

Heads Up

Considerations for Divers with High Blood Pressure



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Hypertension, or high blood pressure, is one of the most common medical conditions seen in the general population and among divers. It is a chronic condition that tends to progress with aging and represents one of the major risks for death due to heart disease, stroke or kidney failure. Deaths while scuba diving in about 30 percent of cases in U.S. and Canadian divers are related to cardiovascular diseases, including high blood pressure¹.

All adults mindful of their health and fitness should take care of their blood pressure. It is certainly very important for divers. The good news is that high blood pressure may be prevented, slowed down or managed in a way that it does not preclude one from diving.

The following article provides information about lifestyle interventions that benefit divers who already have high blood pressure and those interested in preventing it.

— DAN Medical Services

The entrance to the chimney at Randy's Gazebo in Little Cayman begins at the top of a lush reef at about 40 feet (12 meters). It drops 20 feet (6 meters) straight down and continues with a steep headfirst dogleg to 75 feet (23 meters). From there, you enter the big blue and look back on Bloody Bay Wall.

BY GRETCHEN M. ASHTON, CFT, NBF

It's a spectacular dive. But despite its appeal, it's not without risks. For instance, you are likely to experience more than one cause for increased blood pressure on this particular dive: You can be affected by immersion itself, by the possible forceful Valsalva maneuver used for ear-clearing, by the vertical head-down posi-

tion for an extended distance and the required physical exertion of the dive. Challenges would be even greater in cold temperatures and rough seas or currents.

If you are a diver with high blood pressure, swimming across the reef with a more gradual descent along the wall allows you to enjoy this spectacular dive with fewer risks.

What is high blood pressure?

Blood pressure is the force caused by the work of the heart that maintains flow of blood through the vessels against resistance caused by blood and the vessels themselves. Your blood pressure is important because the blood flow transports oxygen, nutrients and waste products like carbon dioxide to and from working tissues.

Blood pressure is measured in millimeters of mercury (mm Hg) with two numbers, systolic and diastolic, typically presented as systolic over diastolic.

High blood pressure, or hypertension, is defined generally in an adult as a blood pressure greater than or equal to 140 mm Hg systolic pressure or greater than or equal to 90 mm Hg diastolic pressure.

Blood pressure classifications are shown in Table 1.

Postural changes can significantly affect blood pressure. This is especially evident when your head is situated below your heart (as in the head-first position). Other factors that can affect blood pressure include physical exertion, gravity, water temperature, breathing patterns, emotions, medications and medical conditions.

As many as 73 million Americans — one in three adults — have HBP. While its cause is generally unknown, its prevalence increases with age, from 7 percent in men aged 20-34 to 82 percent in 75-year-olds and older women.³

Hypertension is also one of the most reported medical conditions by scuba divers, according to Divers Alert Network®.¹ Most DAN® members are in their 40s and 50s. In this age group, the prevalence of this condition among people who take medication for it in the general population is 36 percent. Another 20 percent may have elevated blood pressure. Chances are 50 percent that a typical scuba diver has either elevated or high blood pressure.

How HBP affects your life

High blood pressure usually causes no symptoms until it is well advanced; consequently, almost 30 percent of Americans with high blood pressure do not know they have it.⁴

Often termed “the silent killer,” hypertension can often go overlooked until you experience a serious medical event.

Checking your BP regularly is important. The higher your resting blood pressure, the more your heart works with less reserve for physical exercise. If blood pressure is not controlled, over the years it speeds up damage to blood vessels, heart, brain kidney and other vital organs.

High blood pressure directly increases your risk of coronary heart disease, which leads to heart attack and stroke, especially when it is present with other risk factors. Some products contribute to high blood pressure. This includes tobacco products and smoking, caffeine (e.g., coffee and energy drinks), alcohol, and allergy and cold medications. In addition, these products may interfere with blood pressure medications.^{4,6}

Excessively high blood pressure may manifest itself in headaches, dizziness, blurred vision and nausea. These symptoms indicate an emergency situation that requires immediate attention.

How HBP affects dive fitness

If controlled properly, moderately HBP does not compromise fitness to dive. If your blood pressure remains high despite treatment, or if it is erratic, you should avoid diving.

