Diabetes & Metabolic Syndrome: Clinical Research & Reviews xxx (2018) xxx–xxx

Contents lists available at ScienceDirect

Diabetes & Metabolic Syndrome: Clinical Research & Reviews

journal homepage: www.elsevier.com/locate/dsx

Original Article

Sleep disorders in a sample of students in Taif University, Saudi Arabia: The role of obesity, insulin resistance, anemia and high altitude

Ahmed M. Kabel[a,b,*], Amani M. Al Thumali[c], Khayriah A. Aldowiala[c], Raghad D. Habib[c], Shoroq S. Aljuaid[c]

[a] Department of Clinical Pharmacy, College of Pharmacy, Taif University, Taif, Saudi Arabia
[b] Pharmacology Department, Faculty of medicine, Tanta University, Tanta, Egypt
[c] Pharm D, College of Pharmacy, Taif University, Taif, Saudi Arabia

ARTICLE INFO

Article history:
Available online xxx

Keywords:
Sleep disorders
Obesity
Insulin resistance
Students
Taif

ABSTRACT

Aim: The aim of this study was to assess the incidence of sleep disorders and excessive daytime sleepiness (EDS) among Taif University students and to explore the precipitating factors of these disorders.
Methods: This study was carried out on 1066 students in Taif University of both sexes aging from 18 to 25 years. All included individuals were subjected to full history taking and thorough clinical examination, with special concern on anthropometric measurements (weight, height, waist-to-hip ratio and body mass index). Also, fasting blood glucose, fasting serum insulin, homeostatic model assessment (HOMA) index and blood hemoglobin levels were measured. Sleep disorders were assessed using sleep disturbances scale and the Epworth sleepiness scale.
Results: The overall incidence of sleep disorders and EDS was 31.33% and 15.29% respectively with statistically significant prevalence in females than males. There was significant positive correlation between sleep disturbances scale and Epworth sleepiness scale on one hand and body weight, body mass index, waist-to-hip ratio, the height of the residence place above the sea level, fasting and post-prandial blood glucose, fasting serum insulin and HOMA index on the other hand. Also, there was significant negative correlation between sleep disturbances scale and Epworth sleepiness scale on one hand and blood hemoglobin levels on the other hand.
Conclusion: Sleep disorders and EDS in Taif University students were precipitated by high altitude, anemia, obesity and glucose intolerance. Control of these factors may have a positive impact on the incidence of sleep disorders and EDS in this age group.

1. Introduction

Sleep is a state characterized by absent or decreased consciousness, inactivity of most of the voluntary muscles and relatively suspended sensory activities [1]. It can be differentiated from wakefulness by decreased ability to react to stimuli and sleep is more easily reversible than being in coma [2]. Sleep can be divided into two main types: non-rapid eye movement (NREM or non-REM) and rapid eye movement (REM) sleep. Each of these types has a characteristic set of associated physiological and neurological features. Most dreams occur during REM sleep. Deprivation of REM may lead to psychological disturbances with dramatic shift in subsequent sleep patterns when the individual is allowed to sleep without interruption [3].

The body's sleep-awake cycle is usually under the control of circadian rhythm which is regulated by the hypothalamus [4]. Incoming light which is transduced by retinal ganglion cells is believed to be the primary factor synchronizing circadian rhythm. Serotonergic stimuli coming from the midbrain periaqueductal gray area will inhibit the effects of light on the different body systems and will be associated with different aspects of the sleep-wake cycle [5].

The serotonin input is minimal during REM sleep and is maximal following REM sleep directly. So, these neurons may normally inhibit phasic REM events and their silence during REM sleep indicates termination of this inhibition [6]. On the other hand, many factors that promote sleep have been identified, including muramyl peptides, lipopolysaccharides, interferon-alpha 2, tumor necrosis factor, interleukin-1, sleep-inducing peptide, prostaglandins and vasoactive intestinal peptide. Besides

* Corresponding author at: Department of Clinical Pharmacy, College of Pharmacy, Taif University, Al-Haweiah, P.O. Box 888, Zip Code 21974, Saudi Arabia.
E-mail address: ahmed.kabal@med.tanta.edu.eg (A.M. Kabel).

https://doi.org/10.1016/j.dsx.2018.03.024
1871-4021/

enhancing sleep, they exert effects on the regulation of body temperature and on the immune response [7].

The characteristic features of sleep disorders include disturbances in the amount of sleep, quality or timing of sleep [8]. Also, disturbances in behaviors or physiological conditions associated with sleep are usually prominent in patients with sleep disorders. This may cause impaired daytime functioning and a variety of medical health problems. Moreover, sleep disorders can lead to increased morbidity and higher health care costs [3].

