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The effects of sleep on oral health

A PEER-REVIEWED ARTICLE | by Noor Ajaz, RDH, Alise Plemmons, RDH, and Kandice Swarthout, RDH, LPC,

ABSTRACT

Sleep plays a crucial role in the proper functioning of various body systems. Inadequate sleep is prevalent in adolescents and adults and poses significant health consequences. Modern attitudes and lifestyles set individuals up for failure in obtaining the proper amount of sleep. The body needs a delicate balance of the correct quantity and quality of sleep. This course will define the science of the sleep cycle, stress, cardiovascular disease, immune response, inflammatory response, diabetes, obesity, and oral connections as related to sleep.

EDUCATIONAL OBJECTIVES

1. Define quality sleep, sleep hygiene, and the appropriate amount of sleep for optimal health
2. Outline the science of sleep and how it affects the human body
3. Describe the systemic effects of sleep loss
4. Associate the systemic effects of sleep loss with oral manifestations

Sleep loss and insufficiency pose a significant imbalance in the brain and body. Advances in research allow for an ever-evolving understanding of how the human body, including the oral cavity, depends on proper sleep. A direct cause between issues that arise in the oral cavity and the lack of sleep has yet to be made; therefore, relationship studies of sleep and oral/systemic connections are needed to aid in patient management and outcomes. The importance of acquiring sleep has been downplayed due to a lack of understanding and modern attitudes that portray sleep as laziness.[1] Systemic/oral connections can allow for greater understanding and overall treatment of patients getting inadequate sleep. The research found in this course presents the indirect link between sleep and the oral cavity via the oral manifestations of the effects of sleep insufficiency.

Modern attitudes about sleep

The primary necessities of life or even the driving forces of nature can be narrowed down to the need to eat, hydrate, breathe, and sleep. Sleep is a requirement for life and is located at the bottom of Maslow's hierarchy of needs (figure 1), along with breathing, food, water, sex, homeostasis, and excretion. Maslow's hierarchy theorizes that the most basic survival needs at the bottom of the triangle must be met before

humans can experience safety, love/belonging, self-esteem, and self-actualization.[2] Loss of sleep is so consequential that it has been used as a torture tactic throughout history.[3] Different from food, water, and breathing, the importance of sleep is often understated and not discussed in the medical setting due to a lack of understanding of why it is needed or how it contributes to health.[1,2]

Sleep has long been seen as an expendable aspect of the lives of humans. With modern-day society's constant fast pace, people often struggle to get a full night's rest. Quality sleep is often elusive between school, work, and social lives, although this mindset only tends to last until the effects of sleep deprivation begin to set in or one loses the fight against the weight of the eyelids. "You'll get plenty of sleep when you're dead" is a thought process that has driven employees, students, parents, and almost everyone to sacrifice sleep. This line of thinking can be problematic.[1]

According to the Centers for Disease Control and Prevention (CDC), one-third of our lives are spent sleeping. Sleep plays an integral role in survival, yet more than a third of American adults report inadequate sleep regularly.[4] Sleep is vital to many essential functions of the human body and contributes in ways that have not been fully explored.[3] Individuals suffering from sleep loss can reach for a supplement the body has been trained to depend on. An example is caffeine, which blocks the adenosine receptors that induce drowsiness and improves alertness, vigilance, attention, and reaction time. This may allow the sleep-deprived to brush off the short-term effects of sleep loss.[5]

This is one example of how the industrialization of Western society has had an adverse impact on the human sleep pattern, affecting long-term health and development.[1] A business culture of fortified "arrogance," health conditions, nighttime disruptors, work and school schedules, environment, and artificial light can derail the drive or ability to get the quantity or quality of restful sleep.[1] This imposing issue affects around 62% of adults worldwide and can also lead to the neglect of other health-related habits and measures.[6]

FIGURE 1: Maslow's hierarchy of needs[2]

Science of sleep

The process of restful sleep lies in cycles. While asleep, the body sequences through distinct phases and stages, collectively known as the sleep cycle. Not all rounds last the same length of time. On average, one sleep cycle lasts 90 minutes. The body sequences through approximately four to six cycles a night. The duration of each cycle progressively increases, with the first being the shortest.[7] As part of the sleep cycle, there are two phases: nonrapid eye movement (NREM) followed by rapid eye movement (REM) sleep. NREM is divided into three stages: N1, N2, and N3, representing the first three stages of a cycle and the depth of sleep.[8,9]

