Review Article

Black Pepper: It's health benefits

ABSTRACT :

Black pepper having a scientific name of*'piper nigrum'*is an unripe fruit of peppercorn which is dried, it is a flavour enhancer in food, besides also has health benefits, it contains bioactive compound piperine which adds a pungent taste to it being an antioxidant it reduces risk of various life threatening illnesses (atherosclerosis, cardiovascular disease and neurological conditions) and also increases bioavailability of various nutrients, piperine at any given dose weakens memory impairment, in low dose piperine potentially increases neuronal density in hippocampus. Black pepper boosts HCL in stomach and has antispasmodic properties. Active compounds present play a significance in stimulating leucocytes increasing immunity against various pathogens. It is given along with iron supplements to improve its bioavailability without any adverse reaction. Piper Nigrum given in significant amount enhances learning and memory inadequacy related to AlCl, also exhibits anticholinesterase activity preventing nerve degeneration. In the ongoing COVID scenario biologically active compounds in piper nigrum: piperdardiine and piperanine are markedly effective against COVID- 19, hence is preferred as a medication. Black pepper rectifies the lipid profile, along with degree of total cholesterol, LDL and triglyceride in patients with cardiovascular diseases, piper nigrum being prosperous in having constituents of vanadium in it contributes in boosting and recovering fron cardiac function after a myocardial infarction and dealing with pressure overload–induced hypertrophy by inhibiting protein tyrosine phosphatases. Piper nigrum can boost melanocyte proliferation and bring back pigmentation to depigmented skin, therefore this could possibly be the treatment for vitiligo. Alkaloid constituent of black pepper, bring to bear anticancer properties in a wide range of malignancies.

KEYWORDS: Black pepper, piper nigrum, piperine, antioxidant, health, pharmaceutical drug, spices, medicinal properties.

INTRODUCTION :

Black pepper is a term that is derived from pippali which is a traditional hindi word, prior was also referred to as black gold. It is considered to probably have the prolonged history as a pursued zest, because of its capacity to season food sources, go about as an additive, and put in warmth to a recipe. Black provides offers a scope of medical advantages not withstanding its taste-improving properties.

Black pepper is local to Kerala, Goa, and Karnataka which are located along the Malabar Coast in southwest India, in the backwoods a location in the tropics. This zest is the unripe organic product which is then dried. —the peppercorn — of the following plant, which comes in a variety of shades depending on when it is harvested. The most well-known pepper is black pepper. To obtain black pepper, select peppercorns that are nearly ready and allow them to dry until they are black.(1)

Their smell is infiltrating and fragrant it has a spicy, stinging flavour, and extremely impactful. Ground black pepper contains up to 3% essential oil, which has the sweet scent of Capsicum peppers but not the pungency.. The trademark flavour is basically gotten from the synthetic piperine, however the seeds additionally contain chavicine, piperidine, and piperettine

Something beyond a food flavour enhancer, black pepper offers medical advantages on account of its bioequivalentcombinations, where piperine is considered to be the most noteworthy. Piperineshows presence of adistinctive organic compound that imparts dark pepper its sharp flavour. It is additionally the fundamental part thatimparts black pepper its wellbeing boosting nature.

Piperineis viewed as a kind of cancer prevention agent that assists with bringing down the danger of ongoing ailments like aterosclerosis, CVS infection, and CNS disorders. The given substance positively affects supplement bioavailability too. At the point when you season your food with black pepper, you increment the measure of supplements ingested within your circulatory system.

STRUCTURE OF PIPERINE: (2)

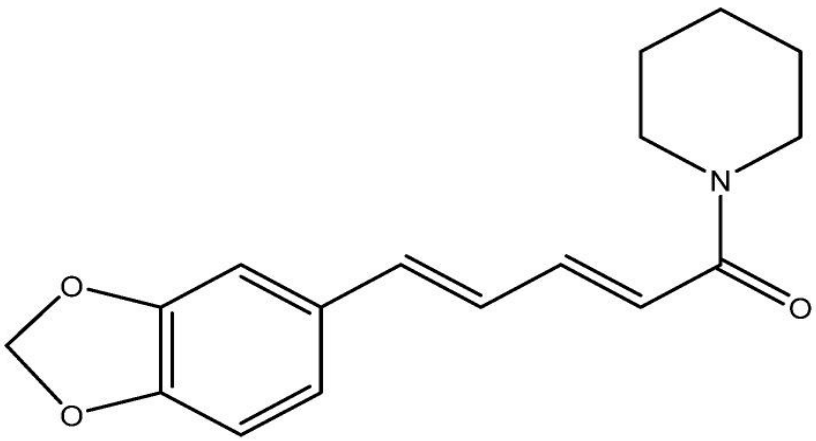

Fig. 1. Chemical structure

OBJECTIVE:

To review the health advantages of piper nigrum and its medicinal use in a variety of disorders. It primarily focuses on the following ailments: atherosclerosis, covid, neurological disorders, vitiligo, cancer, and numerous microorganism-related diseases.

