Chapter 115

Differential Diagnosis and Evaluation of Sleepiness

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ABSTRACT

Excess sleepiness is a common problem. Prevalence of this problem is increasing because of fast pace of life. Common causes of sleepiness include: obstructive sleep apnea, narcolepsy, insufficient sleep, use of sedative drugs, periodic limb movements and circadian rhythm sleep disorders. During evaluation of a case of sleepiness, detailed history taking including history of snoring, apnea, sleep hygiene, use of sedatives, nature of duty hours, abnormal limb movements, sleep paralysis and cataplexy should be taken. Bed partners should also be interviewed. Epworth sleepiness scale helps in subjective evaluation of sleepiness. Clinical examination should include general examination including blood pressure, jaw, face, upper airways, neck circumference and signs of heart failure or hypothyroidism. Polysomnography, multiple sleep latency test and measurement of wakefulness test help in reaching the diagnosis depending on the findings of history and clinical examination.

Keywords: Sleepiness, obstructive sleep apnea, narcolepsy, polysomnography

INTRODUCTION

Excessive daytime sleepiness (EDS) is a common problem which affects a large segment of the population. Complicated work schedules, fast lifestyles with early morning wakeups, and the lack of time for relaxation conspire to throw off the delicate rhythms of sleep, causing excessive sleepiness during daytime. Sleepiness is both a subjective and an objective phenomenon. It may be considered a physiological state like hunger. Just as hunger occurs with fasting and is satisfied by eating, sleepiness is produced by sleep deprivation and is reversed by sleep.

Daytime sleepiness was reported by 16.2% of 1,138 male subjects aged 18–23 years in a questionnaire distributed in Milan. The prevalence of EDS was reported to be 14.1% amongst 58,162 draftees in the French army.1-3 41.5% of the elderly population from India have been reported to be suffering from EDS.4 The Wisconsin Sleep Cohort study demonstrated that at least 2% of middle-aged women and 4% of middle-aged men had obstructive sleep apnea (OSA) and symptoms of EDS. Similar observations have also been reported from India.5

QUANTIFYING SLEEPINESS

The sensation of sleepiness is difficult to quantify, as are other subjective symptoms like dyspnea or pain.

Subjective Measures of Sleepiness

Several subjective sleepiness scales are available to the clinicians. Stanford sleepiness scale (SSS) is a 7-point self-rating scale ranging from 1 (wide awake) to 7 (almost sleepy). The Epworth sleepiness scale (ESS) (Table 1) is the most popular subjective sleepiness scale. It is based on questions relating to eight situations, known to be very much soporific. The questions are self-administered. Patients are asked to rate on a 0–3 scale how likely they are to doze off in the situation based on their usual habits. ESS scores have significant correlations with mean sleep latency in the multiple sleep latency test (MSLT) and disorders of excessive sleepiness such as narcolepsy, OSA and idiopathic hypersomnolence.

Objective Measures of Sleepiness

There are several objective measures of sleepiness.

Polysomnography

Polysomnography (PSG) is the term used to denote the continuous and simultaneous recording of multiple variables during sleep. Routinely monitored variables include: electroencephalogram (EEG) (central, occipital), right and left electro-oculogram (EOG) (to detect presence and stage of sleep), chin electromyogram (EMG), electrocardiogram (ECG), airflow (nasal and oral), respiratory effort, anterior tibialis EMG [to detect periodic leg movements (PLMs)] and arterial oxygen saturation. These variables usually are recorded on a polygraph, using a standard paper speed of 10 mm per second, and/or digitally acquired on a computer system. Sleep disordered breathing (SDB) is present when there are repetitive episodes of cessation of respiration (apnea) or decrements in airflow (hypopnea). Apnea/hypopnea index [(AHI)—the number of apneas plus hypopneas per hour of sleep] is used to quantify the severity of sleep apnea.2-8

<table>
<thead>
<tr>
<th>Situation</th>
<th>Chance of dozing</th>
</tr>
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<tbody>
<tr>
<td>Sitting and reading</td>
<td>0 = Would never doze</td>
</tr>
<tr>
<td>Watching TV</td>
<td>1 = Slight chance of dozing</td>
</tr>
<tr>
<td>Sitting inactive a public place</td>
<td>2 = Moderate chance of dozing</td>
</tr>
<tr>
<td>As a passenger in a car for an hour without break</td>
<td>3 = High chance of dozing</td>
</tr>
<tr>
<td>Lying down to rest in the afternoon when circumstances permit</td>
<td></td>
</tr>
<tr>
<td>Sitting quietly after lunch without alcohol</td>
<td></td>
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<tr>
<td>In a car, while stopping for a few minutes in traffic</td>
<td></td>
</tr>
</tbody>
</table>

