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Systematic Review

A Systematic Review (Before 01 January 2025) on Oat Consumption to Reduce Stroke Risk

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Abstract

Oats has rich nutritional profile and potential health benefits, such as reducing blood pressure and cholesterol level - both of which are risk factors in stroke. Hence, it is conceivable that regular consumption of oats may help to reduce risk of stroke. However, there has been no systematic review to linking oat consumption to reduced stroke risk. Therefore, this systematic review examines whether oat consumption can reduce stroke risk using studies indexed in PubMed prior to 01 January 2025. 173 studies were identified and 9 were included; of which, 4 supporting the notion that oat consumption can reduce stroke risk while 5 do not support. Of the 5 studies that do not support, 4 studies show no evidence that oat consumption increase stroke risk, except an early study. This suggests that oat consumption potentially can reduce stroke risk.

Keywords: Oats; Oats Consumption; Beta-Glucan; Phytochemicals; Cerebrovascular Accident; Cerebrovascular Insult; Brain Attack; Stroke; Hyperglycaemia; Hypercholesterolemia; Hypertension

Introduction

Oats is one of the oldest crops known to human civilization [1]. Over the years, increasing number of individuals consumed oats due to its potential benefits from its bioactive compounds, such as beta-glucan. Beta-glucan is water-soluble and high viscous in the human colon [2], immune to digestion and absorption in the small intestine [3], and is a potential gut microbiome modulator [4]. In addition, oats also supplies the body with good quality protein [5] where it is available in four different types, albumin, globulins, prolamins and glutelin while at the same time being low in cost [3]. Some of the micronutrients that oats have to offer are vitamin E, folates, zinc, manganese, iron, selenium, choline, betaine, sulphur, carotenoids, and many phytochemicals [3].

Stroke has two main variants [6] - ischemic and haemorrhagic. Common risk factors of stroke [7] are hypertension and hypercholesterolemia; and oat consumption has been suggested to improve hypertension [8] and hypercholesterolemia [9]. Hence, it is plausible to conceive that regular consumption of oats may help to reduce risk of stroke. However, there has been no systematic review to date examining regular oat consumption may reduce stroke risk. Therefore, this systematic review examines whether oat consumption can reduce stroke risk. Eight of the nine included studies either show that oat consumption can reduce stroke risk or are neutral, except an earlier study suggesting oat consumption increases stroke risk.

Method

A PubMed search was conducted for existing studies published before 01 January 2025 on the relationship of oat consumption and stroke prevention. The search term, (oats OR oat OR oatmeal AND "cerebrovascular accident" OR "cerebrovascular insult" OR "brain attack" OR stroke), was used with the following URL: https://pubmed.ncbi.nlm.nih.gov/?term=(oat+OR+oats+OR+oatmeal)+AND+("cerebrovascular+accident"+OR+"cerebrovascular+insult"+OR+"brain+attack"+OR+stroke)&filter=dates.1000/1/1--2024/12/31. The following exclusion criteria were used [10-13]: (A) non-full text, (B) non-English, (C) non-primary article, (D) articles not about oat(s) or stroke, and (E) articles not about oat consumption.

Results and Discussion

A total of 173 studies were identified from PubMed search. Ten studies were included after screening through the PRISMA exclusion criteria (Figure 1) [10-13]. Of which, 4 studies support that oat consumption reduces stroke risks [14-17] while 5 studies do not support [18-22].

