Natural Solutions to Rejuvenating Sleep

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"Sleep is the golden chain that binds health and the body together."

- Thomas Dekker (English playwright, 1572-1632)

Rejuvenating Sleep: A Necessity of Life

For most adults, the amount of sleep needed for a sound mind and healthy body is seven to eight hours each night. The deep uninterrupted sleep, called rejuvenating sleep, is as vital for health as is good nourishing food and water. Sleep is the precious time during which the body rests, repairs, and recharges itself for the challenges of the next day. Humans spend one-third of their life sleeping (7-8 hours out of the 24-hour day), and nature designed that for a good reason. Rejuvenating sleep is the ultimate performance enhancer for every pursuit in life, whether it is intellectual, athletic, artistic, or creative. Despite this knowledge, many individuals fall into the trap of depriving themselves of sleep. They spend countless hours awake to get ahead in the competitive maze set up by the modern economic and digital revolution. Sleep deprivation is a great epidemic of current times. It is marching toe to toe with the epidemics of obesity, type 2 diabetes, heart disease, and cancer because all these are interconnected.

The prevailing culture in modern urban societies is that sleep time is equivalent to wasted time. Ungodly hours of work and late-night social activities have become a badge of honor for college students and corporate hustlers. A prerequisite to good work ethics in many corporations is synonymous with the employee staying connected to the work digitally 24/7. Working 18-hour days in the corporate world has become a new normal. The science, however, clearly shows that sleep deprivation ultimately leads to loss of productivity and creativity. ***"Presenteeism"*** is the new term coined for this phenomenon. It means that the employee is present at work physically but accomplishing less than his/her real potential. The corporate world is slowly catching up to this knowledge and will hopefully institute the culture of work-life balance.

The global community has to be made aware that the new culture of sleep deprivation, celebrated by the young generation and perpetuated by the business community, threatens health, productivity, and the economic progress of the society as a whole. Long-term sleep deprivation ultimately traps an individual into the disease state of sleeplessness called insomnia. The three significant reasons for the current epidemic of sleep deprivation and insomnia amongst the city dwellers are:

1. ***Sleep deprivation from a reduced opportunity for sleep***. That could be either deliberate self-imposed or work-imposed. The ultimate consequence of sleep deprivation is the disease state of insomnia.

2. ***Inability to sleep or insomnia.*** The most common reason is stress, anxiety, and fear originating from work, family, or social situations. The individual is desperate for sleep, but it is not in his/her reach.

3. ***An unbalanced lifestyle.*** The habits and behaviors which disrupt healthy sleep, such as frequent late-night socializing, late eating after 8 PM and late morning wake up.

There are several medical reasons for insomnia, which will not be discussed here because these may require specific therapeutic interventions. This discussion will focus on the current epidemic of sleep deprivation and insomnia resulting from human behaviors, which run against nature's norm. That accounts for most cases of insomnia currently afflicting the urban population.

The great news is that awareness and knowledge of the cause in itself will help to formulate the strategies of insomnia cure. The enduring wisdom in medicine states:

> ***"In medicine, we ought to know the cause of disease to be able to find an effective cure and prevention."*** – Avicenna (Persian physician, 980-1037)

In keeping with this enduring wisdom, the present discussion will focus on:

- **Sleep deprivation versus insomnia: Know the difference**
- **Common insomnia types affecting urban population**
- **Science of natural sleep and how sleep gets disrupted**
- **Natural sleep cycle and how it relates to the rejuvenating sleep**
- **Natural solutions to overcome sleep deprivation and common insomnia disorders**

Sleep Deprivation Versus Insomnia: Know the Difference

It is critical to know the difference between sleep deprivation and insomnia. The individuals with the two conditions experience similar symptoms of lack of sleep. However, the cause and approach to behavioral management differ. The significant differences between sleep deprivation versus insomnia are:

	SLEEP DEPRIVATION	INSOMNIA
THE UNDERLYING CAUSE	There is an ability to sleep, but there is no opportunity for it. The reason is persistent late-night work and social schedules or the night shift work. One can compare this situation to "food deprivation" in that the ability to eat is there, but there is no food available.	There is plenty of opportunities to sleep, but there is no ability to sleep. The reasons are anxiety, fear, stress, and harmful habits of eating late in the night and waking up late in the morning. These factors create a negative situation for falling asleep and staying asleep.
SLEEP ONSET TIME The average time between getting into bed and sleep onset is 20-30 minutes. This time differs when there is sleep deprivation versus when there is insomnia.	Sleep-deprived individuals will fall asleep very quickly within a few minutes of getting into the bed. No time wasted in tossing and turning.	Anxiety, stressful thoughts, late-night meals, and late morning wake up get in the way of falling and staying asleep. There may be tossing and turning in bed for a long time. The sleep, when it comes, is interrupted and not restful.
BEHAVIORAL OR ATTITUDE DIFFERENCES	Self-imposed or work-imposed sleep deprivation carries with it the deep-rooted sentiment in the individual's mind that sleep is a waste of time. That sentiment has created the modern cultural clichés like "If you snooze, you lose." These individuals typically claim that they are unique in that they can get away with 4 to 5 hours of sleep every day. They go to bed with a big "to-do list" in their minds. A simple attitude change these individuals require is to know the value of sleep. And, the behavior change they require	These individuals have the deep-rooted fear and anxiety in their mind about not getting good sleep. The insomniac brain is preoccupied and possessed by the thoughts of not being able to get good sleep. The apprehension, fear, and negative thoughts consume their daily life. A good example, "If I do not sleep tonight, how will I function tomorrow?" or even worse, "I may lose my job if I continue missing out on sleep." The more the time in bed trying to fall asleep, the higher is the rush of negative thoughts and anxiety. The sensible advice for these

	is “set aside time for unwinding and sleep.”	people is, restrict the sleep time, do not get into the bed until sleepy, stay awake during the day for 16 hours to build a sleep drive. Finally, get out of the bed if not getting sleep in the usual 30-40 minutes as tossing and turning worsens the problem.

It is essential to be familiar with the above differences to be able to figure out which behavior therapy will be suitable for fixing the sleep problem.

How Much Sleep Do We Need?

Sleep needs of humans decrease as they get older:

Newborn to 1 year	12-17 hours
1-5 years old	10-14 hours
6-13 years old	9-11 hours
14-17 years old	8-10 hours
18-65 years old	7-8 hours
65 years and older	6-7 hours

For optimal health, most adults require at least seven consecutive hours of sleep each night. That comes to 20-30 minutes of restful sleep for each hour in the wakeful state. That amounts to a total of 7-8 hours of sleep at night for 16 hours of daytime being awake. These are guidelines, and there are exceptional cases who claim to get away with 5-6 hours of sleep a day. If you feel well-rested, not tired, irritable, or sleepy the following day, you are okay with the amount of sleep you are getting. The mind and body are the best judge and barometers of the adequacy of sleep. Nonetheless, research supports that a sleeping habit of fewer than 6 hours a night may increase the risk of stroke and heart attack.

