SLEEP: PHYSIOLOGY & ITS CONCEPT IN UNANI MEDICINE

SABA FATMA[1] & PROF. RUBI ANJUM[2]

1. Dept. Of Tahaffuzi- Wa -Samaji Tib (Preventive And Social Medicine), School Of Unani Medical Education And Research, Jamia Hamdard, New Delhi, India.

ORCID ID: https://orcid.org/0000-0003-1227-3228

2. Chairperson, Dept. of Tahaffuzzi -Wa -Samaji Tib, A K Tibbiya College, AMU, Aligarh, India.

ABSTRACT

Sleep is an important part of our life. We spend about one-third of our life time doing it. Optimum quality and quantity of sleep at the right time, is as essential to survival as food and water. Without sleep an individual can't form or maintain the pathways in the brain that let him learn and create new memories, and it will cause harder to concentrate and respond quickly. Unani system of medicine has described Asbab e sittah zarooriyah (Six Essential factors) of life. Any abnormality or dysregulation in the normalcy of these factors may become a cause of diseases. Naum wa yaqza (Sleep and wakefulness) is the fifth important entity of these six factors. Ancient Unani Scholars described very elaborately the sleep with various aspects like its relation with general physical, mental health, body metabolism, digestion, immunity and human well- being. Ancient Unani literature has also described benefit of optimum sleep and characteristics of good sleep.

Keyword: *Sleep, Sleep Physiology, Asbab e sittah zarooriyah, Naum wa yaqza, Unani Medicine, REM*

INTRODUCTION:

Sleep is an essential function that allows our body and mind to rejuvenate, making us refreshed and attentive when we wake up. Healthy sleep also helps the body remain healthy and stay away from diseases. Without enough sleep, the brain cannot work properly. This can impair our capability to converge, think clearly, and process memories [1].

Every individual needs sleep, but its biological purpose remains a mystery. Sleep affects almost every type of tissue and system in the body like the brain, heart, and lungs, body metabolism, immune system, mood, and disease resistance. Research shows that a chronic lack of sleep, or getting poor quality sleep, enhances the risk of diseases like hypertension, cardiovascular disease, diabetes, depression, and obesity.

Sleep is imperative for various brain functions, comprising the communication of nerve cells (neurons) with each other. As a matter of fact, brain and body stay extremely active while we sleep. Recent researches suggest that sleep plays a significant in removing toxins from brain that build up while we are awake [2].

CONCEPT OF SLEEP IN UNANI MEDICINE:

Unani system of medicine has described *Asbab e sittah zarooriyah* (Six Essential factors) of life. Any abnormality or dysregulation in the normalcy of these factors may become a cause of diseases; hence their equilibrium is essential for preservation of health. Nobody could escape from these factors so long he is living [3]**.**

Naum wa yaqza (Sleep and wakefulness) is the fifth important entity of these six factors. Any derangement in the functioning of the factor may lead to excess or deprivation in the sleep and wakefulness. Imbalance between these two conditions leads to disease state known as *Sehar* (Insomnia). Insomnia leads to imbalance in another components of *Asbab–e-sitta zarooriyah* known as *Harkat wa sakoon e badani* (Rest and Physical activity) and *Harkat-wa-Sakoon-e-Nafsani* (Psychological activity and Repose). Normal sleep is be because of *ratoobat wa*

baroodat i.e. wetness and coldness in our brain and if there is derailment of balance in sleep and wakefulness, it implies the predominance of *yaboosat wa hararat* i.e. dryness and hotness pervasive in the brain [4] .

Ancient Unani Scholars described very elaborately the sleep with various aspects like:

- Its effects on general, physical and mental health.
- Effect of improper sleep on body metabolism.
- Its role in human well -being.
- Characteristics of normal sleep.

