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Excessive Daytime Sleepiness Prevalence and Its Correlation with the Educational Level among Patients in the Pulmonary Diseases Department - Sleep Unit - Hassan II University Hospital, Fes – Morocco

Mohamed Jiar[1], Ismail Alaoui[2], Mohammed Jear[3], Manal Abouhmala[4]

[1]Psychology Professor, Private University Of Fez. Fez-Morocco
[2]Psychology Professor, The Faculty Of Arts And Humanities Dhar El Mahraz
[3]Research Student In English, The Faculty Of Arts And Humanities Dhar El Mahraz
[4]Psychology Professor, Private University Of Fez. Fez-Morocco

Abstract
This study aims to assess the prevalence of excessive daytime sleepiness (EDS) among adults. We conducted a descriptive and analytical study of 151 patients at Hassan II University Hospital in Fes. With the objective of identifying the causes of EDS and its impact on individuals with lower educational levels. The study tools included an Arabic translation of the Epworth Sleepiness Scale, after verifying its validity and reliability. The scale effectively identifies sleep disorders and risk factors for EDS. The participants' ages ranged from 18 to 65+ years, with a male ratio of 34.4% (52) and a female ratio of 65.6% (99). Results showed no high prevalence of EDS in the sample. However, statistically significant differences were found in sleepiness on the basis of the educational level.

Keywords: Sleep, Excessive Daytime Sleepiness, Obstructive Sleep Apnea Syndrome.

1. Introduction:

It is undisputed that sleep plays a significant role in human life, and its function goes beyond mere rest, as some believe. Sleep is a crucial factor in the process of growth and other complex functions in general. Many researchers describe it as a physiological process capable of influencing psychological and cognitive aspects of the body (Hershner, Chervin, 2014). Generally, sleep has a daily circadian rhythm (the biological clock) that regulates the routine of life. Any disruption in this system can lead to difficulties in concentrating, thinking, and paying attention, as well as hinder academic achievements (Ohayon, 2008). Among the serious problems associated with sleep disorders is the excessive daytime sleepiness. Philip and Sagaspe (2011) argue that the evolutionary and rapid trends of societies, along with the organization of work (working around the clock) and overlapping hours, expose individuals, workers, or drivers to the accumulation of sleep deficits. Some estimates indicate that the difficulty of staying awake affects 5% of the population.

EDS is a sudden condition that makes a person sleep at inappropriate times and places. However, it is often linked to many sleep disorders, causing adjustment difficulties in life, and sometimes fatal accidents (Adjiri, 2022).

Billiard (2007) defines it as a decrease in wakefulness, manifested as a desire to sleep during the day. He attributes this to physiological factors. If it occurs in the evening, it is due to the effect of homeostasis, while its occurrence in the early afternoon is primarily related to the influence of the biological clock. EDS creates a pathological condition that makes the individual feel a kind of embarrassment, especially if it happens during social situations such as seminars, in addition to causing other problems at the level of cognitive processes.

In this context, Dietman et al (2019) describe excessive daytime sleepiness as the involuntary need to sleep during the day due to nighttime sleep disturbances. They emphasize the essential distinction between EDS and daytime fatigue, the latter being a loss of physical energy measured by the Chalder Fatigue Scale (CFQ). Obstructive sleep apnea syndrome is often directly involved in the emergence of EDS, especially when recurrent awakenings occur at night due to the temporary obstruction of the upper airways.

Furthermore, Mannarino, Di Filippo, and Pirro (2012) define obstructive sleep apnea syndrome as the collapse of the tongue during sleep, leading to frequent awakenings at night and often resulting in excessive daytime sleepiness. Additionally, Guilleminault and Zupancic (2009) see it as a complete or partial cessation of airflow through the nose and mouth, lasting at least 10 seconds, and is associated with various symptoms, with fatigue being the most significant.

Philip and Chaumet (2007) highlight three types of EDS: behavioural, organic, and drug-induced.

A. Effects of Excessive Daytime Sleepiness on Behaviour: Studies in chronobiology have shown that internal rhythms can produce cognitive impairments during specific daytime hours according to the biological clock. This period is typically between 03 and 05 AM, where a decrease in wakefulness and selective attention is observed. On one hand, this can cause a sharp slowdown in information processing. On the other hand, prolonging the waking time to high levels is an indicator of an increase in homeostatic pressure (internal balance), which in turn affects the operating mechanisms of wakefulness and attention. Consequently, errors become highly likely during activities such as driving.