The American Academy of Sleep Medicine categorizes N1 (5%) and N2 (45%) as "lighter sleep," while N3 (25%) is classified as deepest sleep or slow-wave sleep (SWS).[8] Each sleep cycle phase and stage has a role in allowing the body to wake up refreshed. Analysis of brain activity characterizes the phases and stages; therefore, depending on which phase or stage of sleep the body is in, it undergoes variations in eye movements, brain wave patterns, and muscle tone.[7] A back-and-forth dance between NREM and REM sleep occurs throughout the night. However, the first half of the night is dominated by deep NREM sleep and its stages, while the second half shifts to predominantly REM sleep.[1,7]

NREM is considered "quiet sleep," with relaxed muscles and regular breathing, comprising 75%–80% of total sleep.[7,9] Most people cycle through NREM during the first third of the night, and NREM sleep is the most restorative.[8] It lends to reparative mechanisms such as synaptic plasticity, memory consolidation, tissue growth and repair, muscle and bone building, and strengthening of the immune system.[3,7]

REM is known as "dream sleep" and makes up about 20%–25% of total sleep in the final stages of each cycle. It is not

considered restful sleep as the heart rate and blood pressure increase, and the eyes move irregularly and rapidly. As the night goes on, REM sleep increases, and NREM decreases in each cycle. In this phase, breathing is irregular, and the muscles become paralyzed (REM atonia) to protect the sleeper from acting out dreams.[7-9] While NREM is considered a weeding-out process as it eliminates unnecessary neural connections, REM serves as a rebuilder that strengthens neurological networks.[1] Therefore, regular sleep is vital to ensure the body can go through multiple rejuvenating cycles to promote health.

A specific determination of what equates to the "appropriate" amount of sleep for any person can be affected by age. Other influencing factors include genetics, behavior, medical, and environmental factors. Adults ages 18 to 60 require at least seven hours per night to promote optimal health and obtain adequate sleep.[10] Newborns need the greatest amount of sleep at 14 to 17 hours. This number progressively decreases throughout childhood, as toddlers (ages 1–2 years) require 11 to 14 hours, and school-age children (ages 6–12 years) require 9 to 12 hours per night. For adults ages 61 to 64, seven to nine hours of sleep is required, while adults 65 and older need seven to eight hours.[10,11]

Sleep insufficiency

Being well rested results from not only the quantity of sleep but also the quality of sleep. Therefore, sleep insufficiency is more accurately used to describe factors contributing to poor sleep quality and quantity that prevent a person from waking up refreshed.[12] Persisting for three months or longer, chronic insufficient sleep is described as a curtailed sleep pattern associated with feelings of restlessness throughout the day.[13] Poor sleep quality is characterized by falling asleep longer than 30 minutes after getting into bed, waking up more than once per night, feeling tired throughout the day, and sleeping less than seven hours per night.[4,12]

As stated, one in three Americans suffers from sleep deprivation.[4] This prevalence throughout the United States demonstrates that sleep deficit results from various causes, such as lifestyle or voluntary choices, work obligations, sleep disorders, age, and medical conditions.[8] Affecting 70 million people in the United States, a common cause of sleep deprivation is sleep disorders, which include sleep apnea, restless leg syndrome, insomnia, and narcolepsy.[8,14] Adults, typically 65 years and older, experience difficulty sleeping due to age-related medical conditions; however, sleep insufficiency does not have an age or gender predilection, as anyone can suffer from it. Depression, chronic pain, cancer, and other medical conditions may cause a lack of sleep in all ages.[8,15]

Acute sleep deprivation is characterized by short-term consequences of lack of sleep, which are more evident and may be presented as increased stress levels, daytime cognitive impairment, memory loss, performance deficits, and mood disorders. These effects may be experienced after 24 hours of sleep deprivation.[3] Meanwhile, chronic sleep deficit has long-term consequences, presenting as chronic and systemic issues, such as immunodeficiency and a reduced inflammatory response, diabetes, obesity, cardiovascular disease, hypertension, and stroke.[3,8]

Systemic effects and oral manifestations

Immunodeficiency: The immune system is the first line of defense against infection or inflammation. Sleep plays a vital role in recharging the immune system. A reduction in sleep to four hours a night diminishes the production of natural killer (NK) cells that have a significant role in killing tumor cells, decreases the production of antibodies that fight infections and inflammation, and upsurges inflammatory cytokines that signal other cells to stimulate inflammation.[16,17] This promotes immune system suppression, and the risk of developing infections increases.[16]