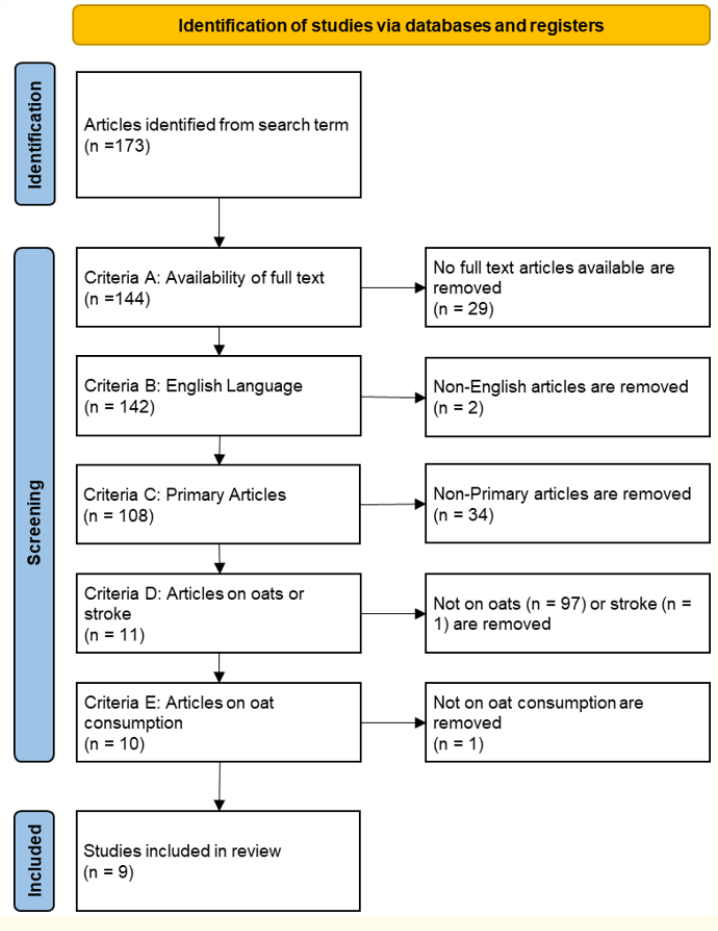

Figure 1: PRISMA Flowchart.

Oat consumption reduces stroke risk

Several studies suggest that oats are beneficial in reducing stroke risk due to the benefits that oats have to offer [14-17]. A Danish cohort study [15] examines whether a Healthy Nordic Diet (HND), which included grains like oats, can lower the risk of stroke. HND encourages eating whole foods like whole grains, fruits, vegetables fatty fish, legumes, low-fat dairy etc [23], which can help in improving blood lipid profile and insulin sensitivity and lowers blood pressure and body weight in hypercholesterolemic subjects. 55,338 participants took part in this study [15] and followed HND regularly (median follow up of 13.5 years). Participants with higher adherence to the HND had a lower risk of stroke by 14% and 32% reduced risk of ischemic stroke compared to those who had low adherence. A study [17] shows that introducing three portions of whole grain foods including oats daily could result in a significant reduction in systolic blood pressure by 6 mmHg and pulse pressure by 3 mmHg, and estimates a reduction of stroke occurrence by almost 25%. In terms of older adults, two studies found significant reduction of stroke risk with oat consumption [14,16]. A study on 142,000 participants [14] found significant inverse association between oat cereal consumption and stroke risk in individuals who are aged 80 years and older, as older adults who consumed oats had lower odds ratio (OR = 0.79, 95% CI: 0.69-0.90) of getting a stroke compared to those who do not consume any oats. Another Danish study [16] followed 55,095 individuals who are aged 50 to 64 within a 13.4-year period and showed that by replacing white bread or eggs for just one serving of oatmeal per week could lower the risk of total stroke, ischemic stroke and haemorrhagic stroke [16]. For instance, replacing eggs with oatmeal reduced the risk of total haemorrhagic stroke by 6% and ischemic stroke due to small-artery occlusion by 5%, which emphasizes the importance of oatmeal as a part of a healthy diet.

Beta-glucan from oats is heat stable [24] and soluble, which is responsible for the possible influence of cholesterol metabolism [25] by discouraging the intestinal uptake of dietary cholesterol and the re-absorption of bile acids [26], which increases the synthesis of bile acids from cholesterol leading to reduced circulating LDL cholesterol levels [27]. The viscosity of beta-glucan also plays a part in the reduced levels of glucose and insulin responses after a meal [28]; thereby, helping patients who has diabetes mellitus [29]. It has also been shown to regulate blood pressure [30] as elevated intraluminal pressure causes significant changes in the function of the endothelium and smooth muscle in the intracerebral arteries by increasing endothelial permeability, leading to disruption of the blood-brain barrier and the development of local or multifocal brain edema [31]. Additionally, hypertension accelerates atherosclerosis, raising the risk of cerebral lesions caused by stenosis and embolism originating from large extracranial vessels, the aortic arch, and the heart [31]. Systolic blood pressure has better prediction of the risk of stroke compared to diastolic blood pressure at high levels of blood pressure [32] and with lowering just 10 mmHg of systolic blood pressure may reduce stroke incidence reduction by 41% [33]. Moreover, individuals who suffer from celiac disease may be able to tolerate oats due to the low content of prolamin compared to rye, wheat and barley [34].