Yaqza (awakening) is a condition in which *rooh-e-nafsani* (neural pathway) enables the *badan-e-insani* (human body) to perform physical activity and make the sensory organs functional to perceive and be aware. During this phase, due to physical activities energy is utilized, as a result of this *hararat-e-gharizia* (innate heat) and *ratubat-e-badania* (body fluid) get debilitated leading to exhaustion, lethargy and dryness. *Naum* (sleep) is a condition in which *rooh-e-nafsani* (neural pathway) as well as *badan-e-insani* (human body) remains at rest thus reinstate as well as strengthens and nourishes *quwwat-e-haiwania* (physical power). During sleep, free radicals are being scavenged from the body, which are produced during awakening by physical and mental exertion, moreover *ratubat* and *barudat* is regained, hence sleep rejuvenates the body and refreshes it [3, 5, 6, 7, 8, 9]**.**

According to **Avicenna**, sleep directs the *hararat-e-gharizia* (Innate heat or metabolic activity) inwards and strengthens the physical faculty. It slows down the function of nervous faculty by relaxing and moistening the passage of nerves and making the vital forces strengthened, hence, by preventing dispersion produced by wakefulness. Sleep removes fatigue and stops the excessive flow of excretion promoted by activity. Sleeps helps to expel the waste matter from the surrounding of the skin by confirming the *hararat- e –gharizia* to the interior of the body. It also takes up the digestion and maturation of food and converts it into blood. Whilst, wakefulness has the opposite effect to that of sleep. If wakefulness predominates resultant in causing disturbance in brain by producing dryness and weakness, leading to insomnia and confusion [10]**.**

CHARACTERISTICS OF GOOD SLEEP:

As mentioned in classical unani literature good sleep must have these characteristics;

- Deep Sleep: Sleep must be deep. It means the person who is sleeping should not aroused so easily.
- Regular and continuous: Sleep should be regular and continuous. It means the person who is sleeping should not be aroused in the middle.
- Average sleep: Sleep should be average in the duration. It means sleep should not be so prolonged or very short in the duration.
- Sleep after the digestion of meal: It means sleep should be stablished after meal but when the digestion of food taken place in the stomach [11]**.**

BENEFITS OF SLEEP:

- **Razi** has said that normal sleep assists *taskeen* (relaxation) and *taqwiyat* (potentiation of power) in the body [12]**.**
- **Aristole** has said that sleep is the essential requirement related to the activity of heart from which motion and perception arise [12].
- **Razi** has said that sleep produces *dam- e-mehmood* [12]**.**
- **Avicenna** has said sleep takes up the digestion and maturation of food and converts it into blood [10].
- **Abu Sahel Masehi** has said that sleep induces production of good *akhlat* (Humors) [12]**.**
- Sleep provides *tarteeb* (moistening) of the brain and removes fatigue and restlessness [13]**.**
- Sleep strengthens the *quwat-e-tabiya* (Physical Faculty) and slows down the *quwat-e-nafsania* (Mental Faculty) by relaxing it [14]**.**

PHYSIOLOGY OF SLEEP

Sleep is defined as unconsciousness from which the person can be aroused by sensory or other stimuli. It is to be differentiated from *coma,* which is unconsciousness from which the person cannot be aroused. There are multi stages of sleep, from very light sleep to very deep sleep [15]**.**

Human beings spend about one-third of their lives asleep, yet most individuals know little about sleep. Although its function remains to be fully illuminated, sleep is a universal need of all livings including humans, absence of which has grave physiological concomitant [16]**.**

Two Types of Sleep: Each night, a person goes through stages of two types of sleep that alternate with each other. They are called (1) *slow wave sleep (NREM):* because in this type of sleep, the brain waves are very slow, (2) *rapid- eye- movement (REM) sleep:* in this type of sleep the eyes undergo rapid movements despite the fact that the person is still sleeping [15].The function of alternations between these two types of sleep is not yet understood, but irregular cycling and/or absent sleep stages are associated with sleep disorders [17]**)**. NREM sleep is composed of stages 1, 2, 3, and 4. Each has special features including variations in brain wave patterns, eye movements, and muscle tone. Sleep cycles and stages were uncovered with the use of electroencephalographic (EEG) recordings that find the electrical patterns of brain activity [18, 19]**.**

Most sleep during each night is of the NREM (slow-wave) variety, this is the deep restful type of sleep that the person experiences during the first hour of sleep after having been kept awake for many hours. Episodes of REM sleep occur periodically during sleep and occupy about 25 per cent of the sleep time of the young adult, they normally recur about every 90 minutes. This type of sleep is not so restful, and it is usually associated with vivid dreaming [15].REM sleep is usually associated with dreaming, so that, loss of muscle tone and reflexes serve an essential role because it protect an individual from "acting out" their dreams or nightmares during the sleep [20]**.** Approximately 80 percent of vivid dream recall results after arousal from this stage of sleep [21]**.** REM sleep may also be important for memory consolidation [22, 23]**.**