Types of Insomnia and Its Prevalence

Insomnia is a lack of restful sleep and is the most common sleep complaint affecting 30% of the urban population around the globe. Of these, about one-third may seek help for persistent insomnia severe enough to cause significant anxiety, distress, and daytime limitations. Young school-going and working population commonly suffer from sleep deprivation, which, when persistent, leads to insomnia. Fortunately, sleep deprivation-induced insomnia can be reversed effectively by behavior therapy and good sleep hygiene. Insomnia is present when there are one or more of the following problems:

- Longer than usual 30 minutes to get to sleep
- Poor sleep quality—broken sleep with frequent awakenings

- Wake up occurs very early in the morning, so the average sleep time is cut short.
- The sleep quality is unsatisfactory, with a feeling of waking up not well-rested.

There are five broad categories of insomnia:

1. ***Adjustment Insomnia.*** It is the most common form of insomnia. It is sudden in onset, short-term, and severe. It results from life situations that cause anxiety, mental anguish, and stress. This form of insomnia affects 15-20% of adults, making up almost two-third cases of insomnia. Most adults in their lifetime have experienced this type of insomnia at least once or twice. The word of caution is that if one falls into the trap of treating this form of insomnia with sleep drugs, the problem becomes persistent. The good news is that this, the most common type of insomnia, responds well to natural solutions of behavior therapy and sleep hygiene.

2. ***Behavior Insomnia of Childhood.*** Insomnia in infants and children occurs when the child associates sleep with an action (rocking, holding), an object (a favorite blanket, sucking on the bottle, thumb, etc.) or a setting (being close to parents). Every parent knows how to fix this problem, and the child eventually grows out of insomnia.

3. ***Inherent Insomnia of Unknown Cause.*** About 1% of the population suffers from this rare distressing insomnia, which may run in families. It is lifelong and challenging to treat.

4. ***Insomnia from Sleep Deprivation.*** It is the second most common form of insomnia. This insomnia occurs because of disordered sleep habits, which cause persistent sleep deprivation. As can be expected, this type of insomnia is more common in young adults with overwhelming work schedules or busy social lives. Fortunately, this type of insomnia responds well to behavior change and good sleep hygiene.

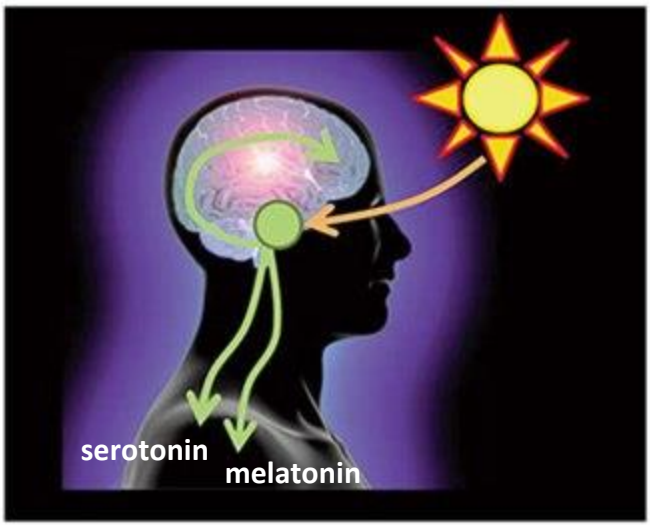
5. ***Insomnia Associated with Medical Problems.*** There are many prescription drugs (see below) and medical conditions such as chronic pain or physical discomfort or mental disorders which cause insomnia. This type of insomnia requires therapeutic interventions.

The current discussion will focus on the two most common types of insomnia—the adjustment insomnia and insomnia secondary to sleep deprivation. Both types of insomnia conditions respond to natural therapies of behavior modification and sleep hygiene. To be able to understand the insomnia therapies, it is essential to become familiar with the science of sleep and the reasons why healthy sleep gets disrupted.

The Chemistry of Natural Sleep-Wake Cycle

There are two systems in the body which drive the daily rhythms of the human sleep-wake cycle:

1. The Homeostatic Sleep Drive (called Sleep S)
2. Circadian Rhythm Sleep Drive (called Sleep C)



Brain Clock: Sunlight Stimulates Synthesis of Serotonin and Melatonin

Both the sleep systems work together to set up a regular pattern of Sleep-Wake cycle in harmony with natural day and night cycle.

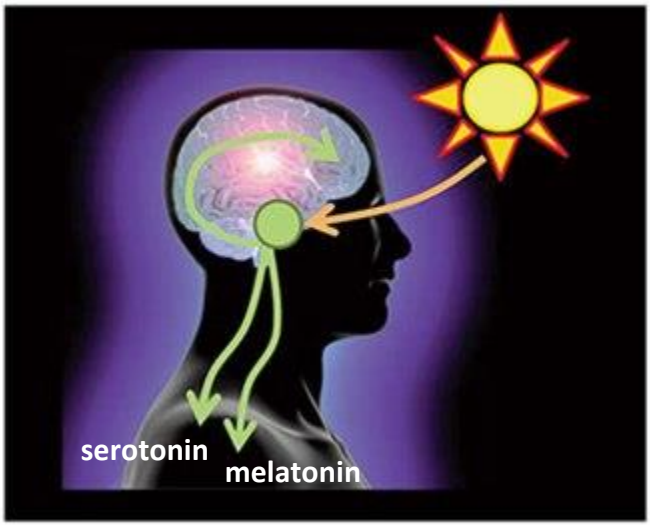
1. ***Homeostatic Sleep drive or Sleep S.*** The body has an innate drive to sleep called the homeostatic drive. This drive gets built up during the day's activity and brought down during the sleeping hours. The chemical substance adenosine controls this sleep drive. Adenosine is a byproduct of energy production in the body, so the physical activity of the wakeful state increases adenosine. Lack of physical activity during the day will not build optimal adenosine levels for a healthy sleep drive. As we stay awake longer and active, the adenosine levels will be higher, making one feel sleepier. Afternoon naps, which last longer than 30 minutes, and reduced physical activity during the day, diminish the homeostatic sleep drive.

2. ***Circadian Rhythm Sleep Drive or Sleep C.*** The natural cycle of sunlight or bright daylight and the night darkness create biological circadian 24-hour rhythms. From plants and the tiniest living organisms such as bacteria to complex living beings such as humans, each has set natural behaviors for survival. These behaviors get controlled by the circadian rhythms (*circa* means round, and *dien* signifies a day). The circadian rhythms are under the control of the master clock located in the brain. The brain clock resets itself daily to a 24-hour day cycle of light and darkness. It controls three behavior cycles of survival in all mammals, including humans:
   - **Sleep-Wake cycle**
   - **Fasting-Feeding Cycle**
   - **Activity-Rest Cycle**

"The Sleep-Wake cycle is the core survival behavior which regulates the other two behavior cycles. If the Sleep-Wake cycle gets disrupted, the other two invariably get disrupted, leading to disease and disability."

Circadian Rhythm Sleep and the Hormone Melatonin. The hormone melatonin in the brain controls the circadian rhythm sleep. Melatonin sleep is deep and rejuvenating. It is vital to health as the rest, repair, and rejuvenation of the body as a whole occurs during this sleep cycle.