BLACK PEPPER:

Black pepper has few uses, for example, it helps in relief from discomfort, stiffness, chills, influenza, colds, solid throbs and fever. It has antimicrobial, antimutagenic, cell reinforcement and radical scavenging proper and inward breath of dark pepper oil increment the reflexive gulping development. Black pepper assists with stimulating In order to efficiently digest and absorb the nutrients you eat, you need hydrochloric acid in your stomach. It has a carminative effect as well, which can assist to lessen uneasiness and acid indigestion development in one's digestion tracts. It's critical to have a healthy immune system to help you avoid getting sick, in addition, black pepper can aid. White blood cells, employeedto protect against invading germs and illnesses, are boosted by the active components in this supplement. This impactful spice contains an assortment of dynamic mixtures, explicitly oleoresins and alkaloids like piperine and chavicine. It likewise has cancer prevention agents, flavonoids, fundamental oil, and other phenolic intensifies that assist with securing your phones and lift stomach related wellbeing.(1)

Pipernigrum is additionally a wellspring of the accompanying nutrients and minerals:

vit C, vit K, vit E, vit A, vit B(1), vit B(2), vit B(5), Vit B(6), Mn, Cu, Fe, Ca, P, K, Se, Zn, Cr.(1)

Manganese, an essential mineral for bone health, wound healing, and metabolism, is abundant in black pepper. One teaspoon of black pepper contains 16 percent of your recommended daily allowance (RDA) manganese and 6% of your recommended daily allowance vitamin K (RDA). Piper nigrum is a decent wellspring of manganese, a mineral that can assist with bone wellbeing, wound mending, and digestion. Truth be told, one teaspoon of dark pepper offers 16% of your recommended daily allowance (RDA) of manganese and 6 percent of your recommended daily allowance (RDA) of nutrient K .(1)

BLACK PEPPER FOR PREVENTION AND TREATMENT OF CANCER:

Spices inhibited carcinogenesis, proliferation, invasion, metastasis, and migration by producing apoptosis, cell death, and DNA damage, generating G2/M arrest, and inducing apoptosis, cell death, and DNA damage. Spices' anticancer abilities against breast and prostate cancer are also linked to the regulation of hormones or hormone receptors, such as oestrogen and androgen receptors.(2)

By inducing caspase-3 and PARP cleavage, piperine inhibits cell growth and activates apoptosis. Piperine inhibited EGF-induced MMP-9 articulation by interfering with ERK1/2 and p38 MAPK, resulting in a decrease in relocation.(3)

Piperine inhibits the growth of LNCaP, PC-3, 22RV1, and DU-145 prostate cancer cells. Piperine-modulated ROS triggers DNA damage and Chk1 activation, resulting in G1 cell cycle arrest and death in melanoma cells.(2)

Angiogenesis assumes a significant part in cancer movement. Piperine, a significant alkaloid constituent of dark pepper, has different physiological activities including killing of

malignant growth cells; be that as it may, the impact of piperine on angiogenesis isn't known. Piperine repressed the expansion and G1/S change of human umbilical vein endothelial cells (HUVECs) without causing cell passing. Piperine likewise restrained HUVEC relocation and tubule development in vitro, just as collagen-instigated angiogenic movement.(4)

BLACK PEPPER FOR HEALTHY HEART AND ATHEROSCLEROSIS:

Black pepper has been shown to have an effect on lipid digestion, mostly through the mobilisation of unsaturated lipids.. The levels of cholesterol, free unsaturated fats, phospholipids, and fatty compounds all decrease when piperineis consumed. As measured in the plasma, black pepper supplementation increases the concentration of high density lipoprotein-cholesterol (HDL-c) while decreasing the concentrations of low density lipoprotein-cholesterol (LDL-c) and very low density lipoprotein-cholesterol (VLDL-c).(5)

Piperine inhibits ABCA-1 debasement in THP-1 macrophages, allowing it to increase ABCA1 articulation and enhance cholesterol efflux. Pepper has anti-atherosclerotic effects by regulating lipid digestion, inhibiting ROS production, and slowing the rate of VSMC development by masking MAPK signalling.(6)