With an increased risk of infections, the oral cavity is more susceptible to developing periodontal disease.[18] A study by the American Academy of Periodontology showed that "individuals who slept more than seven hours per night were less likely to exhibit severe periodontal disease."[18] Similarly, a different study by the National Library of Medicine found that "the odds of periodontitis among the sleep-deficient population were 19% higher than the sleep-adequate participants."[19] The result of sleep loss causes a reduction in the production of infection-fighting antibodies, cells, and protective cytokines, thus increasing risks for infections such as periodontitis.[16]

Inflammatory response: In addition to antibody production being affected, another way sleep loss affects the immune system is through its inflammatory response. When the body is sleep-deprived, cytokines associated with inflammation increase. The loss of sleep is linked to increased levels of proinflammatory markers, including cytokines, interleukin (IL)-6, C-reactive protein, and TNF-α.[17] These three cytokines overlap in gingivitis, such as with C-reactive proteins, and in periodontitis with IL-6 and TNF-α. Therefore, when an increase of inflammatory hormones is released throughout the body, gingival tissues also experience inflammation.[20] Moreover, the American Academy of Medical Orthodontics states there is an increased risk of developing inflammation of gingival tissues among the sleep-deprived.[21] The inflammatory markers also signify why sleep-deprived individuals are at higher risk for diabetes, cardiovascular disease, and hypertension.[22]

Diabetes: Sleep plays an integral

role in regulating metabolic functions, demonstrating the link between sleep insufficiency and the risk of diabetes. Metabolic disruption is provoked by inadequate sleep, thus resulting in appetite suppression and cardiometabolic disease. Lack of proper sleep is also associated with glucose intolerance and insulin resistance. Therefore, insufficient sleep may exacerbate the condition in a prediabetic person. While the traditional risk factors for diabetes include physical inactivity, being overweight, and family history, the risk factor of sleep insufficiency is equally predictive in diabetes. Researchers have found that the odds of prediabetes in sleep-inadequate individuals were higher than in those who reported sleeping seven hours.[23] In relation to the oral cavity and its effects, sleep deprivation increases the risk of diabetes, which automatically implies an increased risk for periodontal disease, as it is a known contributor. Diabetes does not favor a specific periodontal pathogen; therefore, the destruction is related to the host's response to the pathogens. The host response, however, is already weakened in individuals with insufficient sleep due to the suppressed immune system, thus increasing the severity of the disease.[24]

Obesity: Weight gain and obesity can result from various risk factors. Hormone imbalance occurs in the body because of sleep loss, which stimulates overeating and weight gain. With sleep insufficiency, appetite-regulating hormones leptin and ghrelin are altered, resulting in increased appetite and hunger. Increased cortisol levels, growth hormone deficiency, and decreased food metabolism are also associated with sleep insufficiency. Sleep-deprived individuals have a propensity for unhealthy, high-calorie foods to get more energy while simultaneously getting less exercise—resulting from daytime fatigue.[25-27] Overweight individuals are also more prone to airway obstruction. This commonly results in mouth breathing among obese individuals. Mouth breathing can lead to a decrease in saliva production, creating a drier environment. Saliva aids in neutralizing the acids in the oral cavity and flushes out bacteria from the mouth; therefore, with a reduction in saliva, obese individuals are at an increased risk for dental caries.[28]

Cardiovascular disease, hypertension, and stroke: Cardiovascular diseases (CVD) are the leading causes of death worldwide, with more than 80% resulting in heart attacks and strokes.[29] Poor sleep or short duration has been connected to the prevalence and incidence of cardiovascular diseases, including hypertension, myocardial infarction, and stroke.[29,30] Sleep insufficiency contributes to hypertension in both adults and adolescents.[31] One cohort study observed an association with difficulty maintaining sleep and myocardial infarction in middle-aged women.[31] The activation of the sympathetic nervous system is associated with sleep deprivation and linked to long-term health outcomes.[30] Thirty percent of cardiovascular deaths occur in adults under 70 years old, showing that these premature incidents are highly preventable. More proactive efforts for sleep health could curtail avoidable CVD deaths.[29]

