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## Even High-But-Normal Blood Pressure Elevates Stroke Risk

People with prehypertension have a 55 percent higher risk of experiencing a future stroke than people without prehypertension, report researchers at the University of California, San Diego School of Medicine in a new meta-analysis of scientific literature published in the September 28 online issue of the journal *Neurology*.

Prehypertension is clinical category created by experts in 2003 to describe patients whose blood pressure was elevated, but still considered within normal range. Hypertension or abnormally high blood pressure is a major risk factor for cardiovascular disease and strokes, but much less is known about the health threat posed of prehypertension, which is defined by a systolic pressure reading between 120 and 139 mmHg (the top number) and a diastolic reading between 80 and 89 mm Hg (the bottom number).

"The experts reasoned that, generally speaking, the higher the blood pressure, the greater the risk of death and disease, possibly starting from within the normal blood range," said Bruce Ovbiagele, MD, professor of neurosciences at UC San Diego School of Medicine and senior author of the study.

However, Ovbiagele said, conclusive evidence was lacking, "so we decided to compile all the published studies in the scientific literature to date, and using statistical techniques find out if there is indeed a higher risk of future stroke in people with prehypertension, the extent of that risk, and whether particular characteristics were associated with higher stroke risk."

The researchers identified 12 relevant prospective cohort studies of prehypertension. All of the studies were derived from the general population. Four were from the United States, five from Japan, two from China and one from India. Combined, the studies involved more than 518,000



Bruce Ovbiagele, MD

participants and covered periods ranging from 2.7 years to 32 years, with stroke occurrences documented. The prevalence of prehypertension in the studies ranged from 25 to 46 percent. In the United States, it's estimated roughly one-third of adults have prehypertension.

"Overall, people who had prehypertension (in the studies) were at a 55 percent higher risk of experiencing a future stroke than people without prehypertension," said Ovbiagele. "This result held regardless of sex, race-ethnicity, blood pressure type (systolic or diastolic) or the type of stroke (ischemic or hemorrhagic)."

The health risk was measurably greater for those whose blood pressure levels were at the high end of the "normal" spectrum. "We found that those people who fell within the higher range of prehypertension were at 79 percent higher risk of experiencing a future stroke," Ovbiagele said.

The findings should add clarity to the perceived health risk of prehypertension, said Ovbiagele. "Prehypertension has been controversial since its inception, with occasional accusations that it would not be used to diagnose sick people, but rather it would label healthy people whose blood pressure was towards the upper reaches of normal as unhealthy, without any compelling reason for doing so. Others complained that the new designation would needlessly expose people to blood pressure-reduction drugs, all to the benefit of pharmaceutical companies."

Thomas Hemmen, MD, PhD, director of the UC San Diego Stroke Program and a neurologist at the UC San Diego Sulpizio Cardiovascular Center who was not involved in the study, described it as "ground-breaking."

"Over the years, the blood pressure range identified as increasing stroke and cardiovascular risk has been lowered," Hemmen said. "Now anything that's above 115 is thought to increase risk. But we need more tools for diagnosing prehypertension. We need to learn more so that we can adjust risk and develop therapies. Hopefully, this study will lead to more research."

Both Hemmen and Ovbiagele note little empirical evidence exists to show that taking blood pressure-reducing drugs can prevent future strokes. "There just haven't been any large studies," Hemmen said. On the other hand, both doctors say the new findings should encourage persons with high-but-normal blood pressure to change unhealthy behaviors.

"Young and middle-aged persons should check their blood pressure regularly. If they do fall into the higher range of prehypertension, they should take specific steps to modify their lifestyle, such as reducing salt intake and maintaining a normal weight," said Ovbiagele.

“Modifying one’s lifestyle is relatively safe and could potentially lower not just the risk of future strokes, but possibly other complications of prolonged elevation of blood pressure, including heart attacks, heart failure and kidney disease.”

Co-authors of the paper are Meng Lee, UCLA Geffen School of Medicine and Chang Chung Memorial Hospital at Chiayi; Jeffrey L. Saver and Qing Hao, UCLA Geffen School of Medicine; B. Chang, Chang Gun University College of Medicine, Taiwan; and Kuo-Hsuan Chang, Chang Gung Memorial Hospital at Linkou and University College of Medicine, Taiwan.

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