

The Effect of Sleep on Cardiovascular Disease
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ABSTRACT:

Background

Poor sleep habits can increase an individual's chances of cardiovascular disease. This can occur due to Circadian misalignment from rapidly changing sleep habits or having poor sleep quality and short sleep periods. By learning how sleep can affect cardiovascular disease (CVD), individuals may be more motivated to improve their sleep habits and lead to an overall increase in population cardiovascular health.

Methods

This literature review used PubMed and included papers published within the last 10 years using key search terms sleep, cardiovascular disease, and CVD. Systematic reviews and meta-analyses were excluded.

Results

Circadian misalignment can lead to hypertension and tachycardia. Every one hour increase in sleep onset time can increase risk of CVD by 36%, and a decrease in sleep quality can account for a 9% increase in risk.

Discussion

Hypertension can lead to ruptures of blood vessels, and tachycardia can lead to hypertension. The evidence found in the review supports the idea that poor sleep habits lead to increased risk of CVD. More research should be done regarding the behavioral changes caused by sleep and how they lead to declining heart health.

INTRODUCTION:

Significance of the Problem

Around 20% of the US gets less than six hours of sleep a night [1]. One in every five deaths is due to a cardiovascular disease (CVD), and lack of sleep can increase the risk of hypertension and coronary heart disease [1,2]. These effects can be magnified for those diagnosed with insomnia, the most prevalent sleep disorder plaguing the country [3].

Background Information

One of the main reasons unhealthy sleep habits lead to heart problems is due to Circadian misalignment, or the individual's internal clock no longer being in sync with the outside environment, such as the presence of sunlight. This can lead to elongated sleep cycles, feeling constantly sleepy throughout the day, or even insomnia, where the body is in a state of constant hyperarousal and cannot rest at all. Two ways Circadian misalignment can occur is due to long-term shift work, defined as any work outside the hours of 7am and 6pm, or constantly changing your sleep routine.

Information Gap

While many studies have analyzed sleep as a determinant of cardiovascular disease, not many have talked about how the effects of sleep disorders are compared to sleep habits. By informing a wider audience about the true effects sleep can play into your life, it will hopefully encourage more people to put importance on getting a proper amount of sleep each night, which is defined as 7-9 hours by the National Institute of Health (NIH) [4]. In the case of disorders like insomnia, the study hopes to urge medical professionals into further expanding knowledge in this area by showing that these disorders may be even more dangerous than they seem. With sleep being one of the factors that determines cardiovascular health, a larger population getting more sleep will also help to reduce the number of deaths due to heart problems and lead to a higher overall level of health in the country.

Objectives

This literature review aims to explore how abnormal sleep patterns and sleep habits can lead to an increased risk for cardiovascular diseases and how different kinds can have different effects upon the body.

METHODS:

Search Strategy

The search engine used for the literature review was PubMed. Key search terms included were sleep, cardiovascular disease, and CVD.

Inclusion and Exclusion Criteria

Only free full texts published within the past 10 years (2013 and earlier) were used to maximize the probability of any results being reflective of the present day in 2024. Systematic reviews and meta-analyses were excluded.

RESULTS:

Circadian Misalignment

In one study discussing the effects of shift work on the heart, individuals with Circadian misalignment were found to have an increased overall blood pressure when studied over a 24 hour period [5]. Systolic blood pressure was increased by 3.0mmHg while diastolic blood pressure went up by 1.5mmHg [5]. When being exposed to Circadian misalignment for a longer period of time, individuals were also found to have an increased 24-hour heart rate by 1.6 bpm compared to those with Circadian alignment [5]. However, during wake-periods, heart rate was lower by 0.9bpm and higher by 3.6 bpm during sleep periods for Circadian misalignment [5].

Sleep Duration and Sleep Onset

Another study included 1,992 participants all known to be free of heart problems and evaluated the effects of sleep duration and sleep onset timing on CVD [6]. Every 1 hour increase or decrease from the average sleep duration was found to lead to a 36% higher chance of acquiring a cardiovascular disease, after adjusting for other sleep related factors and other risks of CVD [6]. When taking into account these same factors, every additional one hour increase in the average sleep onset timing led to an 18% increase in risk of CVD [6]. When calculating the risk by including both sleep duration and onset timing, there was a 14%-23% increase in CVD risk [6].

Joint Effects of Sleep Duration and Sleep Quality

A study used a calculated measure called sleep score to determine the joint effects of sleep duration and sleep quality on CVD [7]. A higher, and better, sleep score meant an individual had a better sleep quality and were more likely to be getting 6-8 hours of sleep when compared to an individual with a lower sleep score [7]. A better sleep score was found to greatly reduce the risk of CVD, with every 5 unit increase in the Sleep Score accounting for a 9% decrease in CVD risk [7]. When looking at sleep duration and sleep quality separately, those with worse sleep quality were found to have a 21%-40% increase in CVD risk while those with sleep durations less than 6 hours had an increased risk of 13% [7].

DISCUSSION:

Having unhealthy sleep habits can lead to an increase in the risk of cardiovascular diseases. Through many of the studies reviewed, it was found that sleeping less than the recommended 6 hours a night and also having a lower quality of sleep can increase risk for CVD by over 21%, while sleeping just one hour later than the average in a population consistently could lead to an 18% increase in CVD [1,6]. Through another study reviewed, it was found that some of the overall effects of Circadian misalignment due to unhealthy sleep patterns on the heart are an increase in blood pressure and fluctuations in heart rate [5].

The increased risk of CVD due to poor sleep quality and sleeping less shows us that having bad sleep habits can possibly lead to getting a heart disease in the future. High blood pressure, also known as hypertension, and fluctuations in heart rate are known risk factors of cardiovascular diseases and indicators of poor heart health [8]. Hypertension can lead to CVD since the pressure of the blood in blood vessels may be too much for the vessel walls to bear, causing them to rupture and leading to a stroke [8,9]. An increase in resting heart rate, or tachycardia, may not mean much, but if it continues consistently, it can lead to certain forms of hypertension, again leading to increased risks of strokes and worsening heart health [9]. Since unhealthy sleep patterns, such as sleeping too little or having poor sleep quality, is what leads to the increased heart rate and hypertension, these pieces of evidence also support that unhealthy sleep habits lead to more heart problems. Shockingly, simply sleeping one hour later than recommended can lead to drastic changes in the risk of CVD.

The results of my review are mostly in line with other existing literature, such as articles published by the Center of Disease Control (CDC). One such article mentions poor sleep habits can lead to high blood pressure, but it also says that sleep can affect behavioral characteristics that then lead to heart health, such as unhealthy eating choices and less motivation for physical exercise [10]. While my study did evaluate how sleep affected risk of CVD, it did not take into account lifestyle choices that could then lead to declining heart health with sleep acting as an indirect cause.

Going forward, this data can be used to help the public understand the true implications of staying up too late. Due to over 35% of the current US population sleeping less than 7 hours a night, cardiovascular diseases can be expected to become more prevalent over the coming years [10]. Individuals can reduce their risk of this by making sure to get enough sleep while also doing whatever they can to improve the quality of their sleep.

According to the CDC, there is an established connection between an individual's heart health and their mental health [11]. We can apply the information found through this study to also help decrease problems due to mental health. If we can increase overall heart health in a population by improving sleep, it is expected that mental health will also improve.

More research should still be done in this area, such as how exactly certain bodily processes during sleep are interrupted by poor sleep habits and how this can affect heart health. Another area that little is known about is the effects of sleeping too long and its potential impacts on CVD.

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