Review

Screening, Prevention and Risk Factors of Stroke in Adult Patients

Shada Baoum[1], Mohammed Alghamdi [2], Naief Almatroudi [3], Naif Alzahrani [4], Abdulaziz Baghdadi [5], Abdulmalek Alshomrani [6], Hassan AlAli [7], Rakan Alhamoud [8], Khalil Alnakhli [9], Fahad Alluhayyan [3], Laila Aloutaibi [10]

[1] Primary Healthcare, King Fahad General Hospital, Jeddah, Saudi Arabia
[2] Primary Healthcare, King Abdullah Medical Complex, Jeddah, Saudi Arabia
[3] General Practitioner, Ministry of Health, Riyadh, Saudi Arabia
[4] Public Health – Department of Preventive Medicine, Directorate of Health Affairs, Albaha, Saudi Arabia
[5] Department of Emergency Medicine, Al Noor Specialist Hospital, Mecca, Saudi Arabia
[6] College of Medicine, Baha University, Albaha, Saudi Arabia
[7] College of Medicine, Vision Colleges, Riyadh, Saudi Arabia
[8] Department of Family Medicine, Ministry of Health, Riyadh, Saudi Arabia
[9] College of Medicine, Qassim University, Mulayda, Saudi Arabia
[10] College of Medicine, Almarefa University, Riyadh, Saudi Arabia

Correspondence:

Correspondence should be addressed to **Shada Baoum**, Primary Healthcare, King Fahad General Hospital, Jeddah, Saudi Arabia. Email: baoum.shada@gmail.com

Abstract

Stroke, also known as a cerebrovascular accident, is a medical emergency characterized by an immediate disruption of cerebral perfusion or vasculature. Strokes are divided into two categories: ischemic stroke and haemorrhagic stroke. Strokes can be caused by a variety of factors, including high blood pressure, arteriosclerosis, and emboli generated in the heart as a consequence of atrial fibrillation or rheumatic heart disease. Stroke is linked to a number of risk factors, that are categorized into modifiable and non-modifiable risk factors. In order to reduce stroke-related morbidity and mortality, prevention is critical. It is believed that 50% of strokes can be avoided by controlling modifiable risk factors and making lifestyle modifications. The purpose of this research is to review the available information regarding screening, risk factors and prevention of stroke. Hypertension, smoking, obesity, diet, lack of physical activity, diabetes mellitus, alcohol consumption, mental distress, heart disease, and lipid disorders account for 90% of strokes, depending on the number of risk factors included. Medical interventions that have been demonstrated in numerous randomized trials can significantly lower the risk of stroke. Observational research clearly suggests that healthy eating habits, quitting smoking and abstaining from excessive alcohol consumption, regular physical activity, and maintaining a normal body weight are all helpful for stroke prevention. In order to facilitate services for preventative stroke treatments and acute stroke care, community awareness of stroke risk factors and symptoms must be improved. Education, awareness as well as screening for risk factors of stroke among public is need of time.

Keywords: stroke, risk, factor, prevention, screening

Introduction

Stroke, also known as a cerebrovascular accident, is a medical emergency characterized by an immediate disruption of cerebral perfusion or vasculature. Stroke continues to be associated with a high rate of morbidity and mortality. Stroke survivorship varies between 60% and 80% after a year. Those who survive have a long recovery time and a high chance of recurrent stroke. After a stroke, the majority of patients are left incapacitated or even have partial neurological abnormalities that prevent them from working (1). Strokes are divided into two categories: ischemic stroke and haemorrhagic stroke. Ischemic stroke is the most common form, which is caused by a blockage in blood supply to a specific part of the brain. 85% of all acute strokes are caused by an ischemic stroke. Haemorrhagic strokes, which are triggered by the rupture of a blood artery, account for 15% of acute strokes. Intracerebral haemorrhage and subarachnoid haemorrhage are the two most common kinds of haemorrhagic strokes, accounting for around 5% of all strokes (2).