A sleep episode starts with a short period of NREM stage 1 progressing through stage 2, followed by stages 3 and 4 and finally to REM. An individual does not remain in REM sleep the remainder of the night but, rather, cycle between stages of NREM and REM throughout the night. NREM sleep composes about 75 to 80 percent of total time spent in sleep, and REM sleep composes the remaining 20 to 25 percent. The average duration of the first NREM-REM sleep cycle is 70 to 100 minutes. The second, and later, cycles are longer lasting approximately 90 to 120 minutes [24]. In normal adults, REM sleep increases with the progress of night and is longest in the last one-third of the sleep episode. As the sleep episode progresses, stage 2 begins to account for the majority of NREM sleep, and stages 3 and 4 may sometimes altogether disappear [16]**.**

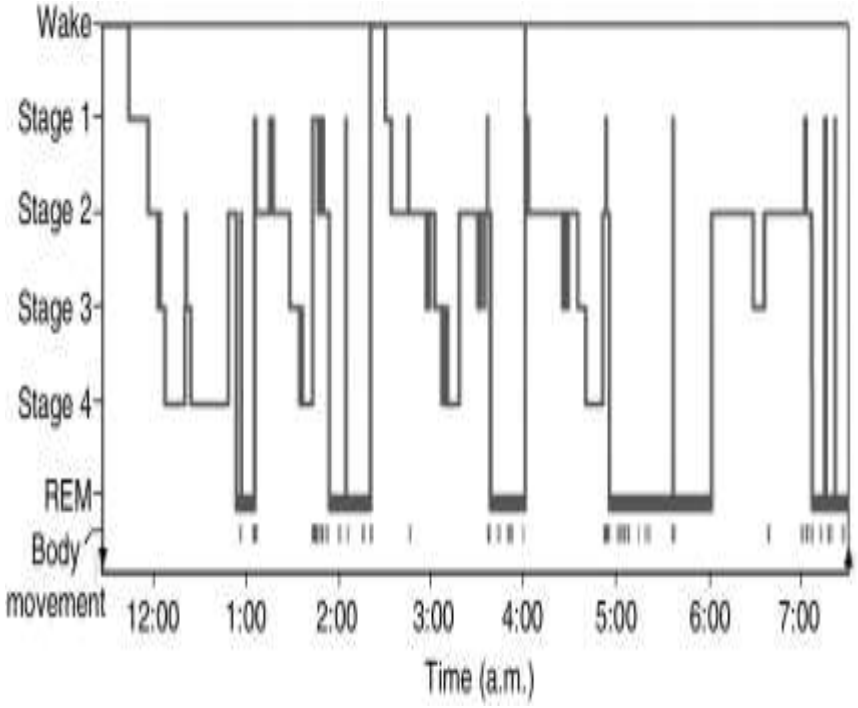

Figure :1 Continuation of sleep states across a single night in young adult.

Source: [24]

SLEEP- WAKE REGULATION:

The sleep-wake system is considered to be regulated by the interplay of two major process, one that promotes sleep (process S) and one that maintains wakefulness (process C). Process S is the homeostatic drive for sleep. The need for sleep (process S) accumulates across the day, peaks just before bedtime at night and dissipates throughout the night.

Process C is considered as wake promoting and is regulated by the circadian system. Process C builds across the day, serving to counteract process S and promote wakefulness and alertness. However, this wake-promoting system begins to reduce at bedtime, serving to increase sleep consolidation as the need for sleep dissipates across the night. With an adequate night's rest, the homeostatic drive for sleep is reduced, the circadian waking drive begins to increase, and the cycle starts over. In the absence of process C, total sleep time remains the same, but it is randomly distributed through- out day and night therefore, process C also works to consolidate sleep and wake into justly distinct episodes. Importantly, through synchronization of the circadian system, process C assists in keeping sleep-wakefulness cycles coordinated with environmental light-dark cycles [16]**.**

PHYSIOLOGICAL CHANGES DURING NREM AND REM SLEEPS:

Central nervous system: Cerebral blood flow (CBF) increases by 50–100% above the level of resting wakefulness during tonic REM sleep and is even greater during phasic REM sleep. Cerebral metabolic rate, oxygen consumption and neuronal discharge rate are decreased during NREM sleep but increased above resting values during REM sleep. The autonomic nervous system exhibits a decrease in sympathetic tone and an increase in parasympathetic tone, except in phasic REM sleep.