Stress: Stress and sleep have a symbiotic relationship that creates a vicious cycle. Acute sleep deprivation increases stress levels, and amplified stress can cause sleep loss.[32] As stated, fragmented sleep or lack of sleep activates the sympathetic nervous system. This ultimately triggers the adrenal cortex, which stimulates the stress response and the release of hormones called glucocorticoids.[3,8,33] Glucocorticoids in the bloodstream are responsible for a cascade of hormonal and biochemical reactions that are ultimately responsible for chronic health consequences such as CVD, autoimmune disease, malignancy, and infections.[33,34] Corticotropin-inhibiting hormones that hinder the activation of glucocorticoids also assist in the onset of sleep. The lack of sleep increases glucocorticoids, diminishing the effects of corticotropin-inhibiting hormones, continuing the vicious cycle. The good news is that the body will eventually succumb and fall asleep. The bad news is that the elevated stress hormone levels will rob the body of slow-wave, restoring deep sleep.[34]

Bruxism, or teeth grinding, is a sleep-related movement disorder that occurs in the N1 and N2 sleep cycle stages, and is frequently caused by high stress and anxiety. Symptoms of bruxism include face and neck pain, temporomandibular disorder (TMD), and disturbed sleep. Bruxism has strong links to snoring and sleep apnea, both of which are associated with mouth breathing, which causes a reduction in saliva and an increase in dental caries.[35]

Disturbances in sleep and effects on the brain, such as anxiety, stress, and depression, can alter the fluctuations of the brain during sleep and lead to continued or worsening bruxism.[36] In high stress, psychological disturbances may influence neglect of oral hygiene, thus resulting in the accumulation of plaque and increased risk of periodontal disease. Dietary intake may also be affected, as food choices and the quantity of food consumption vary according to stress levels. Greater consumption of refined carbohydrates predisposes an increase in plaque accumulation; thus, periodontal disease. Smoking is also related to increased stress and directly correlates with periodontal disease.[33]

Obstructive sleep apnea

Obstructive sleep apnea (OSA) is described as partial or complete obstruction of the airway repeatedly throughout one's sleep. It adversely affects the quality of life, cardiovascular system,

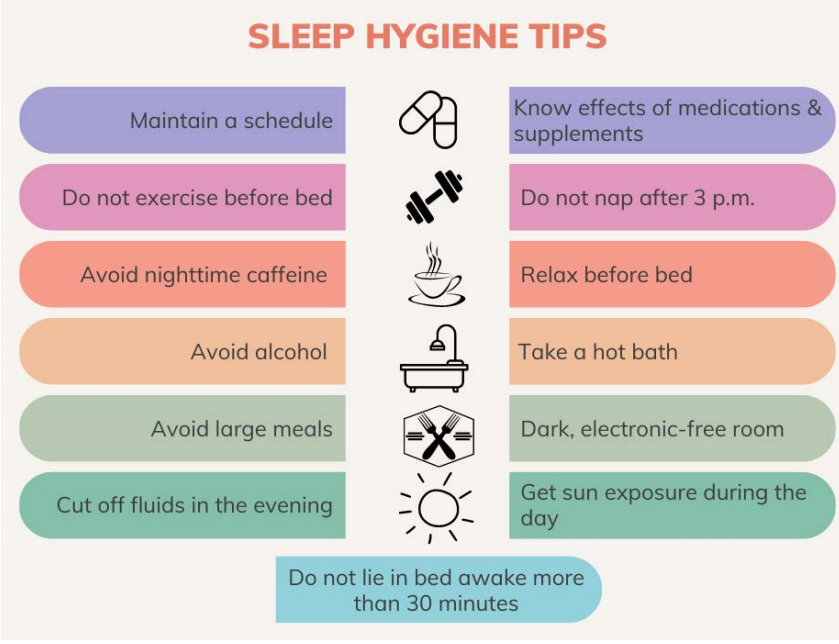

FIGURE 2: Sleep hygiene tips[1]

and neurocognitive impairment and is a risk factor for future stroke. Childhood parafunctional habits and the effects on the oral cavity's anatomy are contributing risk factors to adult sleep disturbance. The prevalence of malocclusion, soft palate extension, and vaulting affecting the airway can be seen in those affected with OSA. OSA has long been treated with continuous positive airway pressure (CPAP) and oral appliances such as soft palate lifters, mandibular advancement splints, and tongue retainer devices.[37] As stated, OSA is a condition that affects and has effects on multiple systems; therefore, specialists from varying fields may be necessary for aid and prevention in children and adolescents, as well as treatment options for adults.[38]