Stroke was previously classed as a blood vessel disease till the International Classification of Diseases 11 was issued in 2018. The actual form, as well as importance of stroke, as well as importance of stroke was recognized in the International Classification of Diseases 11 after years of advocacy by a group of doctors; stroke was re-categorized within the neurological chapter. The recategorization of stroke as a neurological condition has resulted in more precise data documentation and statistical analysis, allowing for advances in acute care and the acquisition of stroke research funding (3, 4). Strokes can be caused by a variety of factors, including high blood pressure, arteriosclerosis, and emboli generated in the heart as a consequence of atrial fibrillation or rheumatic heart disease. Clotting disorders, cervical arterial dissection, and different kinds of vasculitis may be added to the list of probable reasons in younger patients. Before giving any sort of treatment in the event of a potential stroke presentation, a thorough history and physical examination, as well as emergent neurological imaging, must be undertaken. One can improve his or her chances of a meaningful recovery by receiving early, focused therapy based on the etiology of the stroke, rehabilitation services, and long-term lifestyle adjustments (5).

Stroke is the world's second-largest cause of mortality. It affects 13.7 million people and responsible for almost 5.5 million people per year fatalities. Ischemic infarctions account for about 87% of strokes, a prevalence that grew significantly between 1990 and 2016, owing to lower mortality and better therapeutic management. The majority of strokes are caused by primary, which is also referred as first-time haemorrhages, with recurrent haemorrhages accounting for 10–25%. Over the same period, the incidence of stroke in low- and middle-income nations doubled, while it fell by 42% in high-income countries. According to the global burden of disease report, the socio-economic burden of stroke has grown over time while the age of individuals affected, their sex and their geographic location have all reduced (6, 7) .

Certain factors that raise the chances of having a stroke are known as risk factors. Stroke is linked to a number of risk factors, that are categorized into modifiable and non-modifiable risk factors. Age, gender, ethnicity, and heredity are non- modifiable risk factors, while hypertension, cardiovascular diseases, diabetes mellitus, hyperlipidaemia, obesity, smoking, excessive alcohol use, and polycythaemia are modifiable risk factors (8). As a result, effectively acting with risk factors is critical in preventing stroke onset. Stroke screening programs and consistent community education criteria have long been recognized as critical measures for promoting stroke prevention (9). Also screening for stroke not only helps in early detection but also helps in creating awareness among public.

In order to reduce stroke-related morbidity and mortality, prevention is critical. It is believed that 50% of strokes can be avoided by controlling modifiable risk factors and making lifestyle modifications. An international network of leaders active in this subject has recently designated stroke prevention as one of their top goals. Treatment of hypertension, using statins and angiotensin-converting enzyme inhibitors, and anticoagulation in nonvalvular atrial fibrillation are all primary preventative techniques that work. For both primary and secondary prevention, attention to lifestyle factors is generally warranted: aerobic exercise to counterbalance inactivity, weight loss in obese, glycemic control among diabetics, smoking cessation, and food. Recurrent stroke as well as other vascular problems can both be prevented with antihypertensive therapy. The use of statins with antiplatelets to lower cholesterol has been demonstrated to minimize the incidence of recurrent stroke and other vascular events (10). The purpose of this research is to

review the available information regarding screening, risk factors and prevention of stroke.

Methodology

This study is based on a comprehensive literature search conducted on March 31, 2022, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information regarding screening, risk factors and prevention of stroke. There were no restrictions on date, language, participant age, or type of publication.

Discussion

There are several risk factors for stroke, both modifiable and non-modifiable. Short-term risks or triggers include viral events, sepsis, stress while intermediate-term risk factors include hypertension, hyperlipidemia, and long-term risk factors include hypertension, hyperlipidemia which are all examples of risk factors for stroke. Awareness of modifiable risk factors and validation of the utility of risk reduction measures are required to reduce the burden of stroke in the population. Stroke risk factors in young people are likely to differ from those in older people. Estimating stroke risk based on a person's unique combination of risk factors, especially for a first stroke, is an important part of basic care. The Framingham Stroke Risk Profile is a continuously updated, well-known, and widely used score that combines stroke predictor variables such as age, systolic blood pressure, antihypertensive therapy, diabetes, smoking cigarettes, left ventricular hypertrophy by electrocardiography, and the involvement of cardiovascular disease to estimate 10-year stroke risk stratified by gender (11).