According to the results of many studies concerned with sleep, stress is the main cause of sleeping difficulties. Drinking beverages that contain caffeine in the afternoon or evening, traveling across several time zones, exercising close to bedtime and working or doing mentally intense activities before or after getting into bed can disrupt sleep [9]. Environmental factors including too hot or too cold atmosphere or too noisy or too brightly environment may represent a barrier to sound sleep. Also, living in high altitudes may cause sleep disorders, possibly due to oxygen deficiency. Other factors include physical factors, medical problems, hormonal disturbances, psychiatric disorders, occupational factors, genetic factors, certain drugs and aging [10]. The aim of this study was to assess the incidence of sleep disorders and excessive daytime sleepiness (EDS) among Taif University students and to explore the precipitating factors of these disorders.

2. Subjects and methods

A cross-sectional study was carried out on 1066 students (487 males and 579 females) in Taif University, Taif, Kingdom of Saudi Arabia. This study was carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans. This study was approved by the local ethics committee of Taif University, Kingdom of Saudi Arabia. An informed consent was obtained from all the involved subjects before the beginning of the study.

2.1. Exclusion criteria

Students having any chronic diseases such as hypertension, diabetes mellitus and liver diseases were excluded from the study. Also, students receiving medications for treatment of chronic diseases such as antiepileptic drugs or anti-diabetic drugs and residents outside the study area (Taif city) were excluded.

2.2. Study design

All included students were subjected to full history taking with stressing on the demographic data such as age, sex and residence and family history of similar conditions. Then, they were subjected to thorough clinical examination, with special emphasis on the anthropometric measurements including weight, height, waist-to-hip ratio and body mass index (BMI) calculated as kg/m2 were assessed. Height and weight were measured to the nearest 0.1 cm and 0.1 kg with light clothes on and without shoes. Fasting blood glucose levels were measured using commercially available kits obtained from Crescent Diagnostics Company according to the method of Trinder [11]. Blood hemoglobin levels were measured using an XE-2100D (Sysmex, Tokyo, Japan). Fasting serum insulin was measured using ELISA kits supplied by DRG Diagnostics, Marburg, Germany, according to the instructions of the manufacturer. The homeostatic model assessment (HOMA) index, which is the normalized product of fasting glucose and fasting insulin levels and used as a measure of insulin resistance, was calculated from available insulin and glucose levels as follows: HOMA = fasting glucose (mg/dL) X fasting insulin (mU/mL)/405. Also, ENT examination was performed to exclude the presence of any organic causes of sleep disorders.

2.3. Screening for sleep disorders

This was carried out using the sleep disturbances scale [12]. This scale consists of twenty six items that determine the presence of disorders of initiating and maintaining sleep, sleep breathing disorders, disorders of arousal, sleep-wake transition disorders, disorders of excessive somnolence and sleep hyperhydrosis. This was rated on a scale of 1 (Never) to 5 (daily). The total score ranges from 26 to 130, with a score more than 52 considered positive for sleep disorders.

2.4. Screening for excessive daytime sleepiness (EDS)

This was carried out using a modified version of the Epworth Sleepiness Scale [13]. The probability of falling asleep in 8 different situations was rated on a scale of 0 (not likely at all) to 3 (extremely likely). The total score ranges from 0 to 24, with a score of more than 10 considered positive for EDS.

2.5. Statistical analysis

The statistical analysis of the results was carried out using the Statistical Package for Social Sciences (SPSS) version 21.0 Inc., Chicago IL, USA. Descriptive statistics were used to describe all variables. Pearson's correlation coefficient (r) was applied to correlate between the different parameters. P-value less than 0.05 was considered statistically significant.

3. Results

3.1. The distribution of the different anthropometric and biochemical parameters among the students involved in the study according to gender

There were significant differences in the body weight, BMI, waist-to-hip ratio, fasting blood glucose, fasting serum insulin, HOMA index and blood hemoglobin between male and female students involved in the study (Table 1).

3.2. The prevalence of sleep disorders among the students involved in the study according to gender

The overall incidence of sleep disorders was 31.33%. The incidence was more prevalent in females (58.33%) with a mean value of 54.21 ± 2.64 compared to males (41.67%) with a mean value of 47.21 ± 2.17 (Table 2).

3.3. The prevalence of EDS among the students involved in the study according to gender

The overall incidence of EDS was 15.29%. The incidence was more prevalent in females (66.54%) with a mean value of 10.45 ± 0.73 compared to males (33.46%) with a mean value of 6.78 ± 0.45 (Table 2).

3.4. The prevalence of sleep disorders and EDS among students according to residence

The incidence of sleep disorders and EDS was more prevalent in the high altitude areas such as Al-Muhammadia (1953 m above the sea level) and Al-Hada (1785 m above the sea level) compared to the areas with low altitude such as Al-Haweiah (1435 m above the sea level) (Figs. 1 and 2).

Please cite this article in press as: A.M. Kabel, et al., Sleep disorders in a sample of students in Taif University, Saudi Arabia: The role of obesity, insulin resistance, anemia and high altitude, Diab Met Syndr: Clin Res Rev (2018), https://doi.org/10.1016/j.dsx.2018.03.024