Sleep health and hygiene

Sleep hygiene practices are behaviors before bed that can reduce physical and emotional stresses and aid in preparing the body and brain for rest.[39] With modern attitudes being that "sleep is for the lazy," or "I can sleep when I am dead," individuals often take sleep health for granted. Routines can aid in productivity and feeling anchored when life gets complex or unpredictable; a sleep routine is no different. Helping patients recognize poor sleep hygiene behaviors and develop healthy habits assists in better sleep, physical health, mental health, and productivity. Dr. Matthew Walker states that the most crucial step toward positive sleep habits is going to bed and waking up at the same time every day, even on the weekends. This helps set the rhythm and cycles. Sleeping in a cool, dark room keeps the body at proper temperatures without disturbances from light. This means assessing the bedroom for things such as bright alarm clocks and device power lights. The recommended sleeping temperature is 65 degrees. Taking a hot bath before bed is beneficial because the drop in body temperature after getting out of the bath helps bring on sleepiness.[1]

Here is a comprehensive list of sleep hygiene habits that can be implemented in the dental hygienist's patient education for sleep-deprived individuals (figure 2):[1]

- Maintain a sleep schedule by going to bed and waking up at the same time every day, even on the weekends.
- Exercise at least two to three hours prior to bedtime. Exercising too close to bedtime may disrupt sleep.
- Get sun exposure during the day. Thirty minutes of sun exposure a day is key for healthy sleep.
- Avoid caffeine in the late afternoon and evenings. Caffeine can take up to eight hours to wear off.
- Avoid alcohol before bed. Alcoholic beverages may aid in falling asleep but are disturbing to the sleep cycle and often result in lying awake in the middle of the night.
- Have a light snack but avoid a full meal close to sleep time. Large meals can cause indigestion, interfering with sleep.
- Find a cut-off time for drinking fluids in the evening. Too many fluids close to bed may result in frequent urination.
- Review medications and supplements for ingredients that may cause wakefulness. Consider taking these earlier in the day.
- Naps after 3 p.m. can disrupt nighttime sleep. Consider relaxation time to read or meditate without taking a nap.
- Relax before bed. Plan downtime in the evening.
- Take a hot bath before bed for relaxation.
- Create a dark, electronics-free sleep environment. Noises and lights disrupt sleep. Consider lowering the overhead lights in the evening using lamps or candles.
- Do not lie in bed awake for more than 30 minutes. Get up, walk around, read for a few minutes, and get back in bed. Lying in bed too long can result in worry and anxiety about falling back to sleep.

Turning these simple strategies into habits can reclaim a restful and restorative night's sleep without "the damaging stigma of laziness."[1] Other

approaches for better sleep may require a referral to a sleep medicine doctor, primary care physician, or therapist. Hygienists with a complete health history on each patient can recognize signs of poor sleep, educate patients on proper sleep hygiene, and refer to the proper practitioner for further evaluation.

Conclusion

Dental professionals play a critical role in identifying signs and symptoms of sleep deprivation that manifest both orally and systemically. As ongoing research explores the diverse and lasting effects of sleep loss on overall health, dental professionals are well positioned to contribute valuable insights. Recognizing the complex connections between stress, anxiety, and sleep loss and their impact on the oral cavity provides a window into the mental and physical well-being of patients.

This understanding not only allows for the prevention of additional adverse effects induced by sleep loss but also enables the implementation of proactive management practices. Through comprehensive assessments, dental professionals can contribute to improving oral hygiene and promoting healthy sleep practices, thereby positively influencing both the oral and overall health of their patients.

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Noor Ajaz, RDH, graduated summa cum laude from Collin College in the top 10% of her hygiene class. She is passionate about the connection between oral and systemic health. Since researching the effects of sleep loss on oral health, Noor has incorporated sleep hygiene practices into her nightly routine and improved her quality and quantity of sleep. She is motivated to continue sleep research to better educate patients about the oral-systemic link and hopes to become more involved in sleep dentistry.

Alise Plemmons, RDH, is an honors graduate from Collin College and a former member of the United States Air Force. Alise is passionate about studying and understanding how sleep quality and quantity can also affect the body and the oral cavity. She strives to understand the varying complexities of the body and mind pertaining to sleep and oral health to better impart knowledge and awareness to fellow hygienists and patients.