Hypertension, smoking, obesity, diet, lack of physical activity, diabetes mellitus, alcohol consumption, mental distress, heart disease, and lipid disorders account for 90% of strokes, depending on the number of risk factors included. Results of a case control study conducted in 2017 among young stroke patients with age range of 18–55 years and population-based controls in Germany

revealed that the four potentially modifiable risk factors of hypertension, low physical activity, smoking, and alcohol consumption was responsible for 78% of all strokes, while low physical activity and hypertension being the two most important risk factors, accounted for almost for 70% of stroke. The role of risk variables in ischemic and haemorrhagic stroke was different. Men had much greater population attributable risk than women for diabetes and alcohol usage. When comparing age groups, several risk variables were more important as people became older. However, the overall population attributable risk among all risk factors in those 35 years was still 56%, with inadequate physical activity accounting for the majority of it (12) .

People who belong to specific ethnic groups have an increased risk of stroke. Stroke is more common in African Americans than in any other ethnic or racial group in the United States, including in middle-aged adults and children. According to studies, the age-adjusted stroke rate is around two times higher in Hispanic and African Americans as it is in Caucasians (13). Age is one of the non-modifiable risk factors of stroke. Because the prevalence of stroke is strongly impacted by age, with incidence doubling every decade after the age of 50, the aging population will have a significant effect on stroke epidemiological data, with a predicted rise in the number of senior stroke patients (14). According to recent research, young women aged 18 to 45 are at a greater risk of ischemic stroke than men of the same age. Findings of a systematic review conducted in 2022 revealed that overall, women aged 35 years had 44% more ischemic strokes as compared to men. This disparity closes in young people aged 35 to 45, and there is conflicting information as to whether men or women are more likely to have ischemic strokes in this age group (15).

When compared to the general population, those with diabetes have 1.5–3 times higher risk of strokes and have higher death rates. Proatherogenic risk factors, such as excessive fat accumulation in arteries, hypertension, and hyperglycaemia, are the primary cause of metabolic abnormalities. These risk factors also have a 1.5-fold greater risk of stroke. Atherosclerotic alterations within extracranial and intracranial vessels are generated by the cells' insulin resistance and hyperinsulinemia, which leads to diabetes, rather than by high glucose levels or other risk factors (16). According to data from 30 research studies, hypertension is a major risk factor for stroke, with hypertension being reported in roughly 64% of stroke patients. Patients with stroke in low-income

countries have a lower reported prevalence of risk factors, yet also have the highest in-hospital death rates, which is likely attributable to delays in seeking acute stroke care, disparities in health system responsiveness, and acute stroke management. As a result, managing blood pressure in stroke patients is difficult and necessitates a specific diagnostic and therapeutic goal formulation (17).

Medical interventions that have been demonstrated in numerous randomized trials can significantly lower the risk of stroke. Observational research clearly suggests that healthy eating habits, quitting smoking and abstaining from excessive alcohol consumption, regular physical activity, and maintaining a normal body weight are all helpful for stroke prevention. However, the key difficulty that always remain a challenge is education and awareness of the public about the benefits of a healthy lifestyle and diet, as smoking and some food habits may be classified as addictions. As a result, formation and conduction of formal rehabilitation programs may be necessary in many cases (18). According to studies, modifiable risk factors account for 90% of strokes, and excellent risk factor control and/or elimination can avoid 80% of recurrent strokes. The majority of stroke risk factors can be changed. Treatment of hypertension, diabetes, and excessive cholesterol with drugs and lifestyle changes should be part of secondary stroke prevention measures. Adherence to medications, cessation of smoking, limiting alcohol intake, keeping a healthy weight, following a healthy nutrition, and participating in physical activity are all examples of lifestyle modifications after a stroke. These therapies, when combined, can have a considerable impact on reducing the risk of recurrent stroke (19).