Oats are also high in bioactive compounds; like phenolic acids and polyphenols, which contains antioxidant and anti-inflammatory properties; to help protect blood vessels and reduce the risk of stroke [35]. Polyphenols is a product of plant metabolism which has benefits like protecting organisms from damage from ultraviolet radiation and pathogens [36], and protective against cardiovascular diseases and diabetes [37], which are associated with the risk of getting a stroke. A individual with diabetes is at higher risk for both ischemic and haemorrhagic stroke [38], and individuals with diabetes is more prone of getting another stroke compared to individuals who do not have diabetes [39]. A meta-analysis shows that the increased intake of oat beta-glucan from 2.5 to 3.5g/day for 3-8 weeks in Type 2 Diabetes Mellitus improved glycaemic control with lowered fasting plasma glucose and glycosylated haemoglobin concentration [40]. The importance of dietary polyphenols can be seen in the "French paradox" [41] where French consumes high amounts of saturated fatty acids, which is commonly associated with high mortality due to coronary heart disease, but studies showed otherwise [42]. This is potentially due to high consumption of red wine which is rich in polyphenols.

Oat consumption does not reduce stroke risk

However, there are several studies that did not show that oat consumption reduces stroke risk [18-22]. An early study by Seely [19] finds a positive correlation relationship in the plant-based protein (including oats) to an increased risk of stroke and mortality, specifically in younger populations. However, this study does not appear to be well-received and only cited once to-date [43]. A study [18] examining oat fibre intake on reducing the risk of adverse cardiovascular events among 716 patients with coronary artery disease (CAD) after coronary interventions show that the in-

cidence of stroke in oat fibre consumers was not significantly different from those who did not consume oats (p-value = 0.47). This is potentially due to small sample size as only four strokes were recorded during the follow up. Another study [20] investigates the impact of the Portfolio Diet, a plant-based dietary pattern, on cardiovascular disease outcomes which includes coronary heart disease, heart failure and stroke. Even though the diet is recognised for its benefits in lowering low-density lipoprotein cholesterol and other cardiovascular disease risk factors [44], the study showed that there no significant association between the adherence to the Portfolio Diet and a reduced risk of stroke. A study [21] investigates the adherence to HND and find no protective effect on stroke risk or other cardiovascular outcomes. This is potentially due to low consumption of oats as more than half of the cohort reported that they did not take any form of oatmeal and their median intake levels were nearly zero grams per day. Due to this low level of consumption, it had likely limited the potential impact of oats and its effects on cardiovascular outcomes which includes stroke. A study examines the data of two large cohort studies, the Nurses' Health Study (NHS) and the Health Professionals Follow-Up Study (HPFS), and finds no significant association between total whole grain intake which includes oats and a reduced risk of ischemic stroke [22]. Although whole grain foods such as bran and whole grain cold breakfast cereals show potential negative correlation with ischemic stroke, other whole grains foods such as oatmeal failed to show a statistically protective function [22]. Taken together, 4 [18,20-22] of the 5 studies showing that oat consumption does not reduce stroke risk also do not show that oat consumption increases stroke risk, except for Seely [19].

Conclusion

Oat consumption can potentially reduce stroke risk through the reduction of risk factors; such as hypertension, hyperglycaemia, and hypercholesterolemia.

Supplementary Materials

Supplementary materials can be downloaded from https://bit.ly/Oats_Stroke_SR.

Conflict of Interest

The authors declare no conflict of interest.

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