Respiratory System: During NREM sleep, there is a decrease in respiratory drive and a reduction in the muscle tone of the upper airway leading to a 25% decrease in minute volume and alveolar ventilation and a doubling of airway resistance accompanied by a small increase in PaCO2 and decrease in PaO2**.** Hyper carbic and hypoxic ventilatory drives are reduced compared with wakefulness. The breathing pattern is regular except at the transition from wakefulness into sleep when brief central apnoea are common.

During REM sleep there is additional decrease in hyper-carbic and, especially, hypoxic ventilatory drives. There is irregular pattern of breathing during phasic REM sleep. There is loss in tone of skeletal muscle in REM sleep which affects the intercostal and other muscles which stabilise the chest wall during inspiration.

Cardiovascular System: The Blood pressure decreases during NREM and tonic REM sleep but may increase above waking values during phasic REM sleep. Usually, the Cardiac output is decreased during all sleep phases. Systemic vascular resistance (SVR) and the heart rate are both reduced during NREM and tonic REM sleep and increased during phasic REM sleep [25].

Renal System: The glomerular filtration rate and filtration fraction are reduced and ADH secretion is increased resulting in a low volume concentrated urine.

Endocrine System: The secretion of several hormones is directly linked to the sleep/wake cycle. Melatonin is released from the pineal gland under the control of the supra-chiasmatic nuclei (SCN) in a 4–5 h pulse, usually beginning at the onset of darkness (~9 pm). The pulse is inhibited or delayed by exposure to bright light in the evening. It is best regarded as being permissive of sleep ('opening the gate to sleep') rather than as a hypnotic, as it is possible to maintain wakefulness during this period. Growth hormone is mostly secreted during the first episode of SWS, particularly during puberty. Prolactin concentrations also increase just after onset of sleep and decrease with wakefulness. Sleep phase delay causes delay in secretion of both of these hormones. The cortisol secretion decreases with the onset of sleep and reaches a trench in the early hours of the morning and a peak just after waking.

Body Temperature: Body temperature regulation is subject to circadian system influence. An individual's body temperature is higher during the day than at night. Just before the onset of sleep, our bodies start to lose some heat to the environment, some researchers believe that, this actually helps to induce sleep. During sleep, the body temperature is reduced by 1 to 2°F. As a result, we use less energy preserving our body temperature. It has been postulated that one of the main functions of sleep is to preserve energy in this way

Body temperature is still preserved, although at a slightly reduced level during non-REM sleep, but during REM sleep our body temperature falls to its lowest point. Snugging in bed under a blanket during the usual 10- to 30-minute periods of REM sleep makes sure that we do not lose too much heat to the environment [16, 25, 26, 27]**.**

RECOMMENDED AMOUNT OF SLEEP ACCORDING TO AGE:

The right amount of sleep mainly depends on age. The National Sleep Foundation recommends the recommendation for different age groups [1].

Age Group	**Age Range**	**Recommended Amount of Sleep per Day**
New-born	0-3 months	14-17 hours
Infant	4-11 months	12-15 hours
Toddler	1-2 years	11-14 hours
Preschool	3-5 years	10-13 hours
School-age	6-13 years	9-11 hours
Teen	14-17 years	8-10 hours
Young Adult	18-25 years	7-9 hours
Adult	26-64 years	7-9 hours
Older Adult	65 years or older	7-8 hours

Most of the adults require seven and nine hours of sleep in night. Children and teenagers require considerably more sleep, mainly in younger than five years of age. Work schedules, daily stressors, a disruptive bedroom environment, and medical conditions can all prevent an individual from having enough sleep. A healthy diet and positive lifestyle habits can help ensure an adequate amount of sleep every night. Chronic lack of sleep may be the first sign of a sleep disorder [1].

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