The light signal from sunlight or bright daylight is the wake-up stimulation signal for the brain clock. Stimulation of the brain clock sends a message to the pineal gland in the brain to produce a mood-elevating substance called serotonin. The sleep hormone melatonin, in turn, gets synthesized from serotonin. Since the mood-elevating hormone serotonin and sleep hormone melatonin are interrelated, depression and insomnia are also interlinked. Depression, mood disorders, and suicide rates are higher in the geographic locations of the world where the sunlight and bright daylight are scarce. The melatonin gets stored in the pineal gland and gets released in response to the darkness of the night around 9 PM. Exposure to bright artificial light and blue light of digital devices inhibits the release of melatonin, depriving an individual of vital rejuvenating sleep.



The natural signals of light and darkness have a consistent pattern in most of the geographic locations of the world. These signals work with the circadian brain clock system to produce and release melatonin at appropriate times to bring about natural rhythms of sleep-wake cycles. However, the artificial bright light and blue light from digital devices, which are entirely under human control, prolong the daylight effect, disrupting the melatonin hormone release at night. Waking up late in the morning and keeping indoors in the morning inhibits the synthesis of the sleep hormone melatonin in the pineal gland of the brain. The lifestyle of modern humans interferes both with the melatonin synthesis and its release. These are the most significant disrupter of the natural sleep-wake cycle.

The Natural Sleep-Wake Cycle

The circadian and homeostatic sleep drives work together to regulate the natural sleep-wake cycle. A good comparison can be a car and its keys. The circadian sleep drive, with its melatonin hormone, is the car of rejuvenating sleep. The homeostatic drive with its adenosine is the key that starts the engine.

The first and foremost function of the circadian brain clock is to keep the body awake during the daylight hours. Morning wake up occurs when melatonin release in the brain stops by 6-7 AM (see the natural circadian cycle picture below).

During the daylight hours, the homeostatic sleep drive of adenosine keeps building with each waking hour. When the dark of the night approaches, the awake signals from the brain stop. The built-up of the adenosine from the day activity kick starts the engine of sleep. The melatonin secretion begins at 9 PM and peaks at 2 AM. Most deep rejuvenating sleep happens under the influence of melatonin in the first half of the natural sleep night. The natural sleep night is 7-8 hours extending between the hours of 9 PM to 7 AM. Two hours before the morning wake up time of 6-7 AM, the melatonin release from the brain decreases when melatonin release stops mind and body are fully awake.

The melatonin synthesis in the pineal gland of the brain restarts in the morning on exposure to sunlight or daylight, and the 24-hour sleep-wake cycle repeats itself.

Natural Circadian Cycle-Melatonin release starts at 9 PM and stops at 7 PM

The ideal sleep time is between 10 PM to 6 AM

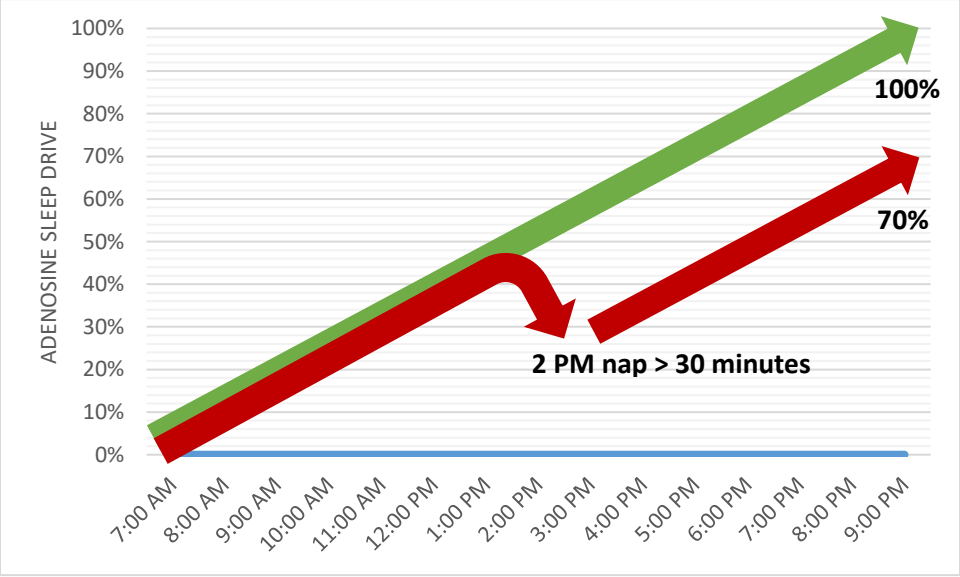
Pearls: Healthy Sleep-Wake Cycle

The science of sleep gives us great insight into how nature builds up a healthy sleep-wake cycle for us. The knowledge can help us cultivate a healthy sleep-wake behavior.

1. ***Waking up is spontaneous in a healthy Sleep-Wake cycle.*** The wake up that follows a deep rejuvenating sleep is automatic. It does not require an alarm clock to jolt the brain awake. If you need an alarm clock to wake up every morning, it indicates that the Sleep-Wake cycle is not in natural harmony. There is either sleep deprivation or a lack or rejuvenating deep sleep.

2. ***A long wake up time in the morning is a sign of poor sleep.*** The individuals who sleep well do not linger in the bed, thinking long and hard about getting up. The vitality generated from good sleep commands them to leave the bed promptly. When a child or an adult takes a long time getting out of the bed, it is a signal that they are not getting enough restful sleep. The automatic wake up to prompt activity is a good indicator that the sleep was relaxing and rejuvenating.

3. ***Afternoon sleep is a bad idea for rejuvenating sleep.*** Brief afternoon naps of 30 minutes or less usually do not disrupt the adenosine sleep drive to kick start the sleeping engine at night. However, if the afternoon nap becomes an extended 1-2 hours of afternoon sleep, the adenosine sleep drive diminishes in intensity. That interferes with the onset of sleep. (See the picture below.)



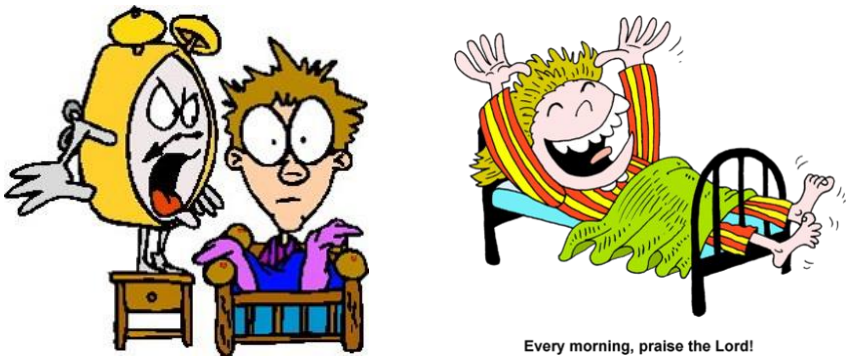
Afternoon Nap and Sleep Drive

4. ***Be aware that most rejuvenating sleep occurs in the first half of the night***. To understand this, see the section of the sleep cycle versus sleep quality below. Those who go to bed very late after 11 PM day after day are losing out on the deep rejuvenating sleep time.

