THE ASSOCIATION BETWEEN NUTRITIONAL STATUS AND SLEEP HEALTH

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Abstract

Sleep is one of the most important factors that influence mental and physical health components different factors can affect sleep quality and quantity such as nutritional status. This study investigated the association between nutritional status and sleep status.

This cross-sectional study was conducted in 2015 with presence 190 employees of Kermanshah university of medical sciences (KUMS) with aged 37/24±9/63 years from both sexes. The subjects were selected by convenience sampling.

Data was collected by a questionnaire including Demographic information, Anthropometric measurement, sleep questionnaire and Food frequency questionnaire (FFQ).

Data was analyzed by SPSS 20 software using Chi-Square test, univariate and multivariate logistic regression analysis for founding the association between nutritional status with quantity and quality of sleep.

In this research we found out quality of sleep in subjects with normal weight was 3 times higher than people who was overweight or obese(p-value =0/04 , OR = 3, CI =1/04 – 8/63) and sleep duration in people with high BMI was higher (7-9 hours) than people with standard BMI(<7 hours) (p <0/035).Quality of sleep in people who had eaten less than 3 serving of vegetables group was lower than people who had eaten 3-5 serving of this food group(P-value = 0.02 , OR = 8/58 ,CI = 1 / 28-61 / 20).

Consumption of 2-4 serving of dairy products in day acts as protective factor for sleep quality. This study is showing the effect of weight and dietary pattern on sleep status. Having the appropriate weight range and a balance diet can play an important role in benefit from quality sleep.

Keywords: Nutritional status; sleep health; anthropometric indicators; sleep quality; sleep quantity; dietary pattern.
Introduction

Sleep is one of the important human physiological needs, and one of the most important factors that influences mental and physical health components (1-2). Sleep health is a multidimensional pattern of sleep-wakefulness, adapted to individual, social, and environmental demands, that promotes physical and mental well-being. Healthy sleep is characterized by subjective satisfaction, appropriate timing, adequate duration, high efficiency, sustained alertness during waking hours and reduce stress, anxiety, nervous stress and helped energy recovery to focus better, consistency and enjoy the daily activities. People who have sleep disorders not only suffer from fatigue, but also they suffer from defecting memory and learning, increased stress and anxiety and reduced quality of everyday life (3-4). Epidemiologic studies have shown that bad sleeping can lead to increase mortality and morbidity (5). Also, other studies confirmed that sleep disorders can lead to incidence of metabolic syndrome (6), overweight, weight gain, general and abdominal obesity (7-9), oxidative stress (10) and inflammatory (11).

Many studies show that different factors can affect sleep quality and quantity which include physical activity, smoking and alcohol consumption (12-13). Other studies confirmed the impact of some nutrients including macronutrients and micronutrients on sleep pattern (14-17). Despite of these, the data about the effects of dietary pattern and anthropometric indicators on sleep status is rare. Dietary pattern is the quantities, proportions, variety or combination of different foods, drinks, and nutrients in diets, and the frequency with which they are habitually consumed (18).

According to the increased rate of chronic diseases and available evidences related to the role of unhealthy sleep in developing these diseases (19 - 21). The aim of the present study was to investigate the association between nutritional status including dietary pattern and anthropometric indicators with sleep pattern.

Materials and methods

This cross-sectional study was conducted in 2015 with presence 190 employees of Kermanshah University of medical sciences (KUMS) without any history of mental and physical disease. The subjects were selected by convenience sampling. Data was collected by questionnaire included:

Demographic information: The age, gender, educational levels, marital, economic and habitant status were collected by a questionnaire which particularly designed for this study.

Anthropometric measurements: Weight was measured by digital scale with name of CAMRY (model: EB9171 max) and 0.1kg precision. Height was measured with an accuracy of 1 cm. Body mass index (BMI) was calculated.
by the dividing of weight in kg to height in meters squared, assessment of normal weight, overweight and obesity was based on standard (22). According to this subjects who had BMI<18.5, 18.5-25, 25-29.9 and >30 were under weight, normal, over weight and obese respectively. In this study BMI was classified into two range include 18/5-24/9 and ≥25. Waist circumference (WC) was measured around the narrowest point between the ribs and iliac crest. Values ≥102 cm and ≥ 88 cm among men and women, respectively, were considered to be high (22). And hip circumference was measured by tape meters, waistline to hip ratio (WHR) was calculated by dividing of waist circumference to hip circumference. Values ≥1 and ≥ 0/8 among men and women, respectively, were considered to be high (22).