TABLE 1 | Epworth sleepiness scale

How likely are you to doze off in the following situations?
Use the following scale to choose the most appropriate number for each situation:

0 = Would never doze
1 = Slight chance of dozing
2 = Moderate chance of dozing
3 = High chance of dozing
### Differential Diagnosis and Evaluation of Sleepiness

**Multiple Sleep Latency Test**
Multiple sleep latency test consists of sleep monitoring during four or five naps spread over the day, at 2-hour intervals (8 AM, 10 AM, 12 Noon, 2 PM, 4 PM). The test is preceded by nocturnal PSG. Patients are instrumented to record the EEG, EOG and EMG. They are put in a quiet, darkened room, and are instructed to fall asleep at lights out and is given 20 minutes to do so. Once sleep is attained, the patient is given another 15 minutes to reach rapid eye movement (REM) sleep within 15 minutes of sleep onset. The sleep latency (time from lights out until the beginning of the first epoch of sleep) and the REM latency (time from the first sleep until the beginning of the first epoch of REM sleep) are determined for each nap. Results of the MSLT in normal subjects show mean sleep latency longer than 15 minutes and 0–1 REM periods in five naps. Patients with sleep apnea have a mean nap sleep latency shorter than 10 minutes. Patients with narcolepsy have nap sleep latency shorter than 5 minutes. The presence of 2 or more REM periods in five naps is characteristic of narcolepsy.\(^{10,11}\)

**Maintenance of Wakefulness Test**
In maintenance of wakefulness test (MWT), patients sit in a chair in a darkened room and are requested to remain awake for 20 minutes. This test had been developed on the assumption that the ability to fall asleep and the ability to stay awake are two separate phenomena. However, this test has undergone further tests of validity, and the test is criticized for lack of a standardized protocol.\(^{10,11}\)

### FACTORS AFFECTING SLEEPINESS

**Sleep Quantity**
The amount of nocturnal sleep has a very strong relationship to the degree of daytime sleepiness. Sleep deprivation is followed by increased daytime sleepiness in normal persons.

**Sleep Quality**
Sleep quality is abnormal when sleep is discontinuous. disrupting sleep continuity affects sleep quality and results in increased sleep tendency. An arousal can be defined as a brief (3–15 seconds) speeding up of the EEG (in sleep study), occasionally accompanied by transient increases in skeletal muscle tone. Sleep studies can identify various causes of arousal, e.g. OSA, leg movements or pain.

**Circadian Rhythms**
*There is a biphasic pattern of sleep tendency over a 24-hour period:* During the nocturnal hours and during the daytime hours (between 2 and 4 PM).

### TABLE 2 | Differential diagnosis of excessive daytime sleepiness

<table>
<thead>
<tr>
<th>Disorders</th>
<th>Evaluation</th>
</tr>
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<tbody>
<tr>
<td>Sleep apnea syndromes</td>
<td>All cases</td>
</tr>
<tr>
<td>Upper airway resistance syndrome</td>
<td>History</td>
</tr>
<tr>
<td>Narcolepsy</td>
<td>Self-rating scales of sleepiness</td>
</tr>
<tr>
<td>Depression</td>
<td>Sleep-wake diary</td>
</tr>
<tr>
<td>Sleep-related movement disorders</td>
<td>Polysomnography</td>
</tr>
<tr>
<td>(Periodic limb movement, restless leg syndrome, bruxism)</td>
<td></td>
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<tr>
<td>Idiopathic hypersomnia</td>
<td>—</td>
</tr>
<tr>
<td>Withdrawal from stimulants</td>
<td>Selected cases</td>
</tr>
<tr>
<td>Insufficient sleep</td>
<td>Multiple sleep latency test (narcolepsy)</td>
</tr>
<tr>
<td>Drug dependence/abuse</td>
<td>Drug screen</td>
</tr>
<tr>
<td>Circadian rhythm sleep disorders</td>
<td>—</td>
</tr>
</tbody>
</table>
Neurology

The presence and severity of OSA can be precisely defined by sleep study. Once a patient has been selected for study, the physician decides between a full PSG (overnight) or a screening study (ambulatory). In cases where probability of OSA is very high, screening study may suffice, but in other cases a full PSG should be done.