Diving increases blood pressure, even in divers with normal pressure. This occurs due to the immersion-caused shift of the blood into the thorax, the constriction of peripheral blood vessels and exercise. Divers with HBP that is

not well controlled face a significant risk from immersion and cold: Together they can cause a sudden increase in blood pressure that can cause liquid from the capillaries to leak into the alveoli and flood the lungs. This is an acute life-threatening condition called immersion pulmonary edema*.

Hypertension is a major risk factor for cardiovascular disease. Increased blood pressure levels are associated with an elevated risk for stroke and coronary heart disease.

Long-term effects of HBP present special concern to divers. Those with a history of the condition should regularly check for heart disease and other possible complications; these conditions could significantly reduce a diver's capacity for physical exercise and increase the risks of sudden cardiac death while diving.

Managing HBP

Monitoring your blood pressure, managing factors that contribute to it and receiving proper treatment are important in preventing long-term damage to vital organs and early death due to heart disease, stroke and kidney failure.⁵

Prospective divers should measure their blood pressure before they begin training. For a start, drug stores and many other places offer free blood pressure checks. Divers older than 35 should measure their blood pressure annually, however; and those diagnosed with HBP should seek professional treatment.

Treatment for HBP will most likely include lifestyle changes — in diet and exercise, weight reduction (if you're overweight) — as well as

Table 1. Classification of blood pressure for adults age 18 years and older

Category	Systolic (mm Hg)	Diastolic (mm Hg)
Normal*	less than 120	less than 80
Prehypertension	120-139	80-89
Hypertension		
Stage 1	140-159	90-99
Stage 2	160 or higher	100 or higher

[Note: Unusually low readings should be evaluated for clinical significance. (From the Seventh Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure 2)]

*For more information on IPE, see the DAN website:
 • <http://www.DiversAlertNetwork.org/medical/articles/article.asp?articleid=82>;
 • <http://www.DiversAlertNetwork.org/medical/faq/faq.aspx?faqid=204>; and
 • <http://www.DiversAlertNetwork.org/News/Article.aspx?newsid=985907>

medications. Keep in mind that excess weight, tobacco use, drinking alcohol excessively and physical inactivity contribute to HBP and can also interfere with blood pressure medications.⁹

Start by being informed

The importance of lifestyle changes for preventing and lowering high blood pressure are described in "Your Guide to Lowering Your High Blood Pressure," a 20-page document issued by an international panel of experts and published by the U.S. Department of Health and Human Services, National Institutes of Health (NIH), National Heart, Lung and Blood Institute (NHLBI), National Blood Pressure Education Program.² (See http://www.nhlbi.nih.gov/health/public/heart/hbp/hbp_low/hbp_low.pdf.)

Here is a brief summary of their recommendations:

• Engage in regular physical activity.

Exercise at least 30 minutes a day, every day. If your blood pressure is moderately elevated, moderate exercise of 30 minutes of brisk walking most days a week may keep you off medicine. During exercise, blood pressure increases, but the resting pressure after exercise decreases. If you take medication for HBP, 30 minutes of moderate physical activity can make your medications work more effectively and make you feel better.²

If you have very high blood pressure, you must undergo a thorough physical evaluation before considering exercise. If you have normal blood pressure, being physically active will help you keep it that way. If you are not active, your chances of developing HBP increase, especially as you get older or if you become overweight, obese or develop diabetes.²

You can get additional health benefits with exercise of higher intensity, greater frequency and/or longer duration, using up to 150 minutes a week of moderate-intensity physical activity, when appropriate. Combined aerobic and muscle-strengthening activities are also beneficial; improvements can occur at any age. If you are planning to start vigorous exercise or training, discuss it with your physician.⁶ (See <http://www.health.gov/paguidelines>.)

• Reduce sodium intake.

Dietary Approaches to Stop Hypertension,

or DASH, is an eating plan designed to lower your intake of sodium. No more than 100 mmol of sodium is recommended per day—approximately 2.4 g of sodium or 6 g of sodium chloride. In a serving size of 1/4 teaspoon, a typical light-salt mixture is 1.4 g. Read food labels to identify ways to reduce sodium intake. You can lower your systolic blood pressure (the top number) by 8 to 14 points by switching to the DASH diet.

Based on 2,000 daily calories, the DASH diet is low in fat, high in fruits, vegetables, legumes and whole grains, and suggests low-fat dairy.² (See http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf.)