BLACK PEPPER: POTENTIAL ANTIVIRAL PREVENTIVES AND IMMUNITY BOOSTERS DURING COVID- 19:

The SARS coronavirus causes a rare type of infectious pneumonia known as severe acute respiratory syndrome. At the moment, the entire world is attempting to tackle the coronavirus sickness, and scientists are working tirelessly to find vaccines. SARS-CoV-2, on the other hand, has just a few specialised medical treatments. We can enhance our immunity with natural items in addition to other public health measures made to prevent this infection.(7)

Because of the increased content of alkaloids in the chloroform extract, Piper nigrum has a stronger antiviral effect. In comparison to commercial antiviral Ribavirin, piperinehas been found to inhibit methyltransferase of Dengue infection and VP35 interferon inhibitory space of Ebola infection.Piperdardiine and piperanine, two bioactive combinations derived from black pepper, are highly effective against COVID19 and can be used to treat it.(7)

PREVENTIVE ROLE OF BLACK PEPPER IN NEURODEGENERATIVE DISEASES:

Neurodegenerative illnesses are typically classified as problems involving the loss of neurons. Ordinary, as well as more recent compounds, have been tested, however they only provide speculative benefits with a plethora of negative effects.The discovery of more compelling particles capable of terminating the pathophysiology of these infections will be regarded as a modern marvel. Although a few synthetic substances are available, they may induce a variety of additional medical issues. Consequently, normal particles from the plants and various sources are being found to supplant accessible medications.(8)

Snake venom activities are inhibited by the ethanolic concentrate of Piper longum organic products, as neurotoxins present in snake venom have dangerous consequences for the central nervous system.Piperine has been shown in studies to reduce memory impedance in all measurements..(9)

THERAPEUTIC EFFICACY OF PIPERINE IN EPILEPSY –

By raising the cortical and hippocampal serotonin and GABA levels, piperine alters the synapse frameworks (serotonin, GABA, Norepinephrine) and delays tonic-clonic seizures.(10)Dysfunctions of GABA receptors have been suggested as a possible cause of epilepsy.(8)Electrophysiological investigations identified the fundamental instrument via which PIP fills in as an adversary of convulsive specialist as a result of its power to antagonise sodium/calcium channel.(10)

THERAPEUTIC EFFICACY OF PIPERINE IN ALZHEIMERS DISEASE -

PIP promotes intellectual advancement by inhibiting AChE and -secretase proteins. Piperineis thought to be able to pass the blood-brain barrier. The methanolic extract of Piper nigrum L. was found to be beneficial in increasing perception as well as lowering oxidative pressure in the A1-42 hippocampus. Piperine (20 mg/kg) given in composition with quercetin (20, 40, and 80 mg/kg) has recently been shown to strengthen the neuroprotective benefits of quercetin while simultaneously lowering the psychological deficiencies and oxidative pressure seen in alzheimer's disease.(8)

The normalized concentrate of piper nigrum essentially further developed learning and memory shortages related with aluminum chloride and furthermore showed the anticholinesterase movement with avoidance of nerve degeneration. Further, PN eased the neuropsychological indications related with alzheimer’s disease. The helpful impact saw with piper nigrumcan be credited to its anticholiesterase and hostile to oxidant action and its inhibitory instrument for the arrangement of amyloidal plaque and oligomerisation of tau protein. In this way, black pepper can be utilized as preventive measure to decrease the episode of alzheimer's disease.(11)

THERAPEUTIC EFFICACY OF PIPERINE IN PARKINSON’S DISEASE –

It has been accounted for that piperine can hinder MAO B catalyst which thusly improve the DA level. Piperine likewise applies influential stimulant activity which is useful if there should be an occurrence of parkinson’s disease.(8) Studies uncovered that piperine has the adequacy to work on the synergism and equilibrium in 6-OHDA initiated parkinsonian rodents. Besides, it has the strength to reduce provocative markers, interleukin-1β (IL-1β) and growth corruption factor-α (TNF-α) in Parkinson's rats which are 6-OHDA-incited.(12)

VITILIGO TREATMENTS USING BIOACTIVE COMPOUNDS FROM PIPER NIGRUM:

Vitiligo is a skin condition in which the skin’s normal pigmentation is lost.(13) It can happen at any stage of life and there isn’t a difference between the pervasiveness as per sex, skin type or race. The influenced skin can lighten or turn completely white.(14)

Piper Nigrum, quite possibly the most generally utilized flavour in the world, has additionally been utilized as medication for quite a long time. Lately the special pharmacological activities of these plants have been investigated.