**The Pittsburgh Sleep Quality Index (PSQI):**

This index calculated by a self-rating questionnaire with 19 questions that grouped to form seven component scores: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. assessment of questionnaire is based on rating from components, Each component score is rated from 0 to 3 and accordingly the global score ranges is from 0 to 21, (The score range of 0-5 is equal to good sleep, 5-10 is equal to slight sleep disorder, 10-15 is equal to mediocre sleep disorder, 15-21 is equal to intensive sleep disorder), actually higher scores indicating poorer sleep quality, as well as sleep duration was assessed using item 4 in the Pittsburgh Sleep Quality Index (PSQI) . Based on this questionnaire proper sleep duration is ≥ 7 hour. In this study PSQI classified into two category, good sleep quality (PSQI= 0 - 10) and poor sleep quality (PSQI=10- 20). In this study was used the Pittsburgh questionnaire that validity and reliability has been confirmed in Iran (23).

**Food frequency questionnaire (FFQ):**

Dietary intake was assessed by a Semi quantitative food frequency questionnaire (FFQ) that validity and reliability in some of the Iran studies have been confirmed (24). Food frequency questionnaire include a list of 168 foods with a standard portion size. The mentioned values for each food are recommended portion size that converted to unit per day.

According to the recommended Food Pyramid Guide by the Ministry of Health and treatment of Iran, the number of recommended units for each food group per day for bread and cereals 6-11, fruits 2-4, vegetables 3-5, meat and grains 2-3, dairy 2-3 unit and consumption of miscellaneous group was considered a negligible value(25). In this study consumption of each food group categorize into three groups including: the recommended consumption quota, the consumption quota of less than recommended amount and the consumption quota of higher than recommended amount by the Food Guide Pyramid of Iran.
Statistical analysis:

Data were analyzed by SPSS 20 software and Chi-Square test with a significance level of %5 (α = %5). Univariate and multivariate logistic regression analysis conducted for founding the association between anthropometric indicators with quantity and quality of sleep and the estimation of OR to association the consumption quota of food groups and anthropometric indicators with quantity and quality of sleep respectively.

Ethics:

This study approved by Department of Researches and Technology of Kermanshah University of Medical Sciences (No.94025). Informed consent was obtained from the participants after full explanation of the study protocol.

Results

Participants were included 85 males (44/7%) and 105 females (55/3%). The average age of men and women were 40/03±9/30 and 34/80±9/29 years respectively. There was no statistically significant difference between ages in both sexes.

Sleep duration average in men was 6/12 ± 1/27 hours and in women was 6/01 ± 1/25 hours. The average of sleep quality index in men was 9/02 ± 3/30 and in women was 9/26 ± 3/29. There was no statistically significant difference in sleep duration and sleep quality index between two sexes. Majority of participants (88%) were suffered from unhealthy sleep as in 66% of them sleep duration was less than 7 hours.

Average of BMI in subjects was 25/12 ± 3/42 and 54/2% of them were overweight or obese. Sleep duration in subjects had a significant association with body mass index (p <0/035). The multivariate logistic regression analysis after adjustment for age, sex, socioeconomic status and physical activity showed that quality of sleep in people with normal weight was three time better than people who were obese or overweight (p-value =0/04 , OR = 3, CI =1/04 – 8/63). Waist circumference average in men was 95/64 ± 7/96 cm and in women was 85/09 ± 10/7 cm. There was not significant association between waist circumference and related indexes to sleep status. WHR average in men was 0/92 ± 0/04 and in women was 0/85 ± 0/1, and the results showed no significant association between this index and sleep status. The association anthropometric indexes with sleep status have been shown in Table 1.

The univariate and multivariate logistic regression analysis conducted for estimation of odds ratio (ORs) to associate the quantity and quality of sleep with the consumption quota of food groups.

The multivariate analysis results showed that sleep quality in those who had eaten less than 3 servings per day of vegetables was 8/58 times less than those who consumed 3-5 servings vegetables per day. (P-value = 0.02, OR = 8/58,
Also, the results showed that consumption of 2-4 servings of dairy products in day acts as a protective factor for sleep quality (Table 2).

