Can good sleep patterns offset genetic susceptibility to heart disease and stroke?

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For the first time researchers have assessed the impact on the risk of heart or blood vessel problems from the combination of sleep patterns and genetic susceptibility to cardiovascular disease.

The study, which is published in the *European Heart Journal* today,

found that even if people had a high genetic risk of heart disease or stroke, this appeared to be offset to some extent by good sleep patterns.

The researchers, led by Professor Lu Qi, Director of Tulane University Obesity Research Center at Tulane University, New Orleans, USA, looked at genetic variations known as SNPs (single nucleotide polymorphisms) that were already known to be linked to the development of heart disease and stroke. They analysed the SNPs from blood samples taken from 385 292 healthy participants in the UK Biobank project and used them to create a genetic risk score to determine whether the participants were at high, intermediate or low risk of cardiovascular problems.

Prof Qi and his colleagues also created a new, "healthy sleep score" by asking the participants whether they were a "morning" or an "evening" person, how long they slept for, and whether or not they suffered from insomnia, snoring or frequent, excessive daytime sleepiness. The healthy sleep score ranged from 0 to 5, with 5 being the healthiest sleep pattern, representing a 'morning" person, who slept between 7-8 hours a night, without insomnia, snoring or daytime sleepiness.

The researchers followed the participants for an average of 8.5 years, during which time there were 7280 cases of heart disease or stroke.

Prof Qi said: "We wanted to test whether the relation between sleep scores and cardiovascular outcomes was different according to the genetic risk. This is the first time this has been done.

"We also wanted to estimate the proportion of cardiovascular problems that would not have occurred if all participants had a healthy sleep pattern, if we assume there is a causal relationship."

The researchers found that compared to those with a sleep score of 0-1

(unhealthy sleep pattern), participants with a score of 5 had a 35% reduced risk of cardiovascular disease, and a 34% reduced risk of both heart disease and stroke.

Prof Qi said: "If the link between sleep and cardiovascular disease proves to be causal, then more than a tenth of all heart disease and strokes would not have occurred if all the participants had a healthy sleep score of 5. Among people with a healthy sleep score of 5, there were nearly seven fewer cases of cardiovascular disease per 1000 people per year compared to those with a sleep score of less than 5."

When the researchers looked at the combined effect of sleep score and genetic susceptibility on cardiovascular disease, they found that participants with both a high genetic risk and a poor sleep pattern had a more than 2.5-fold greater risk of heart disease and a 1.5-fold greater risk of stroke compared to those with a low genetic risk and a healthy sleep pattern. This meant that there were 11 more cases of heart disease and five more cases of stroke per 1000 people a year among poor sleepers with a high genetic risk compared to good sleepers with a low genetic risk. However, a healthy sleep pattern compensated slightly for a high genetic risk, with just over a two-fold increased risk for these people.

"We found that a high genetic risk could be partly offset by a healthy sleep pattern," said Prof Qi. "In addition, we found that people with a low genetic risk could lose this inherent protection if they had a poor sleep pattern."

A person with a high genetic risk but a healthy sleep pattern had a 2.1-fold greater risk of heart disease and a 1.3-fold greater risk of stroke compared to someone with a low genetic risk and a good sleep pattern. While someone with a low genetic risk, but an unhealthy sleep pattern had 1.7-fold greater risk of heart disease and a 1.6-fold greater risk of

stroke.

The researchers cannot exclude the possibility that a poor sleep pattern might be indicative of some underlying and undetected health problem that might play a role in the increased risk of cardiovascular disease. However, they tried to minimise this risk by excluding all patients with cardiovascular disease at the start of the study and they also took account of factors that could affect the results and were related to a person's health, such as age, sex, ethnicity, deprivation, physical activity, smoking, alcohol consumption, body mass index, other health problems and family history of heart disease and stroke.

Prof Qi concluded: "As with other findings from observational studies, our results indicate an association not a causal relation. However, these findings may motivate other investigations and, at least, suggest that it is essential to consider overall sleep behaviours when considering a person's risk of heart disease or stroke."

Other limitations of the study include: the researchers relied on the participants reporting their sleep patterns, and this occurred only once at the beginning of the study; the healthy sleep score did not include all sleep problems such as restless legs syndrome; and the majority of UK Biobank participants are of European descent, which may affect the generalisation of the results to other populations.

It is not clear what mechanisms may be responsible for the link between sleep and risk of cardiovascular disease. The researchers say disrupted sleep could upset the hormonal or metabolic regulation of the body, increase the body's 'fight or flight' responses, increase inflammation and disrupt the body's natural circadian rhythm.

More information: "Sleep patterns, genetic susceptibility, and incident cardiovascular disease: a prospective study of 385 292 UK Biobank

participants", *European Heart Journal* (2019). DOI: 10.1093/eurheartj/ehz849

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