5. ***How to reset the rejuvenating sleep cycle.*** A natural harmony between the homeostatic drive of adenosine and circadian drive of the hormone melatonin is the secret to a restful rejuvenating sleep. Take note that:

   "It is the spontaneous wake-up time in the morning which regulates the sleep onset at night, and not the time one decides to get into the bed. If you wake up early, you are naturally programmed to sleep early."

Therefore, if one wishes to set a regular pattern of rejuvenating sleep cycle, the first step is to set up the morning wake up time. To begin with, take the help of the alarm clock to wake up between 6-7 AM. Spend a few minutes in the morning, bright daylight or sunlight. That helps to initiate melatonin synthesis in the brain. Keep active the entire 16-hour day with no afternoon or other naps during the day. The daytime naps will weaken the adenosine drive of starting the engine of rejuvenating sleep. Take an hour or two to unwind the mind before sleep by disconnecting from digital devices. Read a book or listening to light music. Get into the bed at night only when feeling sleepy. When you begin waking spontaneously in the mornings without an alarm clock, you have reached the goal of reestablishing the natural sleep-wake cycle.



Alarm Clock Versus Natural Wake Up
Photo source: Wordpress.com

The Science: Sleep Cycle Versus Sleep Quality

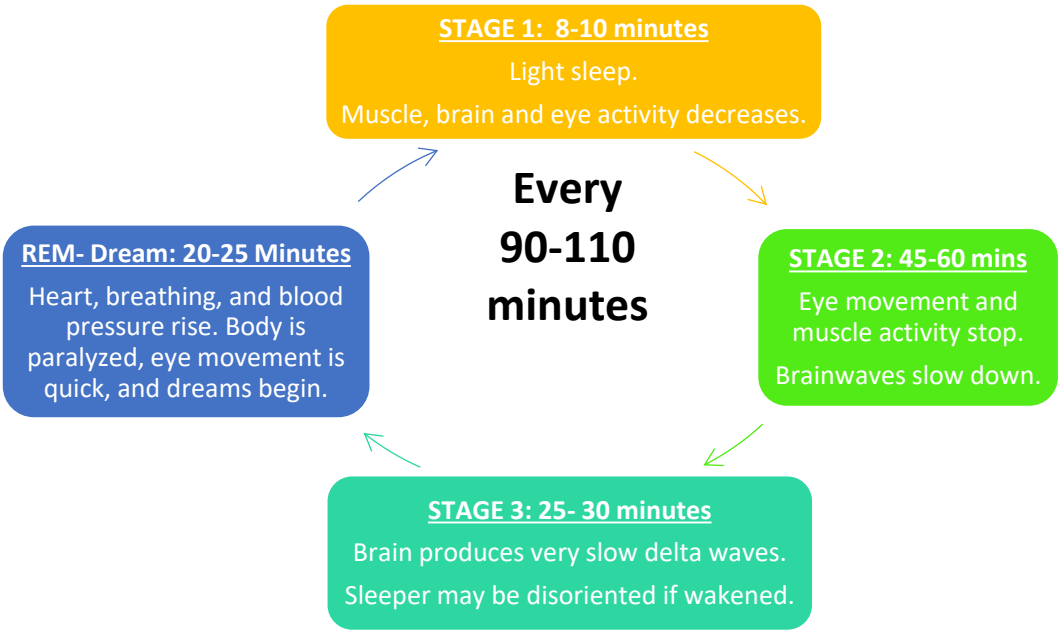
Everyone wishes sleep; not just any kind, but the heavenly deep sleep that rejuvenates the mind, body, and spirit. The secret of sleep quality lies in the cycles of sleep. During the 7 to 8-hour sleep at night, the brain goes through 5-6 cycles of sleep. Each sleep cycle lasts 90-110 minutes. Each sleep cycle has four different stages or phases of sleep. The pattern in which these four stages move in one 90 to 110-minute sleep cycle determines the quality of sleep. An individual spends a specific time in each of the four stages of one sleep cycle, as is outlined below:

- ***Stage 1: Light Sleep (also called N1 sleep)***. This phase takes up only 5% (8-10 minutes) of the sleep cycle time. During this stage, there is drowsiness as brain waves start slowing down. The individual can quickly wake up clear-headed from this light sleep stage.

- ***Stage 2: Deep Sleep (also called N2 sleep).*** An individual spends 50% (45 – 60 minutes) of the sleep cycle time in this phase. Eye movements, brain waves, breathing, heart rate, and muscle activity all slow down, and the body temperature drops. Low body temperature is essential for a deep rejuvenating sleep.

- ***Stage 3 (also called N3 sleep).*** It is the stage of deep rejuvenating sleep. About 25% (20-30 minutes) of the sleep cycle time is taken up by this most vital phase of the sleep. To get to this stage, an individual must pass through the deep second stage of sleep. During this stage, an individual is difficult to arouse; breathing, heart rate, and blood pressure further decrease, the brain waves and muscle activity become sluggish. The level of growth hormone secreted from the brain rises. Under the influence of growth hormone, the body repairs and rejuvenates tissues build bones and muscles and strengthens the immune system. By natural design, the growing children who require more growth hormones get a sound stage 3 sleep from which they are difficult to arouse.

- ***Stage 4: Dream sleep.*** This is also called REM—rapid eye movement sleep. During a healthy sleep cycle, an individual enters the REM stage of dream sleep later, either after stage 2 or stage 3. REM or dream sleep takes about 20% (20-25 Minutes) time of the sleep cycle time, but it can be longer. As the name implies, the eyes are moving fast during the REM stage. The brain is highly active; the breathing is fast; the brain waves speed up, heart rate, and blood pressure go up. However, the muscles are in a paralyzed state, so the sleeping individual does not act out the fantasies of the dreams. The REM or dream stage is the time when the brain processes and consolidates the information for storage in long-term memory. This stage, therefore, plays a role in creating and enhancing learned procedural skills.



For a restful, rejuvenating sleep, the four stages of sleep need to move in a set order. If an individual fails to get into stage 3 from stage 2 sleep, he/she will get deep sleep, but not the vital rejuvenating sleep. Similarly, if an individual moves directly from stage 1 to stage 4 of dream sleep bypassing deep sleep, he/she will wake up tired.

Some Problems of Sleep Cycle Disorder

A few situations of sleep cycle disorder are:

1. ***The puzzle: You were sleeping!! No, I was not!!***

   We hear this argument from poor sleepers and their families all the time. When an individual spends more than 50% of nighttime in stage 2 of deep sleep and misses out entirely on stage 3 rejuvenating sleep, his/her perception is "I was not sleeping!!" However, those who were watching the individual observed that the individual was sleeping pretty well and was even snoring. Here neither party is wrong. It is the matter of disharmony of the sleep cycle- he is getting stage 2 deep sleep but not rejuvenating deep sleep of stage 3.

2. ***Sleeping late takes away the time from rejuvenating sleep***.

   Most of stage 3 rejuvenating sleep occurs in the first half of the natural sleep night. The natural sleep night extends between 10 PM to 7 AM. The individuals who are habitually sleeping late miss out on the restful rejuvenating deep sleep. So they miss out on the time when the body rests, repairs, and rejuvenates itself physically and mentally.

3. ***Disorder of dream sleep***.

