	
Gender					
Men	26 (47,3)	26 (47,3)	3 (5,5)	55	0,79*
Women	52 (34,9)	73 (49)	24 (16,1)	149	
College Class					
2019	15(45,5)	15 (45,5)	3 (9,1)	33	0,94**
2020	51 (42,1)	54 (44,6)	16 (13,2)	121	
2021	12 (24)	30 (60)	8 (16)	50	
Amount of Food Intake	13 (36,1)	18 (50)	5 (13,9)	36	
- Excess	12 (50)	10 (41,7)	2 (8,3)	24	0,782*
- Enough	53 (38,2)	71 (49,3)	20 (13,9)	144	
- Less					

Chi-SquareANOVA*

Table 4. Correlation between Sleep Patterns and Respondents' Food Intake

Sleep Patterns	Amount of Food Intake			*P* Value
	Less (n, %)	Enough (n, %)	Excess (n, %)	
Bad	140 (70,4)	24 (12,1)	35 (17,6)	0,000*
Good	4 (80)	0	1 (20%)	

**Kolmogorov-Smirnov*

Table 5. Correlation btetween Sleep Patterns and Nutritional Status of Respondents

Sleep Patterns	Nutritional Status			Total	*P*
	Overweight	Normal	*Underweight*		
Bad	77 (38,7)	97 (48,7)	25 (12,6)	199	0,000*
Good	1 (20)	2 (40)	2 (40)	5	

**Kolmogorov-Smirnov*

Discussion

Most of the respondents in this study were students who were 20 years old and women with 76 people (37.3%) and 149 people (73%), respectively. The similar results study were also found in the research by Anggraini SA, et al. which showed that the number of respondents was dominated by women with the highest age group aged 20-24 years (Anggraini et al., 2022). Research conducted by Vargas PA, et al. also showed that the most respondents were women (73.2%) with an average age of 21.68 years (SD = 3.49) (Vargas et al., 2014). Based on the amount of food intake obtained, the largest group of respondents were respondents with less food intake (70.6%). This amount followed the recommended amount of food intake based on 2019 AKG data. This result has the similar research conducted by Serly V, et al. Which obtained results of 76.5% by the 166 respondents were

women with the most food intake was moderate (57.8%) and light physical activity (44%) (Serly et al., 2015). Then, research by Noviyanti RD, et al. obtained the most results is on poor diet (63%) and light physical activity (60%) (Noviyanti & Marfuah, 2017).

This study also showed that the majority of respondents had poor sleep patterns, that was 97.5% of 204 respondents and the most nutritional status was normal nutrition (48.5%). The research by Anggraini SA, et al. also obtained the results of the study of the highest number respondents in the group who had poor sleep patterns of (74.8%) and normal nutritional status of (77.7%) (Anggraini et al., 2022). Another study conducted by Sinaga YY, et al. which obtained the research results in the form of 59% of 137 respondents have non-obese nutritional status and 68.6% have poor sleep patterns (Sinaga et al., 2015).

The most bad sleep result in the study was found in a group of 20-year-old respondents (75 people, 98.7%). These results are in line with the research by Hameed R, et al. that the most bad sleep patterns happened in the age group of 20 years, (Hameed et al., 2019), while the research of Jonasdottir SS, et al. shows different results of low sleep patterns which are in the age group of >30 years (Jonasdottir et al., 2021). Regarding to the gender, women are the most in poor sleep patterns (145 people, 97.3%). This result is also in line with theresearch conducted by Jonasdottir SS, et al. (Jonasdottir et al., 2021). However, the study of Al-Abri MA, et al. obtained different results that men respondents had worse sleep patterns (28.32%).

The majority of respondents who have normal nutritional status were 20 years old respondents. The ANOVA test results showed no correlation between age and nutritional status (p= 0.584). The results of this study are in line with the research of Syarifudin NH, et al. which showed that there was no correlation between age and nutritional status (p = 0.519) (Syarifuddin et al., 2022). Different results were found in a study by Makmun A, et al. that there was a correlation between age and obesity (p = 0.016), as well as Nugroho PS who stated that there was a correlation between age and obesity (p = 0.000). Nugroho PS study found that respondents with <14 years old had risk of obesity by 1,490 compared to respondents aged >14 years (Nugroho, 2020). Based on the Chi-square test on the gender variable, it showed that there was no correlation to nutritional status (p=0.79). The results of this study are in line with research by Wicaksana DA, et al. that there was no correlation between gender and nutritional status (p = 0.450) (Arif Wicaksana & Hida Nurrizka, 2019). The similar result was obtained by Syarifudin NH, et al. with a value of p=1,000 (Syarifuddin et al., 2022). However, there was different result from the Nugroho PS study which showed that there was a correlation between gender and the obesity (p = 0.000). The increased risk of obesity in women was 0.595 times greater than men (Nugroho, 2020).