Upper Airway Resistance Syndrome

Upper airway resistance syndrome (UARS) is associated with increasing negative intrathoracic pressure associated with upper airway flow limitation, resulting in arousals from sleep followed by EDS, but there is no apnea or significant fall in SpO₂. UARS is thought to be milder form of OSA spectrum.

Narcolepsy

It is a genetic inherited disorder. Classically there may be four features, referred to as “narcolepsy tetrad”: (1) EDS (multiple sleep episodes are short, and patients wake up feeling refreshed), (2) sleep paralysis (the patients cannot move their body for a few seconds), (3) hypnagogic hallucination (vivid dream-like scenes occurring upon sleep onset) and (4) cataplexy (any emotional excitement like laughter resulting in a loss of muscle tone for a few seconds). Generally patients may experience only two of the four features. MSLT criteria for narcolepsy are: mean sleep latency shorter than 5 minutes or 2 or more REM episodes in five naps.

Periodic Leg Movement

Periodic leg movement consists of stereotypic PLMs during sleep that may be associated with arousals and EDS. Diagnosis of PLM syndrome requires monitoring of leg EMG.

Restless Leg Syndrome

Restless leg syndrome (RLS) consists of paresthesia in the legs, usually described as crawling or creeping. Most patients of RLS have PLM during sleep. RLS symptoms make sleep onset difficult and associated PLM causes frequent awakening. Thus, patients of RLS complaint of insomnia and EDS. The etiology of RLS is not known.

Sleep Bruxism

It is a stereotypical movement disorder characterized by grinding or clenching of teeth during sleep. Generally the individual experiences annoying sounds, deterioration of gums and jaw muscle discomfort.

Idiopathic Hypersomnolence

It is a pathologic state that is manifested by a tendency to fall asleep at inappropriate places or situations. MSLT supports a diagnosis of idiopathic hypersomnolence with a mean sleep latency of less than 8 minutes and fewer than 2 REM episodes in five naps.

Circadian Rhythm Disorders

Circadian rhythm disorders are disorders that can affect the timing of sleep within the 24-hour day. External factors cause an alteration of patient’s circadian rhythm. Jet lag syndrome occurs when an individual travels across several time zones and experience difficulty in adjusting to the new time zone. Adjustment to the new time zone can create various levels of difficulty in initiating or maintaining sleep. Complaints of EDS, mild insomnia and gastrointestinal discomfort may occur. The symptoms may last 2–14 days.

Shift work sleep disorder usually affects individuals who work unusual hours such as night or evening shifts. This disorder consists of symptoms of excessive sleepiness at work and insomnia at home. Shift workers have an elevated risk of developing depression.

Irregular sleep/wake pattern is characterized by irregular episodes of sleep/wake timing with frequent irregular daytime napping and poorly consolidated and abbreviated nocturnal sleep. This sleep pattern may last for 3 months or longer, and most commonly is caused by poor sleep hygiene.

Delayed sleep phase syndrome is a disorder in which the major sleep episode is delayed in relation to the desired clock time, resulting in symptoms of sleep-onset insomnia or difficulty in awakening at the desired time. This syndrome is characterized by the persistent occurrence of sleep at a later-than-desired time, difficulty in awakening at a desired time, and sleepiness several hours after awakening. This disorder is more common in younger patients (i.e. high school and college students), who may complain of sleep-onset insomnia or of EDS caused by decreased total sleep time.

Advanced sleep phase syndrome is the opposite of delayed sleep phase syndrome. This disorder is commonly seen in the elderly.

CONCLUSION

Sleepiness is a common and sometimes serious medical problem faced by both patients and the clinicians. A detailed knowledge about the causes of excessive sleepiness is important. OSA, lack of sleep hygiene, narcolepsy and circadian rhythm sleep disorders are some of the important causes of excessive sleepiness. Thorough history taking and physical examination are rewarding, and helps in reaching a probable diagnosis. PSG and MSLT confirm the diagnosis of OSA and narcolepsy, two of the commonest causes of EDS.

REFERENCES