   Dream (REM) sleep in a healthy sleep cycle should follow stages of deep sleep. When dream sleep comes early, it is not a good situation from the point of restful sleep. The time it takes to reach the dream (REM) stage from the sleep onset is called REM latency. A short REM latency occurs in individuals who are sleep deprived, depressed, or who have a rare condition called narcolepsy, which is a state of excessive daytime sleepiness.

How Do You Know If You Have Sleep Deprivation?

Sleep deprivation leads to the situation of sleep debt. It is the difference between the duration of the sleep one ideally needs versus the period of sleep one is getting. Ideal sleep duration varies amongst adults and may range from 7-9 hours. The best way to judge the sleep deficit is not by the number of hours an individual slept but by how an individual feels and behaves during the daytime. Long-term sleep debt impairs psychological and physical functions:

Short-term sleep debt (a few days)

- Daytime drowsiness/sleepiness
- Impaired memory
- Irritability, anger, hostility

- Reduced reaction time—errors driving an automobile, operating machinery leading to accidents
- Inability to concentrate

Long-term sleep debt

- Insomnia—an inability to sleep even when there is ample opportunity for sleep
- Weak immunity with frequent colds and infections
- Increased risk of asthma attacks, heart attacks, and stroke
- Getting into life-threatening accidents
- Insulin resistance diseases such as obesity, metabolic syndrome (prediabetes), and type 2 diabetes, high blood pressure, heart irregularity, and heart disease

Epidemiological studies suggest that sleep duration of fewer than six hours leads to increased risk of death from heart disease and stroke.

How to Catch Up on Sleep Debt?

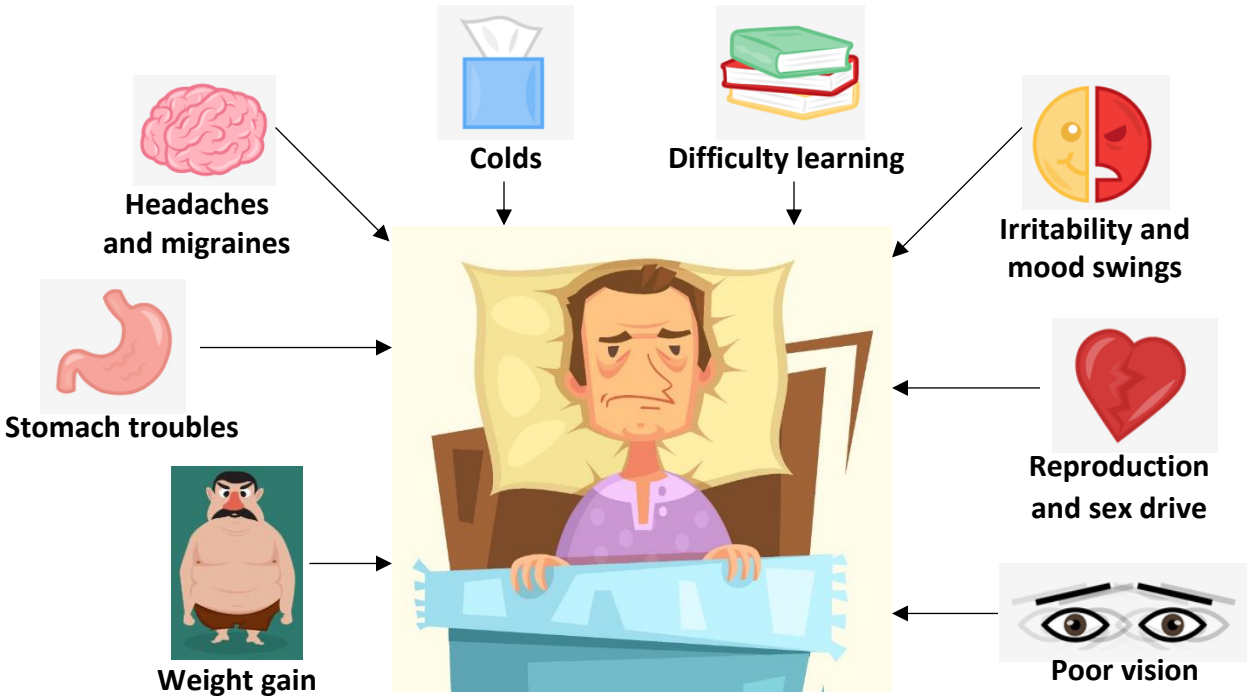
Everyone has experienced that when they lose sleep one night, they get better and longer sleep the following night. This phenomenon is called catching up on sleep debt. It does have limitations in that the extended periods of sleep debt are impossible to catch up on or payback. The long-term sleep deficit eventually causes insomnia and harm to overall health. The human body is very well programmed to get sleep, and no one dies of lack of sleep. If one does not get enough sleep, the adenosine sleep drive takes over. The individual will catch up on sleep at odd hours as short naps during the day. Catch-up sleep is not restful nor rejuvenating.

The scientific research suggests that one can catch up on a sleep debt of a few hours may be up to 20 hours at the most. However, catching up on sleep debt is a slow process. It occurs at the rate of 1-2 hours a day. So the 20-hour sleep debt may take ten or more days to pay back. Sleeping 16 hours on the weekend does not work on catching up because the body's wake up drive is strong and commanding. Although you may linger in bed all morning, the deep sleep is not your companion. The best way to pay back sleep debt is to wake up in the morning when the brain wakes up. Listen to your sleep clock and get to bed early as soon as you feel sleepy and tired. Turn off all the external noises and lights and sleep until your natural clock wakes you up the next morning (no alarm clocks). A substantial sleep debt of several hours may take many days to pay back.

A short nap (30 minutes) in the afternoon is one way to pay back sleep debt. However, be careful not to sleep longer as it will weaken the sleep drive of the adenosine that builds up during the day's activity (See the picture above).

Health Problems Associated with Lack of Sleep

It is common knowledge that if you lose sleep, you lose your mind as well as your health. The well-known health problems associated with sleep deprivation and insomnia are:



Lose Sleep: Lose Health and Mental Peace

Images by the macro vector (freepik.com and Business Insider)

1. ***Impaired mental function***. Sleep plays a critical role in thinking and learning. Lack of sleep impairs attention, alertness, concentration, reasoning, creativity, memory, and problem-solving skills. Sleep removes the toxic waste from the brain, including amyloid protein. Accumulation of the amyloid protein in the brain causes loss of memory, as occurs in dementia and Alzheimer's disease.

2. ***Overweight and obesity.*** Sleeping less than 6 hours and staying awake past midnight with loss of deep sleep leads to weight gain. Sleep deprivation and staying up late at night affects the levels of hunger and satiety hormones ghrelin and leptin. The hormone ghrelin from the empty stomach stimulates the brain to create hunger signals. In contrast, the leptin hormone produced by fat cells sends the message of fullness to the brain. Late sleepers have high ghrelin levels and low leptin levels, which set up a vicious cycle of overeating. Late-night eating promotes junk food eating out of necessity, further adding up to weight gain. Several studies have shown that a long-term lack of sleep of as little as 1-2 hours a day leads to 10-15 kg weight gain.

3. ***Risk of type 2 diabetes***. Sleep loss increases the level of the stress hormone cortisol. High cortisol level interferes with glucose balance and makes it harder for the glucose utilization hormone insulin to do its job effectively. The net effect is increased glucose in the blood and an increased risk of developing diabetes.