B. Effects of Excessive Daytime Sleepiness on Organic Functions: Obstructive sleep apnea syndrome is a disorder responsible for EDS, affecting around 5% of the population and 20% of professional drivers. In general, sleep disorders, especially involuntary sleep disorders and idiopathic insomnia, pose incidental risks of accidents. Therefore, it is recommended to use electroencephalography (EEG) to test wakefulness levels and verify the effectiveness of the adopted treatment before resuming driving tasks.

C. Excessive Daytime Sleepiness Resulting from Specific Medications: Whatever the medication is, it must have side effects, even if the drug is compatible with the medical conditions. Approximately 6% to 8% of traffic accidents are attributed to the consumption of medications with mental effects such as antihistamines and benzodiazepines, known for their sedative properties that might cause sleep while driving.

2. The Study Issue:

Sleep constitutes a crucial aspect of human life, with its various stages providing numerous benefits. The fulfilment of all sleep cycles, from light sleep to REM sleep, serves as an alternative and effective treatment for certain sleep and organic disorders. However, many people resist nighttime sleep to engage in recreational activities, leading to issues affecting the biological clock.

In this context, Hausser-Hauw (2008) considers that a third of the of the population sleeps less than 6.5 hours a night, while they require more than 7 hours of sleep. This accumulation of sleep debt ultimately results in mood disorders and a sharp decline in professional and daily performance.

In France, sleep deprivation contributes to over 20% of traffic accidents, and shift work disrupts sleep quality. The direct factor in its appearance is a sharp increase in obstructive sleep interruption syndrome (Teculescu et al, 2013).

Surveys show that 15-16% of the U.S. population aged 18 and above may experience excessive daytime sleepiness, and representative surveys in four Western European countries: the UK, Germany, Spain, and Italy reveal frequent occurrences of excessive daytime sleepiness more than 3 times per week (Leibowitz, Brooks, and Noir, 2006). It is highly conceivable that EDS influences other mental abilities. According to Garcia et al (2018), this phenomenon affects academic and professional performance, causing individuals to feel tense in situations requiring high alertness.

In Morocco, a study by El Biaz et al (2015) confirms the existence of very high levels of excessive daytime sleepiness. They attribute this increase to the presence of endocrine disorders, cardiac and artery insufficiencies, or the use of certain medications. However, the most distinct possibility remains the likelihood of having obstructive sleep apnea syndrome. Based on the study conducted by Benaicha et al (2017) on 300 taxi drivers in urban areas of Fes, relying on the hypothesis that EDS is a major and potential cause of traffic accidents, they revealed a high level of sleepiness that is statistically significant among the study sample.

In Japan, an epidemiological study conducted on 4,000 adults suffering from poor sleep quality and excessive daytime sleepiness indicated that 29% of participants sleep less than 6 hours per night, and 15% of them EDS. The causes of the latter were attributed to the overall insufficient duration of sleep required for normal functioning (Liu et al, 1999).

Therefore, the focus on studying excessive daytime sleepiness should move towards connecting this phenomenon with its underlying conditions and factors in the Moroccan context. It is essential to verify the role of culture and educational level in addressing situations saturated with danger or adversity as an awareness strategy for self-preservation.

To make the problem of the current study clearer in its interrogative form, it is stated as follows:

- Is there a high level of excessive daytime sleepiness among the individuals in the sample?
- Are there no statistically significant differences in excessive daytime sleepiness among individuals in the study sample attributed to the educational level variable?

3. Study Hypotheses:

- The first hypothesis states: "There is a high level of excessive daytime sleepiness among the sample individuals."
- The second hypothesis states: "There are no statistically significant differences in excessive daytime sleepiness among sample individuals attributed to the educational level variable."

4. Definition of Terms:

4.1. Excessive Daytime Sleepiness (EDS):

Roehrs and Roth (2008) define excessive daytime sleepiness as a sharp deterioration in sleep quality due to insufficient nighttime sleep. This definition aligns with the perspective of Duque, Chabur, and Alba (2015), who consider sleep a general public health issue in Western society, and that excessive daytime

sleepiness is the result of repeated nocturnal awakenings, which in turn harms sleep quality. El Hangouch et al (2018) define it as the inability to stay awake during daily tasks, often associated with sleep disorders, and can directly affect behaviour.

