

Effect of aerobic exercises in prevention of stroke risk factors: A Narrative Review

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Abstract

Stroke is the most common serious manifestation of cerebrovascular disease. It ranks as the second most common cause of death and the main cause of severe disability. It is a catastrophic life-changing event which influences not only stroke patients but also their families and care givers. It causes load and challenge on the global health care system. It is important to make efforts to prevent stroke rather than just treat stroke. The aim of a narrative review to detect effect of aerobic exercises in prevention of stroke risk factors. The most successful way for stroke prevention involve modification and treatment of risk. It has been estimated that over 50% of stroke are preventable through control of modifiable risk factors. Physical activity is considered a modifiable lifestyle factor in stroke prevention strategies. The effect of aerobic exercise is enhancing cardiovascular fitness, improve muscle strength, and promoting brain health. The habitual exercise may prevent or slow the natural decline in resting cerebral perfusion, thereby modifying stroke risk.

Keywords : Aerobic exercises, Risk of stroke, Ischemic stroke

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Stroke is the most common serious manifestation of cerebrovascular disease. It is clinically defined as a syndrome of acute, focal neurological deficit attributed to vascular injury of the central nervous system [1]. It ranks as the second most common cause of death and the main cause of severe disability [2]. It is a catastrophic

life-changing event which affects not only stroke patients, but also their families and caregivers [3].

Ischemic stroke is the most common pathological type of cerebral stroke [4]. The primary lesion of ischemic stroke is cerebral infarction due to inadequate supply of blood to cerebral tissue [1]. It involves approximately 85% of cerebral stroke [5]. Stroke causes load and challenge on the global health care system. About two- thirds of stroke survivors need a level of assistance in their daily activities [6].

Early detection and treatment are the keys to prevent ischemic stroke [7]. It is important to make efforts to prevent stroke rather than just treat stroke [8]. The most successful way for stroke prevention involve modification and treatment of risk. Studies estimate that over 50% of stroke are preventable through control of modifiable risk factors [9].

Stroke is multi-factorial in causation. It is associated with several risk factors, some of them are non-modifiable and some are modifiable. Non-Modifiable Risk Factors are age, gender, race and heredity. Modifiable Risk Factors are hypertension, heart disease, diabetes mellitus, hyperlipidemia, obesity, physical inactivity, and smoking [10].

Non- modifiable risk factors

Age [11].	It is the single most important risk factor for stroke. The incidence of stroke increases with age and approximately doubles with each decade between ages 45 to 85 years. The risk of stroke is greatest in the age group 55-64 years.
Gender [10].	It is as a marker of risk for stroke and cannot be modified. There is much less difference in the incidence of stroke between men and women. Stroke occurs more often in men than in women.

Race [12].	<p>The risk of intracranial stenosis is more common in African and Hispanic Americans compared to White Americans and it is more common in Asian population compared to Northern European.</p> <p>Black Americans and Hispanics were nearly eight-fold higher than Whites.</p>
Heredity [11].	<p>It has been identified as marker and non-modifiable risk factor for stroke.</p> <p>Multiple genetic factors have been identified that may enhance and promote premature atherosclerosis in the whole vascular system including intracranial arterial stenosis.</p>

Modifiable risk factor

Hypertension [13].	<p>Hypertension is the primary modifiable risk factor for stroke. Its prevalence increases to about 45% at age 50, >60% at age 60, and >70% at age 70.</p> <p>It affected over a quarter of the world's population in 2000 and is set to rise to approximately 29% of the population by 2025, affecting 1.56 billion people.</p>
Atrial fibrillation [14].	<p>It is the most powerful and treatable cardiac precursor of stroke. Its prevalence rose from 1.5% in subjects aged 50 to 59 years to 23.5% in subjects aged 80 to 89 years.</p>
Hypercholesterolemia [15].	<p>It is an important modifiable risk factor for coronary heart disease and ischemic stroke.</p>
Diabetes mellitus [16].	<p>It is the strongest independent risk factor for intracranial stenosis.</p> <p>It promotes the accelerated formation of atherosclerotic stenosis through a decrease in fibrinolytic activity.</p> <p>Persons with glucose intolerance have double the risk of brain infarction of nondiabetic persons.</p>
Obesity [10].	<p>Excess bodyweight is the sixth most important risk factor contributing to the overall burden of disease worldwide.</p> <p>It is often associated with increase in severity of hypertension.</p>
Smoking [10]	<p>smoking increases the risk of ischemic stroke.</p> <p>In both the Framingham Study and the Nurses' Health Study cessation of smoking led to a prompt reduction in stroke risk-major risk was reduced within 2 to 4 years.</p>

According to The 2012 annual screening and intervention project “Workbook of Stroke High-Risk Population: The subject with high risk of ischemic stroke should meet two of following items (1) to (7) or item (8): (1) have a history of high blood pressure (systolic/diastolic pressure $\geq 140/90$ mmHg), or be taking antihypertensive drugs. (2) have atrial fibrillation. (3) smoke (at least one cigarette each day for one year. (4) have dyslipidemia. (5) have diabetes mellitus. (6) be obviously overweight or obese (BMI ≥ 24 kg/m²). (7) have a family history of stroke (a stroke history in three generations). (8) have a history of transient ischemic attack [17].

There is a certain eclipse period before the onset of stroke and early prediction and prevention can effectively reduce incidence rate of the disease [5]. Around 80% of strokes are preventable by addressing modifiable risk factors [18]. Many of these strokes may be prevented by lifestyle modifications. These lifestyle modifications include engaging in physical activity, dietary changes such as the Mediterranean diet, smoking cessation, and avoiding substance abuse[19].

Low fitness levels predict an increased risk of stroke [6]. Physical activity is considered a modifiable lifestyle factor in stroke prevention strategies [20]. The benefit of regular physical activity in some populations was associated with as much as 70% reduction in stroke risk. Reducing disability can improve independence and overall quality of life [3].

Aerobic exercise is any cardiovascular conditioning. It can include activities like walking, swimming, running, or cycling. Its hemodynamic response is including changes in blood pressure, cardiac output and perfusion of dependent organs including the brain [21]. The effect of aerobic exercise is enhancing cardiovascular fitness, improve muscle strength, and promoting brain health. It has neuroprotective effects and plays an important role in neuroplasticity [22].

Regular physical activity reduces the risk of stroke due to upregulation of endothelial nitric oxide synthase [23]. It includes light-to-moderate activity, such as walking. Regional cerebral blood flow increases after moderately intense

exercise [20]. Walking produces larger pressure waves in the body that significantly increase blood flow to the brain [24].

In a meta-analysis of eighteen large epidemiology cohort studies and five case-control studies, found that people who are moderately and highly active have a lower risk of stroke incidence or mortality by 20 and 27%, respectively [6]. A meta-analysis reported that high physical activity levels compared with low physical activity levels were associated with overall 19% lower risk of stroke [25].

Not only the aerobic exercise has importance in rehabilitation of different diseases, but also in prevention of stroke for patients with high- risk factors. The habitual exercise may prevent or slow the natural decline in resting cerebral perfusion. This mechanism could modify stroke risk [26].

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