4. ***Heart and blood pressure problems.*** Poor sleep quality increases the risk of heart attack, irregular heartbeat (called atrial fibrillation), high blood pressure, heart failure, and stroke.

5. ***Headache and migraine***. Sleep deprivation and insomnia are the most common causes of headaches and migraines. These are an epidemic in modern city dwellers.

6. ***Joint pain.*** Poor sleep for several days can cause joint pains in the morning. Deep sleep plays a vital role in rest, repair, and rejuvenation via the secretion of growth hormone. Lack of sleep affects balance and coordination, making one more prone to falls and other accidents.

7. ***Mood disorders.*** Poor sleep leads to depression and negative mood with increased irritability, anger, and hostility.

8. ***Sleep and cancer***. Lack of sleep raises the risk of a variety of cancers (prostate, oral, nasal, colorectal, and breast). The sleep hormone melatonin is at the highest level during sleep. Melatonin is a powerful antioxidant. There is a highly credible scientific evidence which supports that melatonin inhibits cancer cells and increases the sensitivity of the tumors to the cancer therapies.

9. ***Immune system.*** Good rejuvenating sleep makes the immune system robust. Lack of sleep raises the risk of frequent colds. It is also a risk factor for autoimmune diseases like rheumatoid arthritis, lupus, and more. The healthy immune system also kills the cancer cells at the outset.

10. ***Fertility***. Sleep deprivation and insomnia affect both male and female fertility and libido. Long-term sleep deprivation in women affects the release of luteinizing hormone, which triggers ovulation. The rhythm of testosterone secretion in men is affected by a lack of sleep. Recent studies show that men who are late sleepers and sleep poorly have a low sperm count and decreased sperm motility.

11. ***Sleep and skin health***. The growth hormone released during the period of rejuvenating sleep repairs the daily damage to the skin. Lack of sleep produces an increased level of the stress hormone cortisol. Excess of cortisol accelerates skin aging, increases breakouts of acne, and rosacea (reddening of the skin on the face). The dark circles around the eyes are typical of persistent sleep deprivation. Beauty experts know that there is no better beauty aid for skin than the rejuvenating deep sleep.

Medical Drugs Which Can Interfere with Rejuvenating Sleep

The list of prescription or over-the-counter drugs which interfere with sleep runs long. In most cases, the prescribing physicians do not inform the patients of this side effect. One can quickly check the side effects of drugs by Google search. The drugs which may disrupt healthy sleep include:

- Antidepressants such as Prozac and Zoloft
- Medications for Parkinson's disease
- Some medicines used to control convulsions (epilepsy)
- Cold remedies and decongestants
- Steroid medications use in asthma, rheumatoid arthritis, and allergies

- Inhalers for treating an asthma attack
- Water pills used in high blood pressure and heart disease
- Some blood pressure-lowering drugs
- Appetite-lowering medications used to treat obesity

Effect of Caffeinated Drinks, Alcohol, and Smoking on Sleep

The Great Sleep Disrupters

Caffeine. The most commonly used addictive substance in our daily life is caffeine. It is found naturally in over 60 plants, including familiar names such as coffee beans, tea leaves, including some green tea leaves, chocolate, and cocoa. Caffeine is a common additive in many soft drinks and energy drinks, some of which may carry a harmful amount of caffeine. As more of the population become sleep-deprived, the use of caffeinated beverages keeps growing. Caffeine sets up a vicious cycle of increased consumption. The more sleep-deprived an individual gets, the more he/she relies on caffeine to stay awake; and the more caffeine he/she consumes, the more sleep-deprived he/she becomes.

Caffeine is a stimulant that blocks the sleep chemical adenosine, considered the driver in chief of starting the sleeping engine in the brain. Caffeine also interferes with the body's timekeeping capability. It is good at eliminating the desire for sleep, convincing the brain that it is not as late even when it is late enough to sleep. It takes the body about 6 hours to eliminate half of the caffeine consumed. So any caffeine consumed in the late afternoon is going to affect the natural sleep drive.

Alcohol. Drinking at night before bedtime may make an individual sleep faster, but not longer. Alcohol increases adenosine production; however, that subsides quickly, keeping the drinker awake. Alcohol changes the sleep cycle, bypassing the stages of deep sleep getting into REM dream sleep. The alcoholics, therefore, spend more time in the dream state. The morning hangover after drinking alcohol is because of this phenomenon. The diuretic effect of alcohol also disrupts sleep for bathroom trips. Additionally, alcohol relaxes muscles of the throat and collapses the breathing passage, causing heavy snoring and obstruction of free movement of air to and from the lungs.

Smoking. Nicotine is the active chemical in cigarettes and other smoking devices. Nicotine is a stimulant. It increases the heart rate and creates a state of alertness; both make it difficult to fall asleep.

Menopausal Sleep Disorder of Women

As the women go through menopause, the ovaries gradually decrease the production of the female hormones estrogen and progesterone. Shifting of the ratios of these hormones contributes to the inability to fall asleep. The low levels of estrogen may make women more susceptible to environmental factors, such as a change in temperature. Hot flashes from temperature sensitivity can often be disruptive to sleep. Estrogen loss associated with menopause may cause depression and mood swings, which may also contribute to insomnia.

Time Zone Travel—Jetlag Sleep Disorder

Jet lag sleep disorder. Jet lag occurs when one travels across the time zones rapidly in the plane. Moving across the time zone disrupts the natural circadian sleep system. Symptoms of jet lag are similar to that of short-term sleep deprivation such as:

- Excessive daytime sleepiness with nighttime insomnia
- Headache, loss of appetite, gastrointestinal problems
- Irritability and inability to concentrate

The brain's circadian clock controls different body functions during the 24-hour day cycle. It regulates when one sleeps and wakes up in response to dark and light cues of the day. In jet lag, the physical body has moved to a different time zone. The new time zone is not in synchrony with the body's natural brain clock, which is in the mode of the previous time zone. So the sleep time becomes the wake time, and waking time is the sleep time in the new time zone.

Fortunately, an individual with jet lag adapts quickly to external cues of daylight and night darkness in the new environment. The brain clock adapts itself 1-2 hours daily until it adjusts to the new light-dark signals in a few days. The longer the time difference between the old and the new time zone, the longer the adaptation time. The maximum time zone difference between east and west global air travel is 12 hours, and it takes a week to 10 days to completely adjust. Melatonin can be used as a sleep-aid to overcome jet lag insomnia. It is available in tablet form as a nonprescription drug. The recommended dose is from 2 to 5 mg for a few days. A word of caution is that an overdose of melatonin can cause poor sleep by disrupting the 24-hour circadian rhythm, so it is safe to start it at 2-3 mg dose. Melatonin should be taken 1-2 hours before sleep time. Keep in mind that natural melatonin gets secreted in the brain at 9 PM; that is 1-2 hours before the sleep time.