4.2. Obstructive Sleep Apnea Syndrome (OSAS):

In line with the scientific trajectory driving this study, obstructive sleep apnea syndrome is the presence of recurring episodes of complete or partial obstruction of the upper airways during breathing (Coutier et al, 2022). From this perspective, Lévy, Tamisier, and Pépin (2023) argue that it is one of the most common sleep disorders, affecting around 5% of the general population. Its severity increases with age, with a similar prevalence between genders. Its primary consequences include excessive daytime sleepiness, cognitive disorders, an increase in road accidents, and an elevated mortality rate among individuals with high blood pressure and coronary artery disease.

4.3. Operational Definition of Excessive Daytime Sleepiness in the Current Study:

Excessive Daytime sleepiness (EDS) refers to a type of involuntary surrender to sleep in various situations, especially those characterized by monotony and calmness, such as watching TV, attending a seminar, or engaging in scientific or public activities. It is the sum of scores obtained by individuals using the Epworth Sleepiness Scale with its eight-point scale, as applied in the current study.

5. Study Objectives:

The study aims to achieve a set of objectives summarized as follows:

A. Highlight the role of regular sleep as a complex process in influencing, operating, developing, and setting the pace of life.
B. Extract the consequences of sleep disorders, with a focus on obstructive sleep apnea syndrome, on the individual's organic and psychological well-being.
C. Demonstrate the daily problems resulting from OSAS and EDS as an example.
D. Indicate the role of cultural and educational awareness in dealing with the challenges resulting from excessive daytime sleepiness.

6. Significance of the Study:

This study sought to provide scientific and methodological contributions by constructing and translating the Epworth Sleepiness Scale into Arabic to examine the impact of EDS on the studied sample, who suffer from obstructive sleep apnea syndrome. In addition, the study aims to draw the attention of healthcare professionals and scientific researchers to the importance of addressing sleep disorders, specifically OSAS, as a real threat to an individual's life. Lastly, we aspire to encourage researchers to undertake further investigations and studies related to the current research variables, or to employ other variables that might contribute to the intellectual momentum and scientific enrichment.

7. Methodological Procedures of the Study:

7.1. Study Description:

The sample is comprised of individuals visiting the Hassan II University Hospital, specifically the Sleep Unit of the Pulmonary Diseases Department. We have reviewed the patients' files, specifically those who underwent the Polysomnography test, as it is considered one of the most accurate techniques for diagnosing sleep disorders.

- **Age:** The sample was chosen from individuals aged 18 to 65 and above.

- **Gender:** The sample included both genders, with 99 females and 52 males.
- **Educational Level:** The sample was selected with diverse educational levels, ranging from low, medium to high.

7.2. Study Tools:

The Epworth Sleepiness Scale (ESS) was used to assess excessive daytime sleepiness.

7.3. Psychometric Properties of the Current Study Tool:

7.3.1. Internal Validity of the Epworth Scale:

To verify the validity of the Epworth scale, we applied it to a random sample of 30 individuals from the original study population. Pearson correlation coefficients were calculated between each item's score and the total score of the scale to assess internal validity. Table (01) illustrates the correlation coefficients:

Table (01): Correlation Coefficients between Each Item and Total Score of the Epworth Scale

Item	Correlation Coefficient	Item	Correlation Coefficient
1	692**	5	.616**
2	.687**	6	.722**
3	.743**	7	.583**
4	.677**	8	.728**

** Significant at a significance level of 0.01

Table (01) indicates that all scale items have positive correlation coefficients, statistically significant at the 0.01 level. This suggests a high degree of internal validity, confirming the credibility of the scale's items in measuring the intended constructs.

7.3.2. Reliability of the Epworth Scale:

To verify the reliability of the Epworth scale, we applied it to the previously mentioned survey sample. From the results, the reliability coefficient was calculated using the Cronbach alpha method for the total number of items in the scale as a whole, as shown in Table (02):

Table (02): Cronbach's Alpha Reliability Coefficient for the Epworth Scale.

Scale	Number of Items	Cronbach's Alpha Reliability Coefficient
Epworth	**8**	**0.80**

It is clear from Table (02) that the Cronbach's alpha reliability coefficient for the Epworth scale has reached (0.80), and this confirms that the scale has an acceptable degree of reliability that makes us more confident about its application to the main study sample.

8. Statistical Tools for the Current Study:

- T-Tests.
- Hypothetical and Arithmetic Means.
- Standard Deviation.
- Cronbach's Alpha Coefficient.

- Multiple Comparisons: Least Significant Difference (LSD) Method.