Kandice Swarthout, RDH, LPC, is a licensed counselor and a full-time educator in Texas, where she teaches community dentistry and research. Kandice is the owner of Inspired Education & Wellness, where she is a speaker, writer, and private practice therapist. She is an approved provider under Texas Health and Human Services for human trafficking training for health-care professionals. Read her articles in RDH magazine, DentistryIQ, Today's RDH, and her Facebook blog, Fearless Compassion: Stories of Personal Triumph. Contact her at kandiceswarthout.com or on social media @The Counselor Hygienist.

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1. Sleep can be found on what level of Maslow's hierarchy of needs?
   - A. Self-actualization
   - B. Physiological needs
   - C. Love and belonging
   - D. Esteem

2. According to Maslow's hierarchy, sleep is as important to survival as:
   - A. Employment
   - B. Friendship
   - C. Property
   - D. Food

3. According to the CDC, what fraction of a person's life is spent sleeping?
   - A. 1/4
   - B. 1/2
   - C. 1/3
   - D. 1/8

4. The average sleep cycle lasts how long?
   - A. 20 minutes
   - B. 90 minutes
   - C. 30 minutes
   - D. 60 minutes

5. What are the main phases in the sleep cycle?
   - A. N3
   - B. REM
   - C. NREM
   - D. B and C

6. All of the following occur during the REM phase of sleep except:
   - A. REM atonia
   - B. Decreased heart rate
   - C. Increased blood pressure
   - D. Irregular breathing

7. Persistent loss of sleep for longer than three months is classified as:
   - A. Acute sleep loss
   - B. Narcolepsy
   - C. Chronic sleep loss
   - D. None of the above

8. Adults between the ages of 18–60 require a minimum of how many hours of sleep per night?
   - A. 7
   - B. 4
   - C. 9
   - D. 2

9. What age group requires the highest amount of sleep per day?
   - A. Toddlers (1–2 years old)
   - B. Adults over 65
   - C. Newborns
   - D. All ages require the same amount.

10. Symptoms of acute sleep loss include all of the following except:
   - A. Increased performance
   - B. Mood disorders
   - C. Increased stress
   - D. Memory loss

11. Obtaining four hours of sleep per night results in all of the following except:
   - A. Decrease in natural killer cell production
   - B. Decrease in inflammatory cytokines
   - C. Decrease in the production of antibodies
   - D. Suppressed immune system

12. Sleep-deprived individuals have higher odds of developing periodontitis by ___% than those who get an adequate amount of sleep.
   - A. 10
   - B. 19
   - C. 45
   - D. 50

13. Sleep loss is linked to increased levels of proinflammatory markers, such as:
   - A. Interleukin (IL)-4
   - B. Interleukin (IL)-10
   - C. C-reactive protein
   - D. TNF-β

14. Which cytokine is associated with gingivitis?
   - A. C-reactive protein
   - B. IL-6
   - C. TNF-α
   - D. All of the above

15. Diabetes has a predilection for which periodontal pathogen?
   - A. *P. gingivalis*
   - B. *T. denticola*
   - C. *T. forsythia*
   - D. Diabetes does not favor a specific periodontal pathogen.

16. Destruction caused by diabetes in the oral cavity is related to:
   - A. The type of pathogens present
   - B. The number of pathogens present
   - C. The amount of time the pathogens have been present
   - D. The host's response to the pathogens

17. Sleep deprivation increases the risk of diabetes, which increases the risk of developing which oral condition?
   - A. Gingivitis
   - B. Periodontal disease
   - C. Oral candidiasis
   - D. Dental caries

18. Which oral condition are overweight and/or obese individuals more likely to experience due to sleep insufficiency?
   - A. Mouth breathing
   - B. Xerostomia
   - C. Dental caries
   - D. All of the above

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19. How does sleep loss affect weight gain?

A. Decreased appetite and hunger
B. Decreased cortisol levels
C. Decreased food metabolism
D. Decreased consumption of high-calorie foods

20. Which hormones are affected by sleep loss?

A. Leptin and ghrelin
B. Cortisol
C. Growth hormone
D. All of the above

21. Cardiovascular diseases are the leading cause of death worldwide, with over ___% resulting in heart attacks and strokes.