This study showed that there was no correlation between the amount of food intake and nutritional status (p = 0.782). These results are in line with research by Wicaksana DA, et al. which showed no correlation between the amount of food intake and nutritional status. Likewise, the results of Syarifudin NH, et al. obtained that food diversity has no correlation with nutritional status (p= 0.832). Makmun A, et al. found different results, namely the consumption of sugary drinks (p=0.025) and fast food (p=0.025) that was associated with the incidence of obesity. This is in line with the research by Serly V, et al. which found a significant correlation between energy intake and nutritional status (p=0.000) (Serly et al., 2015).

The results of this study show that there is a correlation between sleep patterns and the amount of food intake (p = 0.000), which is in line with the results study of St-Onge MP, et al. That individuals with less sleep duration could consume more food, so there is a correlation between sleep patterns and the amount of food intake (p = 0.05) (St-Onge et al., 2011). On the other side, Crispim CA, et al. obtained different results that the amount of food intake was not influenced by the total sleep duration (p= 0.67), so it can be concluded that there is no correlation between sleep patterns and the amount of food intake (Crispim et al., 2011).

Sleep patterns are one of the factors that affect nutritional status, but there are several other factors that play a role as well such as physical activity or exercise, nutritional intake, and genetics.

This study showed that the majority of respondents with poor sleep patterns had normal nutrition (48.7%). The Kolmogorov-Smirnov test showed a correlation between sleep patterns and nutritional status (p=0.000). The results of this study are in line with research by Sharafi F, et al. which found a correlation between sleep patterns and nutritional status (p=0.05) (Sharafi et al., 2020). Research conducted by Sharafi F, et al. also showed the influence of very poor sleep patterns on overweight nutritional status and obesity (Sharafi et al., 2020). Another study by Israel M, et al. in India showed the results that respondents with insufficient sleep duration had overweight nutritional status and obesity with a total of 37 and 9 respondents who were medical students, respectively. A study by Meyer KA, et al. also found a correlation between sleep patterns and nutritional status of respondents (Meyer et al., 2012). Different results were found in a study by Vargas PA, et al. which stated that poor sleep quality had no correlation with obesity (p=0.623) (Vargas et al., 2014). Research by Anggraini SA, et al. in Malang based on 380 people aged 20-39 years showed that the majority of respondents had poor sleep patterns but had normal nutritional status (p>0.05) (Anggraini et al., 2022). Zadeh SS, et al. Showed that there was no significant correlation between sleep patterns and BMI. This result is in line with the research by Sinaga YY, et al. which was carried out on 166 students of the Faculty of Medicine, Riau University class of 2014 (Sinaga et al., 2015). Another study conducted by Sivertsen B, et al. showed results of 27.3% of respondents who had less sleep duration underweight.

The various research results above are different since nutritional status is something that is not only influenced by sleep patterns but can also be influenced by various things, such as genetics, diet, exercise, environment, and psychosocial. Pilcher JJ, et al. concluded that sleep activity affects nutritional status indirectly, but it can also be influenced by physical activity and BMI. Based on the research result by Pilcher JJ, et al. who found that a person with low activity levels and good sleep patterns has a low nutritional status (Pilcher et al., 2021). Chaput JP and Kline CE stated that poor sleep patterns resulted in a person lacking physical activity during the day characterized by the onset of drowsiness or weakness (Chaput et al., 2018 ; Kline, 2014).

Poor sleep patterns can disrupt the body's circadian rhythm and create imbalances between hormones. Hormonal imbalances that occur are the occurrence of a decrease in anabolic hormones, such as hormone growth, testosterone, and insulin-like growth factor 1 (IGF-1) and an increase in catabolic homon, such as cortisol (Satriani et al., 2018 ; Pilcher et al., 2021). Another thing that can happen to bad sleep patterns is impaired regulation of appetite-regulating hormones, such as leptin and ghrelin. An increase in the hormone ghrelin will occur when an individual experiences sleep deprivation. This increase will provoke the onset of hunger (Chaput, 2014). In addition, another factor that plays a very important role is the type of food intake and diet. Research by Markwald RR, et al., showed that respondents who lacked sleep (<7 hours) consumed more carbohydrates than protein and fat even though the body had signaled that the incoming energy was excessive. In addition, individuals with poor sleep patterns tend to consume breakfast less frequently and consume more food during the day and at night. This excessive energy intake will be stored in the form of fat (Markwald et al., 2013)

CONCLUSION

This study showed that women respondents mainly experienced poor sleep patterns with an average age of 20 years. Most of the respondents had normal nutritional status. This study concludes that there is a correlation between the amount of food intake and nutritional status, and there is a correlation between sleep patterns and nutritional status. Education about balanced nutrition and sleep patterns must be provided to impact health positively. Regular monitoring of nutritional status by each individual is essential to maintain physical and mental health. Physical activity or regular exercise is also a factor affecting a person's nutritional status. Further research needs to be conducted to find other factors that can affect nutritional status.

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