9. Explanation and discussion of the current study's hypotheses:

9.1. First Hypothesis: "There is a high level of excessive daytime sleepiness among the sample individuals."

9.1.1. Results:

To verify the first hypothesis, means and standard deviations were calculated. Then, a t-test for a single sample was used to determine whether there are significant differences between the hypothetical mean and the calculated mean of the sample individuals' scores on the sleepiness scale at a degree of freedom (150). Table (03) illustrates this:

Table (03): Results of the t-test for a single sample to determine the level of excessive daytime sleepiness among the sample individuals.

Scale	Sample	Hypothetical Means[1]	Arithmetic Means	Standard Deviation	T-Value	Significance Level	Statistical Significance
EDS	151	12	11.98	5.09	-0.048	0.962	Not Significant

The table (03) indicates no statistically significant differences at the (0.05) level between the hypothetical mean and the calculated mean of the sample individuals' scores on the sleepiness scale. The t-value was (-0.048) with a significance level of (0.962), and this value is not statistically significant at the (0.05) level. These results suggest that the sample individuals have an average level of sleepiness. Figure (01) illustrates the difference between the hypothetical mean and the calculated mean of the sample individuals' scores on the sleepiness scale:

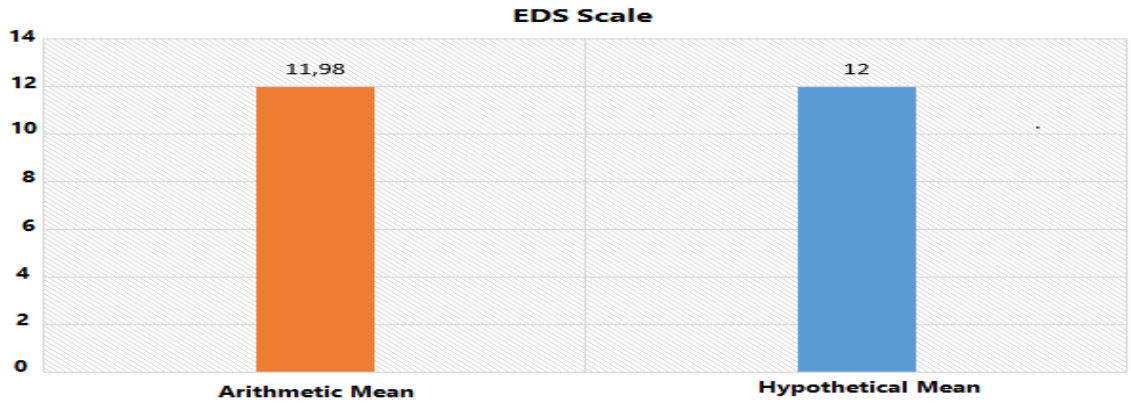

Figure (01): Difference between the hypothetical mean and the calculated mean of the sample individuals' scores on the sleepiness scale.

9.1.2. Interpretation/Discussion of the Results of the First Hypothesis:

To begin with, as we attempt to understand and interpret the results of hypotheses in general, we place them in their scientific context by examining primary and secondary comparisons to clarify the validity of the assumptions expressed through the hypothesis. In this regard, we must inquire about the critical situations that may lead individuals to indulge in daytime sleep at various times, especially in the

[1] The hypothetical average was obtained by summing the theoretical range of the scale divided by 2 as shown in the following equation: (lowest score of the scale + highest score of the scale)/2

afternoon. Therefore, excessive daytime sleepiness is not always attributed to pathological backgrounds, as Vecchierini (2006) suggests, but rather to a simple disruption in the biological clock rhythm caused by responses to daily stimuli.

This disruption does not necessarily indicate a specific disorder, as Vecchierini and Leger (2010) consider it more of a symptom due to the unnatural inclination towards daytime sleep on one hand and the absence of biological control mechanisms on the other.

In this context, a study by Ohayon (2008) indicates that the prevalence of EDS ranges from 2.5% to 21.5% in the age group between 15 and 65 years old. Ohayon argued that excessive daytime sleepiness is not a disorder or illness, but rather one of the symptoms of sleep disorders. The study also warned about the impact of afternoon naps on the quality of sleep, as they extend the time of going to bed at night. This creates habits of staying awake as a disruptive factor to the sleep-wake cycle.

Thus, the critical question arises about the degree of risk that may result from the continuation and surrender to daytime sleep. Headaches, limb heaviness, and mood swings emerge as prominent clinical symptoms.