Table-1: The association of anthropometric indicators with sleep quality and quantity.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Duration of sleep(hours)</th>
<th>Quality of sleep(PSQI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthropometric</td>
<td>≥7 (good)</td>
<td>0-10 (good)</td>
</tr>
<tr>
<td>BMI(kg/m²)</td>
<td>18/5-24/9</td>
<td>10-20 (poor)</td>
</tr>
<tr>
<td></td>
<td>5(5.7)</td>
<td>30(34.9)</td>
</tr>
<tr>
<td></td>
<td>15(15.5)</td>
<td>56(65.1)</td>
</tr>
<tr>
<td>WC (cm)</td>
<td>&lt;102</td>
<td>0.922</td>
</tr>
<tr>
<td>Male</td>
<td>19(11)</td>
<td>65.4</td>
</tr>
<tr>
<td>Female</td>
<td>14(13)</td>
<td>68(67.3)</td>
</tr>
<tr>
<td>WHR</td>
<td>&lt;1</td>
<td>0.538</td>
</tr>
<tr>
<td>Male</td>
<td>21(11.2)</td>
<td>62(34.8)</td>
</tr>
<tr>
<td>Female</td>
<td>18(10.7)</td>
<td>57(35.8)</td>
</tr>
<tr>
<td>Food groups</td>
<td>&lt;3</td>
<td>0.08</td>
</tr>
<tr>
<td>Categories(serving/day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables</td>
<td>3-5</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>&gt;5</td>
<td>0.433</td>
</tr>
<tr>
<td></td>
<td>&lt;3</td>
<td>0.417</td>
</tr>
<tr>
<td>Fruits</td>
<td>2-4</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>&lt;2</td>
<td>1.81</td>
</tr>
<tr>
<td></td>
<td>&gt;4</td>
<td>4.76</td>
</tr>
<tr>
<td>Bread and cereal</td>
<td>6-11</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>&lt;6</td>
<td>0</td>
</tr>
</tbody>
</table>

BMI: Body mass index; WC=Waist circumference; WHR=Waist-to-hip ratio

Table-2: Logistic regression analysis for sleep quantity and quality of related to food groups consumption.
Discussion

The results of this study showed a direct correlation between body mass index and duration of sleep, sleep duration was higher (7-9 hours) in people with BMI higher than standard. Other studies in this area suggests less sleep duration in people with overweight and obesity because of breathing problems such as obstructive sleep apnea (26 - 27).

We found out quality of sleep in people with normal weight was 3 times higher than people who was overweight or obese.

We found no association between indexes of waist circumference and waist-to-hip ratio with the quantity and quality of sleep which may have been due to the normality in relation to this indexes and small sample size or maybe the effect of weight be more important than fat distribution on sleep status. Studies in the field of impact of anthropometric indicators on sleep status are very rare and its mechanism is unknown.

Quality of sleep in people who had eaten less than 3 serving of vegetables group was lower than people who had eaten 3-5 serving of this food group, also consumption of 2-4 serving of dairy products in day acts as protective factor for sleep quality that was showing the important role of food pattern in sleep health.

Michael a. Grandner et al. reported in their studies a strong correlation between quality of sleep and some nutrients, they found out reduce in consumption of some nutrients such as vitamin C which is high in fruit and vegetables, as an antioxidant can disrupt sleep and affect the sleep quality (28), also increased calcium intake in subjects was associated with reducing hard to fall asleep and reduce the lack of sleep recovery (17). That may have been a result of the calcium effects on lowering blood pressure (29).
These results is consistent with the results of our study which represents a positive effect of adequate intake of vegetables on sleep quality and a protective effect of dairy products in associated with sleep quality.

Other study also showed that the lycopene intake in people with shorter sleep duration is less than people with 7-8 hours of sleep (30) Lycopene is an antioxidant with effects on cell differentiation and growth (31). As well as Other study showed that reduced concentration of serum carotenoids is associated with reduced sleep duration and those who had 5-6 hours of sleep, carotenoids concentration were lower than those who had 7-8 hours of sleep (32). These nutrients naturally found in fruits and vegetables that are colorful and come from diet.

Studies showed that nutritional status has an important role in quality of sleep (33). In conclusion this study is showing the effect of weight and dietary pattern on sleep status. Having the appropriate weight range and a balance diet can play an important role in benefit from quality sleep. Sleep quality was better in subjects with normal weight and consumption of recommended amounts of vegetable and dairy products help to having better quality sleep.

Acknowledgements

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References


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