

Hypertension as a risk factor in stroke: An overview

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Abstract

Stroke is the second most common cause of mortality and the third most common cause of disability worldwide. Stroke has modifiable and non-modifiable factors. Stroke risk factors that can be modified include hypertension. Hypertension can lead to endothelial dysfunction and atherosclerosis. Hypertension is also influenced by a dynamic and complex interaction between environmental and genetic risk factors. Since there are numerous contributing factors to hypertension, it is a preventable risk factor for stroke.

Keywords: Hypertension; High blood pressure; Stroke; Risk factor

1. Introduction

Stroke is the world's second-leading cause of death and the third-leading cause of disability [1]. With an estimated 5.5 million deaths each year globally. The burden of stroke is not limited to its high death rate, its high morbidity also leaves up to 50% of survivors permanently impaired [2]. Stroke is a clinical state that includes an abrupt loss of focal brain function and symptoms that either continue longer than 24 hours or result in (early) death [3]. Strokes are generally categorized into two major types: ischemic stroke and hemorrhagic stroke. Ischemic stroke is caused by a disruption in the blood flow to a portion of the brain, resulting in an abrupt loss of function, whereas hemorrhagic stroke is caused by a blood vessel rupture [2]. The majority of strokes (80%) are ischemic, while the proportional burden of hemorrhagic versus ischemic stroke varies by population [4]. The cause of stroke and its hemodynamic implications vary depending on stroke subtype and disease presentation time [5]. However, high blood pressure, also known as hypertension, is one of the most important modifiable risk factors for stroke. [6]. An increase in blood pressure (BP) can cause endothelial dysfunction, which can lead to atherosclerosis. Furthermore, hypertension affects tiny perforators that come from the intracranial artery. Elevated blood pressure has the potential to rupture these tiny perforators, resulting in a hemorrhagic stroke, or to obstruct them, leading to an ischemic stroke [7]. Controlling the major risk factors for stroke, such as hypertension, is necessary to prevent strokes [8]. Therefore, it is important to prevent stroke by monitoring blood pressure regularly and improving lifestyle.

2. Methods

This study is a review of the literature using secondary research methods. PubMed and Google Scholar databases were used for literature searches. The search terms used were “hypertension” with the operator “and”, along with any of the following terms: “stroke”, “risk factors”, “pathophysiology”, “epidemiology” and “incidence”. The research designs included observational studies, clinical trials studies and experimental studies, and the literature was chosen based on the publication year (2013-2023).

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3. Results and discussion

Hypertension is the most significant risk factor after age, and those with hypertension are three to four times more likely to have a stroke [2]. Hypertension is the most prevalent modifiable risk factor for stroke, with a frequency of almost 30% in developed countries. Elderly people are more susceptible to hypertension [9]. The contribution of hypertension and other stroke risk factors such as diabetes, smoking, alcohol use, and lack of physical exercise is higher in the age group above 50 years than in the younger age group [10]. In both men and women of middle age, hypertension has a considerable effect on the risk of stroke [6]. The prevalence of hypertension (HTN) for men and women, respectively, was 34% and 32%, with SBP/DBP \geq 140/90 mm Hg. Age-specific differences in the prevalence trend exist, even though males are generally more likely than women to have hypertension. Age-related increases in both male and female prevalence of hypertension [11]. Among the hypertensive patients, patients with stage 1 hypertension had a decreased risk of stroke than those with stage 2 hypertension [6]. The substantial link between hypertension and stroke has been attributed to hypertension's severe impact on cerebral circulation. Hypertension is known to promote wall hypertrophy and a reduction in the exterior lumen diameter of cerebral blood vessels. Furthermore, hypertension affects endothelial cells' ability to release vasoactive substances and raises the constrictor tone of systemic and cerebral arteries [2].

Hypertension is a complicated disorder, with 90% of cases classed as essential hypertension, meaning the actual etiology is unknown. However, an association between hypertension and inflammation has recently been established [12]. Inflammation may contribute to hypertension by generating endothelial dysfunction. Inflammation is a defensive reaction to an injury or infection. It is a complex process that begins with inflammatory cells detecting the injured tissue, followed by leukocyte recruitment into the tissue, elimination of the offending agent, and repair of the injury site. Interactions between cell surfaces, extracellular matrix, and proinflammatory mediators are required for inflammation. Excessive inflammation can be harmful and contribute to the growth of chronic and/or long-term diseases like atherosclerosis. Inflammation can change the rates of synthesis and degradation of vasoconstrictors and vasodilators, including Nitric Oxide (NO), and decreased NO bioactivity is connected to hypertension [12]. Furthermore, an increase in peripheral vascular resistance is a sign of hypertension. Vascular resistance can be raised by decreasing the lumen diameter or number of arteries, or by increasing artery length. Hypertension decreases both the lumen diameter and the number of vessels in the cerebral vasculature. Hypertension causes structural changes in the arteries that differ from those of a normotensive patient [13].

The emergence of hypertension is the result of a dynamic and intricate interplay between environmental and genetic risk factors. Although physical inactivity, excessive alcohol consumption, diabetes, and obesity are all significant population-level drivers of blood pressure, obesity remains the biggest risk factor for both the development of hypertension and its poorly managed conditions. High salt intake can aggravate high blood pressure, however it can also be corrected by lowering salt intake [14]. Furthermore, diet is regarded as an important risk factor management method, particularly for blood pressure reduction. The most beneficial dietary pattern for decreasing blood pressure comprises eating vegetables, fruits, whole grains, low-fat dairy products, chicken, fish, legumes, nontropical vegetable oils, and nuts while avoiding sweets, sugar-sweetened beverages, and red meats [8]. Reducing the risk of high blood pressure (systolic), high cholesterol, diabetes (high fasting plasma glucose), smoking, inactivity, poor diet, and abdominal obesity (high body-mass index [BMI]) are all interventions that are useful in preventing strokes [15].

4. Conclusion

The most common modifiable stroke risk factor is hypertension. Hypertension induces structural changes in the arteries by promoting wall hypertrophy and a decrease in the width of the outer lumen of cerebral blood vessels. The formation of hypertension is the result of a complex combination of environmental and genetic risk factors. As a result, hypertension management in stroke is complex and challenging.

Compliance with ethical standards

Disclosure of conflict of interest

There are no conflicts of interest among the authors regarding the contents of this study.

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