Recurrent stroke, myocardial infarction, and vascular mortality are all substantial risks for stroke survivors. Because many recurring episodes occur early after stroke, prophylaxis of these incidents should begin as soon as possible after the stroke and should be customized to the precise etiology of the stroke, which may necessitate specific treatment. All stroke patients should follow lifestyle recommendations such as quitting smoking, exercising regularly, eating a Mediterranean-style diet, and limiting salt and alcohol consumption (20). For primordial prevention, effective tobacco control, adequate nutrition, and the growth of healthy populations are important strategies, whereas polypill approaches as well as salt reduction and other dietary interventions, are effective in primary stroke prevention. Through monitoring and surveillance and registries, such

as the world health organizations' non-communicable diseases programs, effective teamwork and co-operation among various health-care sectors, government policies, and campaigns can successfully execute secondary prevention methods throughout high-income and low-income nations (21).

All healthcare workers have a role to play in stroke prevention. Risk of stroke can be reduced by educating the patient about modifiable risk factors. The patient must understand the significance of blood pressure control as well as blood sugar control. Maintaining a healthy body weight and engaging in regular exercise should be stressed even more. Simultaneously, a dietician should be engaged to advise the patient on diet and alcohol abstinence. There is no single approach for preventing stroke, but rather a collection of risk factors that must all be addressed at the same time. Finally, the patient should be referred to physical therapy or encouraged to join an exercise program because losing weight can significantly improve diabetes, hypertension, and stroke control. Stroke risk can be reduced with the support of an interprofessional team (22).

In order to facilitate services for preventative stroke treatments and acute stroke care, community awareness of stroke risk factors and symptoms must be improved. Initiatives to raise public awareness have resulted in a greater awareness of warning indicators, but not a significant improvement in risk factor recognition. Community stroke screenings are a typical technique for improving stroke identification and risk factors, but their effectiveness in modifying health behaviors is questionable (23). Stroke is unfortunately linked to a high rate of mortality and disability. As a result, stroke prophylaxis should begin as soon as possible. Individuals who are at high risk for stroke can be identified early by screening the community for risk factors and doing a health evaluation. This would not only lower the percentage of fatalities and disabilities, but it will also alleviate the financial burden on families and society as a whole. As a result, it's critical to look into the major risk factors for stroke and high-risk populations in order to develop prevention and health-management strategies (24). Findings of an Indonesian study revealed that clinicians do not routinely screen healthy patients for stroke risk factors, but that their appearance , type of complaint, or other present risk factors may elicit a screening (25). There is also scarcity in literature regarding the screening and prevention studies of stroke in recent times. In future more research studies should be carried out on screening of risk factors

among healthy as well as stroke population to generate better prevention strategies.

Conclusion

The assessment of modifiable lifestyle factors is an important part of stroke prevention. Given the rising number of elderly persons at risk of stroke, it is becoming more critical to find lifestyle choices and societal factors that can help minimize risk. Isolation and a lack of community support for participating in healthy practices raise risk levels. It is feasible to prevent or postpone stroke in healthy population by addressing modifiable risk factors, and to lessen the burden of stroke in those who have already had one. Education, awareness as well as screening for risk factors of stroke among public is need of time.

Disclosure

Statement:

The authors declare no conflict of interest.

Funding:

No fund.

Ethical consideration:

Non applicable.

Data availability

Data that support the findings of this study are embedded within the manuscript.

Authors' contribution:

All authors contributed equally to the drafting, writing, sourcing, article screening and final proofreading of the manuscript.

References

1. Khaku AS TP. Cerebrovascular Disease. In: StatPearls [Internet] Treasure Island (FL): StatPearls Publishing; 2022 Jan. 2021.

2. Tadi P LF. Acute Stroke. In: StatPearls [Internet] Treasure Island (FL): StatPearls Publishing; 2022 Jan. 2021.

3. Shakir R. The struggle for stroke reclassification. Nature reviews Neurology. 2018;14(8):447-8.

4. Kuriakose D, Xiao Z. Pathophysiology and Treatment of Stroke: Present Status and Future Perspectives. Int J Mol Sci. 2020;21(20).