The results of the first hypothesis we have reached, despite not being statistically significant and not meeting our expectations, do somewhat align with the findings of El biaz et al (2015). They identified a high prevalence of excessive daytime sleepiness among patients admitted to the Hassan II University Hospital Center in Fes, especially those with chronic heart and arterial diseases, and those affected by obstructive sleep apnea syndrome.

Teculescu et al (2013) argued that excessive daytime sleepiness is attributed to inflammations in the airways and obesity, often associated with OSAS. As the struggle with EDS lays the groundwork for various sources of abnormalities, Teculescu (2007) suggests that the issue of daytime sleepiness, whether severe or superficial, is fundamentally due to continuous and repetitive exposure to upper airway obstructions during sleep. The frequent awakenings affect the total sleep time, leading to a tendency to lie down whenever the opportunity arises.

Schwartz et al (2009) suggested that excessive daytime sleepiness might be accompanied by psychological and neurological disorders such as schizophrenia, depression, or multiple sclerosis, or as a result of the use of certain prohibited medications. They called for caution in dealing with this problem and advised against trivializing the phenomenon.

On the other hand, a study by Roure et al (2008) revealed that a distinctive feature of patients with obstructive sleep apnea syndrome and excessive daytime sleepiness is an increase in slow-wave sleep compared to those without EDS. Although patients showed slight disruptions in breathing and sleep quality, these results indicate that sleep disorders in general are not the primary determinants of increased EDS.

These complementary results align to a large extent with the findings of Ulander et al (2022), who observed moderate EDS in individuals with obstructive sleep apnea syndrome. In other words, there is no statistically significant increase in excessive daytime sleepiness.

In general, looking at the studied sample, we find an involuntary response to daytime sleep in a manner contrary to typical human behaviour. This may suggest that the risk comes from upper respiratory obstructions during the night, deepened by the difficulty of returning to sleep. Waking up represents first and foremost an escape from sleep problems, but this escape is temporally limited. Nevertheless, daytime remains the primary entry point for a compensation strategy. While this behaviour may involve submission and surrender to specific situations, it also indicates that a culture of awareness is necessary to overcome

a range of issues and improve sleep quality and effectiveness. Ulander added that EDS in the presence of obesity does not pose a threat to an individual's mental and psychological well-being to the extent that depression does.

9.2. Second Hypothesis: "There are no statistically significant differences in excessive daytime sleepiness among sample individuals attributed to the educational level variable."

9.2.1. Results:

To test the validity of the second hypothesis regarding the educational level variable, the means and standard deviations were calculated. Subsequently, a one-way analysis of variance (ANOVA) was used to determine whether there are significant differences among sample individuals in the measure of daytime sleepiness based on the educational level variable, with a degree of freedom (148,2). Table (04) illustrates this:

Table (04): Results of One-Way Analysis of Variance (ANOVA) to Determine the Significance of Differences among Individuals in the Study Sample in the Measure of Excessive Daytime Sleepiness According to Educational Level

Scale	Educational Level		Number	Arithmetic Means	Standard Deviation	F-value	Significance Level	Statistical Significance	LSD		
Epworth	Low	1	72	12.94	4.78	3.605	0.030	Significant	1	2	3
	Medium	2	24	12.33	4.46						*
	High	3	55	10.56	5.48				*		

Table (04) indicates statistically significant differences at a level of (0.05) among individuals in the study sample in the measure of Excessive daytime sleepiness based on the educational level variable. The calculated F-value was (3.605) with a significance level of (0.030), which is statistically significant at the (0.05) level. After using the LSD test for post-hoc comparisons to determine the statistically significant differences in the measure of excessive daytime sleepiness, it became apparent that there are significant differences between individuals with a low educational level and those with a high educational level. These differences favoured individuals with a low educational level. Figure (02) illustrates the differences in the measure of excessive daytime sleepiness among individuals in the study sample based on the educational level variable:

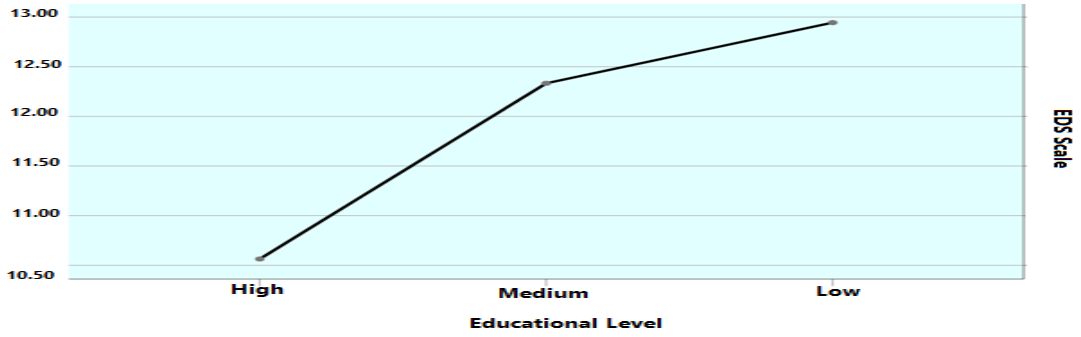

Figure (02): Differences in the Measure of Excessive Daytime Sleepiness among Individuals in the Study Sample According to Educational Level.

9.2.2. Interpretation/Discussion of the Results of the Second Hypothesis:

The study results indicate that the hypothesis is not supported, as there are statistically significant differences in EDS according to the educational level of the sample individuals. This finding is consistent with the study by Jennum et al (2020), which confirmed statistically significant differences between the stratum with a low educational level and the stratum with a moderate educational level. Researchers attribute this difference to the limited financial income that had a retroactive impact on their learning process. Most individuals with a low educational level quit their education at the elementary level, meaning that their mental and cognitive repertoire is very limited and cannot keep up with everything that is cultural. They do not consider EDS as a disorder threatening their health, but rather as a normal consequence related to the nature of their physical activities, whether household chores or the like. Thus, the idea of visiting a doctor, in this regard, remains far-fetched.

Ahmadi and Omiidvar (2022) conducted an intervention study emphasizing the importance of high cultural awareness (educational level) in reducing the rate of excessive daytime sleepiness among individuals with a high educational level. Their information processing in specific contexts takes on a flexible nature primarily due to the theoretical and field experiences acquired during their professional careers, reducing the problem of excessive daytime sleepiness, which is a matter generally related to awareness.

In another context, a study by Adjiri (2022) revealed that excessive daytime sleepiness significantly affects medical college students, which can be directly attributed to exhausting fieldwork, constant training, and repeated nightshifts. The study recommends increasing awareness among students as an alternative strategy to avoid the spectre of the disorder.

We can summarize the most important features that characterize the relationship between excessive daytime sleepiness and the educational level variable in the study by Li et al (2014), where the researchers aim to determine the significance of promoting education policies in the health field among individuals with obstructive sleep apnea syndrome. It is evident that academic or scientific profile does not constitute a definitive framework to claim that it is a fundamental determinant allowing a person to be fully aware of the disorder. One may have the highest academic degrees, yet their knowledge of health, in general, is rather limited or shrouded in some ambiguity, or, let us say, a kind of belittling the problem. What about the case of a person with a low or moderate educational level compared to those with a high level? The study concludes that there is an independent relationship between poor health knowledge and obstructive sleep apnea syndrome. It also highlights the necessity of awareness initiatives for self-diagnosis of sleep disorders, with a focus on obstructive sleep apnea syndrome, and identifying the extent of symptoms such as snoring and EDS, which remain prominent factors in exacerbating the condition.

In accordance with Li's study, El Hangouch et al (2018) presented an experimental perspective on the impact of EDS on medical students, resulting in a negative decline in cognitive abilities. The study concluded that EDS is not statistically associated with academic performance, but rather attributed to recurrent depressive episodes due to multitasking programs and course loads. As excessive daytime sleepiness has multiple contributing factors, Bahri et al (2019) found the presence of EDS among healthcare professionals in the Tunisian health sector, but it was not necessarily linked to sleep disorders. The study suggested that nightshifts contribute to the occurrence of EDS, and provided several recommendations to overcome this crisis, such as implementing work schedules suitable for nightshifts.

10. Conclusion:

Due to the complexity of the issues discussed in this article and the various aspects it covers, we chose to focus on the phenomenon of excessive daytime sleepiness, its causes, factors, and key terminologies. Despite our initial belief that the problem is clear to the reader, especially those interested in psychology and related sciences, there may be variations in assessing the importance of the role played by obstructive sleep apnea syndrome in the emergence of excessive daytime sleepiness. Additionally, factors such as maturity and cognitive awareness, as external influences, control information processing and help avoid psycho-organic disorders.

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