

The adverse effect of sleep deprivation on health

Bennard Anthony and Victoria, James

Nursing Department, Valley View University, Accra Ghana.

ABSTRACT

Sleep plays a vital role in an individual's mental, emotional, and physiological well-being. Not only does sleep deficiency lead to neurological and psychological disorders, but also the literature has explored the adverse effects of sleep deficiency on the cardiovascular system. Decreased quantity and quality of sleep

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have been linked to cardiovascular disease (CVD) risk factors, such as hypertension. Therefore, many of the factors that link endothelial dysfunction to cardiovascular disease are likely a result of the negative effects of sleep deficiency and deprivation. Further research in the area of sleep deprivation/deficiency is needed.

INTRODUCTION

Sleep deprivation is becoming more common. Many people try to adjust their schedule to get as much done as possible, and sleep gets sacrificed. Sleep deprivation also becomes a greater problem as people grow older [1]. Although older adults probably need as much sleep as younger adults, they typically sleep more lightly and for shorter time spans than younger people. It is estimated that half of all people older than 65 have frequent sleeping problems. Sleep is as important to the human body as food and water, but many of us don't get enough sleep [2]. Sleep deprivation is a general term to describe a state caused by inadequate quantity or quality of sleep, including voluntary or involuntary sleeplessness and circadian rhythm sleep disorders. Insufficient sleep, inadequate quality of sleep or disruptions to the sleep-wake cycle (such as those that occur with shift work or travelling to a different time zone) have consequences for how we function in the daytime, causing sleepiness and fatigue [3] [4] [5] [6]. A sleepy fatigued person is accident prone, judgment impaired and more likely to make mistakes and bad decisions. Staying awake for 24 hours leads to a reduced hand-to-eye coordination that is similar to having a blood alcohol content of 0.1. This is why sleep deprivation contributes

to road accidents and work injuries. Lack of sleep can also affect a child's school performance and could be linked to increased risk of emotional problems such as depression. Sleep deprivation occurs when an individual gets less sleep than they need to feel awake and alert. People vary in how little sleep is needed to be considered sleep-deprived. Some people such as older adults seem to be more resistant to the effects of sleep deprivation, while others, especially children and young adults, are more vulnerable [7].

Types of sleep deprivation

Sleep deprivation can occur for a number of reasons:

Sleep disorder.

These include insomnia, sleep apnea, narcolepsy, and restless legs syndrome [8].

Aging

People older than 65 have trouble sleeping because of aging, medication they're taking, or medical problems they're experiencing [9].

Illness

Sleep deprivation is common with depression, schizophrenia, chronic pain syndrome, cancer, heart disease, stroke, Parkinson disease, and Alzheimer's disease [10].

Other factors

Many people experience occasional sleep deprivation for other reasons, including stress, a change in schedule, or a new baby disrupting their sleep schedule [11].

Symptoms

When an individual does not get enough sleep to feel awake and alert, they begin to experience symptoms of sleep deprivation [12]. The main symptom of ongoing sleep loss is excessive daytime sleepiness, but other symptoms include yawning, moodiness, fatigue, irritability, depressed mood, difficulty learning new concepts, forgetfulness, inability to concentrate or a "fuzzy" head, lack of motivation, clumsiness, increased appetite and carbohydrate cravings, reduced sex drive. Sleep deprivation complications over time may also include increased risk for depression and mental illness, increased risk for stroke [13], heart disease, and asthma attack, increased risk for potentially life-threatening complications, such as car accidents, and untreated sleep disorders like insomnia, sleep apnea, and narcolepsy, Hallucinations, Severe mood swings [14].

Effects of sleep deprivation

Sleep deprivation can negatively affect a range of systems in the body [15]. It can have the following impact:

- Not getting enough sleep prevents the body from strengthening the immune system and producing more cytokines to fight infection. This can mean a person can take longer to recover from illness as well as having an increased risk of chronic illness.
- Sleep deprivation can also result in an increased risk of new and advanced respiratory diseases Trusted Source.
- A lack of sleep can affect body weight. Two hormones in the body, leptin and ghrelin, control feelings of hunger and satiety, or fullness. The levels of these hormones are affected by sleep. Sleep deprivation also causes the release of insulin, which leads to

increased fat storage and a higher risk of type 2 diabetes.

- Sleep helps the heart vessels to heal and rebuild as well as affecting processes that maintain blood pressure and sugar levels as well as inflammation control. Not sleeping enough increases the risk of cardiovascular disease.
- Insufficient sleep can affect hormone production, including growth hormones and testosterone in men [16].

Managing sleep deprivation

Another step that may help you to get a good night's sleep is sticking to a consistent schedule, meaning that you go to bed and wake up at the same time every day. If possible, waking up with the sun is a good way to reset your body's clock more naturally. Also, keep your bedroom at a reasonable temperature because a bedroom that is too hot or too cold can disrupt sleep [17]. If you're having trouble sleeping, try doing something else like reading a book for a few minutes. The anxiety of not being able to fall asleep can actually make sleep deprivation worse for some people. Finally, be sure to see a doctor if your problems with sleep deprivation continue. Don't let them linger [18].

Sleep deprivation and cardiovascular disease Endothelial Dysfunction

The endothelium is the thin layer of cells that covers the internal surface of blood vessels, cardiac valves, and several body cavities [8]. These cells play a vital role in maintaining homeostasis by sensing changes in hemodynamic forces and blood-borne signals. In response to homeostatic changes, endothelial cells elicit relaxation and contractions of the underlying vascular smooth muscle cells releasing vasoactive substances. Among those substances, nitric oxide (NO) plays a key role. When an imbalance of the actions of the endothelium toward reduced vasodilation and increased vasoconstriction as well as increased prothrombotic properties occurs, it is said that endothelial dysfunction is

present. Arterial endothelial dysfunction is an important event central to the pathogenesis of atherosclerosis [8]. Continued endothelial dysfunction contributes to plaque initiation and progression. Endothelial function can be measured in coronary arteries and in the periphery by measuring vasomotor function after intra-arterial infusion of pharmacologic substances that enhance the release of endothelial NO [14]. The disadvantage of these methods is their invasive nature, which generally makes them unsuitable for studies involving asymptomatic subjects. For this reason, noninvasive tests of endothelial function have been developed and are more commonly used. Flow mediated dilation (FMD) is an ultrasound-based method that measures arterial diameter in response to an increase in shear stress, which causes endothelium-dependent dilatation [12]. This method can be applied more widely

While there is evidence of an association between endothelial dysfunction and sleep deprivation, it still remains to be evaluated if sleep deprivation is a cause of or is associated with increased risk of cardiovascular disease. However, endothelial dysfunction is an established independent risk factor for cardiovascular

for the evaluation of endothelial dysfunction and has been applied to patients with sleep disorders.

Treatment

Treatments for sleep deprivation vary based on how severe it is. In some cases, your doctor may want you to try self-care strategies before turning to medication. Your doctor may prescribe sleeping pills like benzodiazepines, non-benzodiazepine hypnotics, and melatonin receptor antagonists. But keep in mind that they tend to lose effectiveness after a few weeks and can then actually disrupt your sleep [13]. For more serious insomnia, your doctor may have you try light therapy, which can help your body's internal clock to readjust and allow you to sleep more restfully. If you are diagnosed with sleep apnea, your doctor may prescribe more serious treatment, such as a special breathing machine you'll use while you sleep.

CONCLUSION

disease. Therefore, many of the factors that link endothelial dysfunction to cardiovascular disease are likely a result of the negative effects of sleep deficiency and deprivation. Further research in the area of sleep deprivation/deficiency is needed.

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