Impact of Night Shift Work on Sleep and Health

Individuals who work regular night shifts such as 11 PM to 7 AM must adapt to sleeping during the day and be awake and alert during the night hours. The night shift workers make up 20% of the urban global workforce. Almost half of the night shift workers report falling asleep at work. Even when they want to sleep during the daytime to catch up on sleep debt, they are unable to sleep for long hours. The night shift workers, therefore, remain in a perpetual state of sleep deprivation and as a result, suffer significant health consequences.

A study of workers in Japan in 1997 drew attention to the adverse effects of night shift work. The long-term disruption of the natural sleep-wake cycle causes metabolic diseases such as obesity, type 2 diabetes, high blood pressure, and heart disease. These diseases are becoming an epidemic amongst the urban adults who have work and social life schedule similar to that of night shift workers.

Sleep deprivation affects alertness, judgment, and performance. There is an increased rate of motor vehicle accidents amongst night shift workers. Many epidemiological studies also show that night shift workers have a high incidence of breast, colon, and prostate cancer. The sleep hormone melatonin, which controls the circadian sleep cycle, is a powerful antioxidant that inhibits cancer cell growth.

Strategies which can minimize the health risks of night shift work:

- ***Change in lighting.*** Studies have demonstrated that increasing the intensity of light and wavelength towards the blue end of the spectrum mimicking the sunlight makes it easier for workers to adapt to working at night. That may even enhance the ability of workers to sleep better during the daytime.

- ***Strategic use of caffeine.*** It is sensible to consume small doses of caffeine frequently early in the night shift rather than the fewer but more substantial doses of caffeine. The caffeine consumption should discontinue halfway through the night, allowing 5-6 hours between the last caffeine intake and the desired sleep time in the morning.

- ***Sleep hygiene.*** Protect sleep time and pay close attention to the sleep environment, creating a dark, comfortable, and quiet sleep environment at home. Eliminate anything that could disrupt sleep like turning off phones, disconnecting the doorbell, and other physical disrupters.

Effects of Aging on Sleep

A change in the sleep pattern is a part of the normal aging process. As one age over 60-65, it is harder to fall asleep and more difficult to stay asleep. Sleep needs and time do not decline with age; however, older people spend more time in lighter than in the deep stages of the sleep cycle. Melatonin hormone synthesis and secretion decrease with older age, affecting the pattern of the sleep stages. Compared to the young, older people tend to sleep early and wake up early in the morning. This pattern is called advanced sleep phase syndrome. These changes in sleep are not clearly understood. In case the advanced phase sleep is interfering with the daily routine of life, it can be treated by bright light therapy to postpone sleep time.

A higher incidence of insomnia in older adults may also be due to physical illnesses like arthritis, acid reflux, prostate enlargement, and prescription medications.

Natural Solutions to Reclaim Rejuvenating Sleep

Getting rejuvenating sleep every day makes it to the top of any human's wish list. Lack of restful sleep is a global epidemic amongst the urban city dwellers. Persistent lack of sleep (insomnia) reduces the quality of life and the sense of wellbeing. It adversely affects mood, reduces performance at work,

and increases the risk of injury and accidents. It also leads to significant long-term health problems outlined above.

Lack of restful sleep over an extended period should alert an individual to take steps to reverse insomnia before it disrupts mental and physical health. Reclaiming rejuvenating sleep requires three essential strategies:

1. ***Normalize 24-Hour Circadian Sleep-Wake Cycle***
2. ***Cultivate a Healthy Attitude and Behavior Towards Restful Sleep***
3. ***Practice Good Sleep Hygiene***

Normalize 24-Hour Circadian Sleep-Wake Cycle

Sleep is a vital biological process controlled by the chemical adenosine produced during daily activity and by the sleep hormone melatonin produced in the brain in response to natural light. Taking a lesson from the science of natural sleep outlined above, the sensible guidelines for normalizing sleep-wake cycle are as follows:

- ***Set aside 7-8 hours to sleep in your daily 24-hour schedule.*** Restful rejuvenating sleep is the most critical activity in life. Keep in mind that sleep deprivation will reduce performance and eventually lead you to a more difficult problem—insomnia.
- ***Keep a standard wake-up time.*** A perfect indicator of restful deep sleep is an automatic wake up with no alarm clock. The consistent need for an alarm clock to wake up in the morning suggests a lack of healthy deep sleep. There is no harm keeping an alarm, but most days, it should serve as a backup tool.
- ***The morning wake-up time sets the standard sleep time at night.*** If you wake up by 6-7 AM, it will be natural to fall asleep by 10-11 PM. As outlined above, the deep rejuvenating sleep occurs in the first half of the sleep night. The typical human biological night is 10 PM to 7 AM. So sleeping late at night or past midnight robs you of the rejuvenating deep sleep.
- ***It is winding down that helps deep sleep***. The sleep hormone melatonin secretion begins by 9 PM (see the picture of the circadian cycle below). That is an excellent time to start winding down and prepare for sleep by disconnecting from digital devices, including mobile phones.
- ***Conclude eating by 8 PM to be able to sleep by 10-11 PM.*** The food in the stomach raises the core temperature of the body by one degree, with the shifting of the blood to the digestive tract (in Ayurveda called *Jathar Agni*). For deep rejuvenating sleep, the core temperature must come down by a degree. The late eaters are, therefore, always poor sleepers.
- ***Boost melatonin synthesis with the morning light signals.*** The sleep hormone melatonin gets synthesized in the pineal gland of the brain in the morning hours on exposure to sunlight or bright daylight. Waking up late and keeping indoors in the morning hours reduces melatonin secretion affecting the quality of sleep. The mood-elevating substance serotonin and melatonin are both synthesized in the pineal gland of the brain in response to the natural light signals of the morning. Depression and suicide are more common in the geographic areas of the world where sunlight is scarce. Insomnia and depression are interrelated problems, and one leads to the other.

Cultivate a Healthy Attitude and Behavior Towards Restful Sleep

First and foremost is bringing about an attitude change that sleep is a priority in life. It is a valuable investment and not a waste of time. Consider the following guidelines to change your behavior and attitudes:

- ***Stay loyal to your standard wake up time***. That is regardless of how much sleep you get on a given night. This practice helps in establishing a stable and robust sleep pattern. The body will catch up by itself, making you sleepy earlier the next night.

- ***Wind down before sleeping.*** Solve your problems, resolve your conflicts, and take care of your to-do list an hour or two before going to bed. The biggest obstacle to falling asleep is going to bed with a speeding brain, thinking about plans and solving all problems.

- ***Get out of bed if not sleeping.*** The average time between closing the eyes to falling asleep is 20-30 minutes. If you are tossing and turning for an hour or more, it is better to get out of bed and do an activity which winds you down such as reading a book (not on the computer which is emitting blue light, but a paper book), listening to soft music, doing relaxation exercises, or

meditation with a focus on breathing. Return to bed only when sleepy again. Staying in bed too long without sleep is anxiety-provoking.

- ***Discard negative thoughts about not being able to sleep.*** People with insomnia are anxious and apprehensive about the consequences of no sleep. It is their common habit to look at the clock on how many hours they have slept or not slept. You will be surprised that despite poor sleep for a night or two, you will do alright when the day dawns. It is the thought which hurts more than the consequence of poor sleep. Once you cultivate this resilient attitude and confront insomnia head-on, things will get better fast.