A. 80
B. 60
C. 50
D. 40

22. The activation of the ___ is associated with sleep deprivation and negative health outcomes.

A. Parasympathetic nervous system
B. Sympathetic nervous system
C. Prefrontal cortex
D. Hippocampus

23. Acute sleep loss affects stress by:

A. Triggering stress hormones
B. Interrupting the stress response
C. Lowering stress hormones
D. Lowering stress at the onset of sleep

24. Stress hormones released due to sleep loss are called:

A. Dopamine
B. Adrenaline
C. Glucocorticoids
D. Corticotropin-inhibiting

25. The sleep-related movement disorder that occurs in N1 and N2 is:

A. Snoring
B. Bruxism
C. Restless leg syndrome
D. Sleep walking

26. Stress may influence:

A. Oral hygiene
B. Plaque accumulation
C. Poor dietary choices
D. All of the above

27. Obstructive sleep apnea is the partial or complete obstruction of the airway repeatedly during sleep. It can be treated with CPAP, oral appliances, mandibular advancement splints, and tongue retainer devices.

A. Both statements are true.
B. Both statements are false.
C. The first statement is true; the second statement is false.
D. The first statement is false; the second statement is true.

28. All of the following should be avoided before bed except:

A. Taking a hot bath
B. Blue light screens
C. Drinking too many fluids
D. Naps

29. Sleep hygiene is a term that indicates:

A. Brushing right before bed
B. Ensuring bedding is always clean
C. Practices that result in the reduction of stress and prepare the brain to sleep
D. Taking a shower right before bed

30. Going to bed and waking up at the same time each day is an example of:

A. Healthy sleep hygiene practice
B. Unhealthy sleep hygiene practice
C. Stress reduction protocol
D. Stress-provoking practice on the weekends

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The effects of sleep on oral health

NAME: TITLE: SPECIALTY:

ADDRESS: EMAIL: AGD MEMBER ID (IF APPLIES):

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EDUCATIONAL OBJECTIVES

1. Define quality sleep, sleep hygiene, and the appropriate amount of sleep for optimal health
2. Outline the science of sleep and how it affects the human body
3. Describe the systemic effects of sleep loss
4. Associate the systemic effects of sleep loss with oral manifestations

COURSE EVALUATION

1. Were the individual course objectives met?
   Objective #1: Yes No Objective #3: Yes No
   Objective #2: Yes No Objective #4: Yes No

Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.

2. To what extent were the course objectives accomplished overall? 5 4 3 2 1 0
3. Please rate your personal mastery of the course objectives. 5 4 3 2 1 0
4. How would you rate the objectives and educational methods? 5 4 3 2 1 0
5. How do you rate the author's grasp of the topic? 5 4 3 2 1 0
6. Please rate the author's effectiveness. 5 4 3 2 1 0
7. Was the overall administration of the course effective? 5 4 3 2 1 0
8. Please rate the usefulness and clinical applicability of this course. 5 4 3 2 1 0
9. Please rate the usefulness of the references. 5 4 3 2 1 0
10. Do you feel that the references were adequate? Yes No
11. Would you take a similar course on a different topic? Yes No
12. If any of the continuing education questions were unclear or ambiguous, please list them.

    _____

13. Was there any subject matter you found confusing? Please describe.

    _____

14. How long did it take you to complete this course?

    _____

15. What additional dental continuing education topics would you like to see?

    _____

    _____

Mail/fax completed answer sheet to:

Endeavor Business Media
Attn: Dental Division; 7666 E. 61st St. Suite 230, Tulsa, OK 74133
Fax: (918) 831-9804

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5.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	20.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
6.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	21.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
7.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	22.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	23.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	24.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
10.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	25.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
11.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	26.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
12.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	27.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
13.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	28.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
14.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	29.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
15.	Ⓐ	Ⓑ	Ⓒ	Ⓓ	30.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

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EXAM INSTRUCTIONS. All questions have only one answer. If mailed or faxed, grading of this examination is done manually. Participants will receive confirmation of passing by receipt of a Verification of Participation form. The form will be mailed within two weeks after receipt of an examination.

COURSE EVALUATION AND FEEDBACK. We encourage participant feedback. Complete the evaluation above and e-mail additional feedback to Rachel McIntyre (rmcintyre@endeavorb2b.com) and Laura Winfield-Roy (lwinfield@endeavorb2b.com).

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