5. Hankey GJ. Stroke. Lancet. 2017;389(10069):641-54.

6. Roger VL, Go AS, Lloyd-Jones DM, Adams RJ, Berry JD, Brown TM, et al. Heart disease and stroke statistics--2011 update: a report from the American Heart Association. Circulation. 2011;123(4):e18-e209.

7. Global, regional, and national burden of stroke, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. The Lancet Neurology. 2019;18(5):439-58.

8. Choudhury MS, Chowdhury M, Nayeem A, Jahan W. Modifiable and Non-Modifiable Risk Factors of Stroke: A Review Update. Journal of National Institute of Neurosciences Bangladesh. 2015;1:22.

9. Li F, Chen Y, Hong L, Zhu B, Chen D, Qin X, et al. Effect of stroke screening survey on intravenous thrombolysis and long-term outcomes in acute ischemic stroke patients: the real- world evidence from Shanghai, China. Annals of Translational Medicine. 2021;9(17):1363.

10. Di Legge S, Koch G, Diomedi M, Stanzione P, Sallustio F. Stroke Prevention: Managing Modifiable Risk Factors. Stroke Research and Treatment. 2012;2012:391538.

11. Boehme AK, Esenwa C, Elkind MS. Stroke Risk Factors, Genetics, and Prevention. Circulation research. 2017;120(3):472-95.

12. Aigner A, Grittner U, Rolfs A, Norrving B, Siegerink B, Busch MA. Contribution of Established Stroke Risk Factors to the Burden of Stroke in Young Adults. Stroke. 2017;48(7):1744-51.

13. Alharbi AS, Alhayan MS, Alnami SK, Traad RS, Aldawsari MA, Alharbi SA, et al. Epidemiology and Risk Factors of Stroke. Archives of Pharmacy Practice. 2019;10(4).

14. Béjot Y, Bailly H, Graber M, Garnier L, Laville A, Dubourget L, et al. Impact of the Ageing Population on the Burden of Stroke: The Dijon Stroke Registry. Neuroepidemiology. 2019;52(1-2):78-85.

15. Leppert MH, Burke JF, Lisabeth LD, Madsen TE, Kleindorfer DO, Sillau S, et al. Systematic Review of Sex Differences in Ischemic Strokes Among Young Adults: Are Young Women Disproportionately at Risk? Stroke. 2022;53(2):319-27.

16. Alloubani A, Saleh A, Abdelhafiz I. Hypertension and diabetes mellitus as a predictive risk factors for stroke. Diabetes & metabolic syndrome. 2018;12(4):577-84.

17. Wajngarten M, Silva GS. Hypertension and Stroke: Update on Treatment. European cardiology. 2019;14(2):111-5.

18. Sarikaya H, Ferro J, Arnold M. Stroke Prevention - Medical and Lifestyle Measures. European Neurology. 2015;73(3-4):150-7.

19. Prabhakaran S, Chong JY. Risk factor management for stroke prevention. Continuum (Minneapolis, Minn). 2014;20(2 Cerebrovascular Disease):296-308.

20. Isabel C, Calvet D, Mas JL. Stroke prevention. Presse medicale (Paris, France : 1983). 2016;45(12 Pt 2):e457-e71.

21. Pandian JD, Gall SL, Kate MP, Silva GS, Akinyemi RO, Ovbiagele BI, et al. Prevention of stroke: a global perspective. Lancet. 2018;392(10154):1269-78.

22. Sabih A TP, Kumar A. Stroke Prevention. StatPearls NCBI. 2021.

23. DeLemos CD, Atkinson RP, Croopnick SL, Wentworth DA, Akins PT. How Effective Are Community Stroke Screening Programs at Improving Stroke Knowledge and Prevention Practices? Stroke. 2003;34(12):e247-e9.

24. Wang YS, Liu B, Jiang Y, Liu ZH, Yao H. Stroke screening and health-related physical fitness testing in medical staff members in Urumqi, China. Chronic diseases and translational medicine. 2017;3(2):129-34.

25. Williams PA, Prabandari YS, LaBresh KA. Understanding physicians' perceived barriers to screening and patient education to reduce stroke risk in community health centers in Indonesia. Journal of Communication in Healthcare. 2015;8(2):143-50.