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Sleep Quality Disorders in Obese Patients and their Neurophysiological Consequences: Assessment Based on Clinical Study

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ABSTRACT

In recent years, obesity has been increasingly linked not only to metabolic syndrome, cardiovascular diseases, and diabetes, but also to impaired sleep quality and brain function. Obstructive sleep apnea, sleep fragmentation, and chronic insomnia are common in obese individuals. Poor sleep quality disrupts physiological recovery processes in the body, leading to cardiac arrhythmias, hypertension, insulin resistance, and mental health disorders. This study aimed to investigate the clinical and neurophysiological characteristics of sleep disorders in obese individuals, assess their dynamic prognoses, and predict possible complications.

KEYWORDS: Obesity, sleep disorders, polysomnography, neurophysiology, EEG, HRV, cortisol, cognitive dysfunction.

Introduction. In recent decades, obesity has emerged not only as a metabolic concern but also as a major factor influencing sleep quality and brain function. Particularly, conditions like obstructive sleep apnea, fragmented sleep, and chronic insomnia are highly prevalent among obese individuals. When sleep quality declines, physiological recovery processes are disrupted, which adversely affects cardiovascular function, leads to hypertension, insulin resistance, and worsens mental health. Hence, in-depth analysis of the clinical and neurophysiological aspects of obesity-associated sleep disorders, their dynamic progression, and early detection of complications has become a critical scientific and clinical objective.

Materials and Methods. A total of 72 participants were selected for the study and divided into three groups based on their body condition and sleep status.

- ✓ Group 1 included 24 obese patients with reported sleep disturbances.
- ✓ Group 2 consisted of 24 obese individuals with normal sleep quality.
- ✓ Group 3 (control group) included 24 healthy, non-obese individuals with no reported sleep problems.

All participants underwent anthropometric evaluation (body mass index and waist-to-hip ratio). Sleep quality and architecture were assessed using polysomnography (PSG), measuring sleep stages, total sleep duration, number of awakenings, and apnea-hypopnea index (AHI).

Electroencephalography (EEG) was used to evaluate brain electrical activity, while heart rate variability (HRV) analysis was conducted to assess autonomic cardiac regulation. Statistical analyses involved ANOVA, Chi-square, and correlation tests.

Results. Participants in Group 1 (obese with sleep disorders) showed significantly poorer sleep quality compared to other groups. Average sleep duration was **5.3** hours, and the number of nighttime awakenings reached 12.4 times. PSG findings revealed a reduction in deep sleep phases and disruption in restorative sleep stages.

EEG analysis showed that alpha wave activity was reduced to 35.6% in Group 1, indicating insufficient brain rest. HRV analysis revealed a decline in heart rate variability (34.7 ms), suggesting impaired autonomic cardiovascular regulation. Increased AHI and frequent hypoxic episodes during sleep adversely affected cardiac function.

Sleep deprivation was also associated with elevated cortisol levels, contributing to heightened stress, reduced insulin sensitivity, and increased risk for metabolic syndrome and psychiatric disorders.

The findings demonstrate that obesity-related sleep disturbances negatively impact various physiological systems. Patients with poor sleep exhibited more frequent awakenings, reduced deep sleep phases, diminished alpha wave activity on EEG, and lowered HRV values. These changes significantly increased the risk of hypertension (OR=2.3), type 2 diabetes (OR=2.8), ischemic heart disease (OR=3.1), and cognitive impairment due to depression (OR=2.5).

Additionally, reduced activity of neurotransmitters such as serotonin and dopamine led to symptoms of depression, impaired attention, and decline in intellectual performance.

Conclusion. Early detection and management of sleep disorders in obese individuals is critical not only for physical but also for mental health preservation. Maintaining proper sleep hygiene, adopting a healthy lifestyle, and utilizing appropriate medical or surgical interventions can help mitigate these complications.