• Maintain normal body weight.

Work for a body mass index of 18.5-24.9. Weight control is another benefit of a balanced program of exercise and nutrition. A sustained weight loss of 10 pounds or more can reduce systolic blood pressure by 5 mm Hg and diastolic blood pressure by 7 mm Hg, respectively. People with mild increase of blood pressure and who are overweight may bring their blood pressure back to normal by losing weight.² (To calculate your BMI, go to <http://www.nhlbisupport.com/bmi/>)

• Limit alcohol use.

Many people enjoy alcoholic beverages, but if you have HBP, consume such beverages in moderation. Men should consume no more than 24 oz. of beer, 10 oz. of wine or 2 oz. of hard liquor each day. For lighter-weight individuals and women, half of these amounts are recommended.²

• Do not smoke

Smoking multiplies risks of coronary heart disease and should be avoided even by healthy people. Smoking increases blood pressure, risk of stroke and risk of recurrent coronary heart disease after bypass surgery. It also decreases exercise tolerance.

Cigarette smokers have a higher risk of developing several chronic disorders; these include fat accumulation in arteries (along with decreasing levels of good cholesterol), several types of cancer and chronic obstructive pulmonary disease. Atherosclerosis, or buildup of fatty substances in the arteries, is a chief contributor to the high number of deaths from smoking.⁴

Consider the effects of smoking when diving. Smoke contains carbon monoxide, a poison.

The amount of CO can be 10 times higher in a smoker than in a nonsmoker. Increased levels of CO interfere in the ability of red blood cells to carry oxygen.

Nicotine, another ingredient in tobacco products, constricts blood vessels and may increase the risk of decompression sickness. Smoking has also been implicated as a factor in central nervous system oxygen toxicity. Smokers who dive are more likely to experience decompression sickness; symptoms seem to be more intense in smokers than nonsmokers.⁷

For more information about smoking cessation, visit the American Heart Association at <http://www.americanheart.org/presenter.jhtml?identifier=4731>

• Control other cardiovascular risk factors.

If you are healthy and 35 years or older, you should have an annual medical evaluation for major health risk factors. If you have known medical conditions, an annual medical examination six to eight weeks prior to your longest dive trip of the year may help ensure you get proper treatment and management tools designed specifically for you and suitable to your diving activity.

Annual medical evaluations should check for weight, blood pressure, blood cholesterol and sugar, as well as the effects of smoking, drinking and exercise. If you have high or borderline HBP, it is even more important to control these risk factors.

DAN consistently recommends that divers maintain physical fitness and good health as most important to diving preparedness and prevention of injury and death.⁸

Living a healthy lifestyle will make a positive difference toward managing and lowering HBP, improving one's overall health and enhancing diving performance.

For more in-depth information, check the following:

www.DiversAlertNetwork.org
www.americanheart.org
www.nih.gov

About the Author

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How we rank

Percentage of men and women with high blood pressure in the US, by age group (2001-2004, Health, United States, 2007 NCHS)⁷

Age group	Male (%)	Female (%)
20-34 years	7.0	2.7
35-44 years	19.2	14.0
45-54 years	35.9	35.2
55-64 years	47.5	54.4
65-74 years	61.7	72.9
75 years plus	67.1	82.0

Source: <http://www.cdc.gov/nchs/data/hus/07.pdf#executivesummary>

Additional Resources

- *Your Guide to Lowering Your High Blood Pressure*
National Heart, Lung and Blood Institute, National Institutes of Health
http://www.nhlbi.nih.gov/health/public/heart/hbp/hbp_low/hbp_low.pdf
- *10 Ways to Control Your High Blood Pressure*
American Heart Association
<http://www.americanheart.org/presenter.jhtml?identifier=578>
- *Lowering Your Blood Pressure with D.A.S.H.*
National Heart, Lung and Blood Institute, National Institutes of Health
http://www.nhlbi.nih.gov/health/public/heart/hbp/dash/new_dash.pdf
- *2008 Physical Activity Guidelines for Americans*
United States Department of Health and Human Services
<http://www.health.gov/paguidelines/>
- *Smoking Cessation*
American Heart Association
<http://www.americanheart.org/presenter.jhtml?identifier=4731>

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