- ***No afternoon naps longer than 30 minutes.*** As discussed above, afternoon naps weaken the adenosine sleep drive, which is vital to the process of sleep initiation.

- ***Keep the bed for sleeping purposes only.*** The human mind is programmed psychologically to think of the bed as a sleeping place. When you do activities such as watching television, answering e-mails, or eating meals in the bed, you are confusing your subconscious program of the bed being the sleep site.

- ***Try sleep restriction.*** An excellent way to manage insomnia is sleep restriction. That means restrict yourself from getting into bed until sleepy even if it is a late hour. Less time in bed works better than a long time in bed, tossing and turning worried and thinking about sleep.

Practice Good Sleep Hygiene

Sleep hygiene is about changing lifestyles, which interfere with sleep. It requires patience and determination to change long-held habits regarding foods and beverages, social life, sleep environment, etc. In addition to the above two strategies, a lifestyle change via sleep hygiene goes a long way to promote sleep.

- ***Limit caffeine intake.*** As discussed above, caffeine is a stimulant and is a significant deterrent to sleep. Caffeine effects linger for hours, so it is preferable not to drink caffeinated beverages after 3-4 PM.

- ***Limit alcohol.*** As discussed above, alcohol makes you fall asleep quickly, but sleep quality is poor and not refreshing. If you have insomnia, avoid drinking in the evening or get into the trap of drinking alcohol as a sleep aid.

- ***Do not indulge in strenuous physical activity and exercise after 7 PM.*** Physical activity and vigorous exercise in the morning improves sleep onset time by increasing the level of adenosine. However, after 7 PM, exercise induces an increase in the level of adrenaline that antagonizes adenosine effect. A light exercise like walking after dinner is refreshing before bedtime.

- ***Avoid eating after 8 PM.*** Eat at least 3 hours before sleeping time, and avoid dense or fatty foods. These stay in the stomach too long and cause acid reflux and bloating, interfering with sleep. Late eating also increases core temperature (*Jathar Agni*), which interferes with deep sleep.

- ***Ensure adequate exposure to sunlight or natural light in the morning.*** That enhances production of the sleep hormone melatonin, which is vital to rejuvenating deep sleep.
- ***Avoid exposure to blue light at least 1-2 hours before sleep time.*** Blue light exposure from cell phones, computers, and other screens inhibits the release of the sleep hormone melatonin in the brain. Melatonin is the vital hormone for a deep rejuvenating sleep.
- ***Establish a regular relaxing bedtime routine.*** Read a printed book or magazine, listen to relaxing music, or chant or meditate to calm down the brain.
- ***Avoid emotionally upsetting conversations and confrontations before bedtime.*** It helps to walk out of conflict situations to preserve a good night's sleep.
- ***Keep the sleep environment comfortable and pleasant.*** Have a comfortable bed with light-colored bed linen, dim the lights to unwind followed by darkness, and keep room temperature low.

Are Sleep Medications a Solution for Insomnia?

About 30% of adults may have insomnia, and in one-third of these cases, insomnia is severe enough to cause daytime limitations. The vast majority of insomnia cases, as discussed above, is that of adjustment insomnia and sleep deprivation insomnia.

The underlying cause in adjustment insomnia is stress, anxiety, and fear, which typically last for a few days or weeks. When an individual tries to fix this type of insomnia with alcohol, other forms of addiction, and sleep medication, insomnia becomes a persistent problem consuming the psyche of the individual. The remission or resolution comes only after the realization that sleep drugs and the addictions are a persistent trap and not a solution. Fortunately, the natural strategies outlined above are the solution. Persistent insomnia takes a long time to overcome but is well worth the effort.

Sleep deprivation-induced insomnia is fast becoming the epidemic in modern societies. Sleep deprivation begins as a personal choice, but eventually, as the daytime performance deteriorates, stress

and anxiety become the partners. Once that happens, a vicious cycle of wake-sleep imbalance sets in, and insomnia becomes a persistent problem. As discussed above, sleep deprivation differs from insomnia in that there is an ability to sleep but no opportunity for sleep. The sensible way to fix the problem is the natural solution; cultivate a correct attitude and behavior regarding the value of rest.

There are no sleep medications available in the world, which can give an individual a natural sleep. Unfortunately, none of the sleep medications get tested for long-term use of six months or longer. So medical science neither knows the benefits nor the pitfalls of long-term use of sleep medication. One fact is clear that sleep medications are addicting, and over time the harmful effects dominate an individual's life.

Sleep medications fall in two different categories:

1. ***Drugs which improve the ability to fall asleep.*** The most common drugs are Ambien (Zolpidem), Lunesta (Eszopiclone), and Restoril (Temazepam).

2. ***Drugs for fragmented or broken sleep***. Medicines in this group are Silenor (Doxepin), which can help people asleep for the night. However, the side effects of excessive sleepiness during the day and brain fog keep the patient stuck with the same symptoms.

Sleep medications are not a permanent cure for sleep problems, are addicting, and have the disadvantage of adverse side effects such as dizziness, drowsiness, headache, gastrointestinal issues, allergic reactions, memory loss, and performance problems.

It is always a good idea to start with a natural remedy such as melatonin first, then identify the problem—sleep deprivation or adjustment insomnia, and figure out what is causing the problem. Do not fall into the trap of sleep medications, which are not a solution to natural sleep. The natural solutions remain the best option for overcoming the most common forms of insomnia.

Conclusions

Sleep is a vital need for humans as it is the time when the body rests, repairs, and rejuvenates itself. A healthy body, a sound mind, and a happy spirit are not possible without rejuvenating sleep. Sleep deprivation and insomnia are reaching epidemic proportions amongst city dwellers marching toe to toe with epidemics of obesity, type 2 diabetes, high blood pressure, and heart disease. The prevailing culture of urban societies that sleep time is equivalent to wasted time has a significant contribution to this epidemic. Sleep deprivation and insomnia compromise productivity and performance, and adversely affect practically every organ system in the body.

No medication in the world that will give natural sleep to an individual. The good news, however, is that natural therapies can work well for the two most common causes of insomnia:

- Adjustment insomnia secondary to anxiety, stress, and mental anguish
- Sleep deprivation insomnia of disordered sleep habit

To be able to understand natural therapies, one has to be familiar with the science of sleep. The two systems drive the daily rhythms of the sleep-wake cycle. The homeostatic system initiates sleep, and the circadian system maintains deep rejuvenating sleep. The chemical adenosine produced during everyday activity starts the process of sleep. The hormone melatonin that supports deep rejuvenating sleep gets produced in the brain in response to sunlight or bright daylight signal. The two systems work in harmony to create a healthy sleep-wake cycle. The quality of sleep is a function of the four different stages of the sleep cycle, which must run in a proper order to produce deep rejuvenating sleep.

Human attitudes and behaviors are the most common reason for the disruption of the natural sleep-wake cycle as well as sleep quality. Natural solutions to reclaim rejuvenating sleep require three essential strategies:

1. Normalize 24-hour circadian sleep-wake cycle.
2. Cultivate a healthy attitude and behavior towards a restful sleep.
3. Practice good sleep hygiene.

Sleep medications are poor options for the most common forms of insomnia. These cannot mimic natural sleep, are addicting, and have significant side effects.

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