As indicated by ongoing investigations, piper nigrumhas the ability to induce melanocyte replication and restore shading to depigmented skin, along these lines this could be a likely treatment for vitiligo.(15)

PHARMACEUTICAL PERSPECTIVE OF BLACK PEPPER AS ALTERNATIVE ANTIMICROBIAL REMEDY:

Pepper nigrum set up to have a few helpful assets and is a kind of significant Ayurvedic constituent which has remedies for cough, cold, asthma, and sinusitis issues. It has

antibacterial characteristics, and its antibacterial and antifungal properties have been investigated in labs by various specialists. The antibacterial movement of piper nigrum was tried by agar well dispersion strategy and fungicidal action by poisoned food method.(16)The rough piperine removes from piper nigrum exhibited most extreme antibacterial movement in contrast to multidrug safe gram-positive microorganisms, Staphylococcus aureus (DIZ-18 mm) and antifungal action toward Fusariumoxysporum (DIZ-14 mm). Pepper delivered impressively higher antibacterial action against Staphylococcus aureus (MIC-100 μg/mL) contrasted with other gram-negative microorganisms. Ethanol concentrate of pepper seeds showed antibacterial movement in opposition to every one of the tried microbes.(17)

BLACK PEPPER AS A BIOAVAILABILITY ENHANCER:

Piperine has a minimal toxicity risk, isn't genotoxic and doesn't showcase any critical unfavourable impacts on inside viscera, bodyweight, haemoglobin levels, absolute serum proteins, albumin, cholesterol, lipids, and nitrogen. The different clinical properties and beneficial safety profiles of piperine work as a medicational use, as a nutritive and wellbeing supplement.(18) Thus, BioPerine capsules, which are commercially accessible black pepper extract are used as a supplement to one's diet, and defined up to 15 ppm as a food ingredient. (19)

Bioperinehas been directed accompanied by nutrients, minerals, and a few supplements as a bioavailability enhancer. The warmth impact is an appearance of the organic movement of the piperine contained in the piper nigrum. Bioperine, a normalized concentrate of Black pepper L. constituting of 95% piperine as 1-piperopiperidine, invigorates thermogenic activity in the epithelial cells of the small digestive tract. This goes about as a thermonutrient that considers high assimilation and bioavailability of the supplements.(20)

Piperine improves nutritional absorption through a number of methods, including enhanced micelle production and changes in epithelial cell membranes due to piperine's inclination for fatty compounds. This alteration in membrane lipid dynamics, together with a change in the structure of enzymes in the colon, would assist in Fe absorption.These findings provides us with knowledge that piperine modifies membrane structure by reaping the benefits of its apolar character, which allows it to interact with nearby lipids and hydrophobic portions of proteins.All of these interactions maybe able to overcome membrane lipids steric barrier to proteins, allowing enzyme production to be modulated.(19)

Moreover, in the presence of piperine, ultrastructural investigations using electronic scanning microscopy demonstrated a rise in the size of microvilli. Piperineis thought to promote the permeability of intestinal mucosa, increasing the permeability of their epithelial barrier. Piperine can also cause the creation of cytoskeleton-related proteins that cause the small intestine's uptake area to rise.(19)

PIPERINE ALTERS ANTICOAGULATION OF WARFARIN:

Due to its efficacy and low cost, warfarin is one of the most commonly prescribed anticoagulants. However, because to its strong protein binding and large interindividual variability, its famed drug–drug and drug–food interaction profile poses a difficulty in dosage regimen and safety. Piperinehas also been shown to interact with a variety of drugs at various levels, but its impact on the pharmacokinetics and pharmacodynamics of warfarin has yet to be investigated.Piperine has been shown to affect the bioavailability of a variety of drugs by altering their absorption, resulting in increased plasma levels for some and decreased plasma levels for others.(21-25)

Piperine perhaps can be a strong prohibitor of cytochrome P450 metabolism of warfarin in vivo and, may lessen the plasma concentration and anticoagulation of warfarin.The net consequence of different alterations in pharmacodynamic and pharmacokinetic parameters is a modification in warfarin's anticoagulant action when co-administered with piperine.(21)

CONCLUSION:

Black pepper (Piper Nigrum L.) is a significant good food inferable from its cell reinforcement, antimicrobial potential and gastro-defensive modules. Black pepper, with piperine as a functioning ingredient which acts as a bioavailability enhancer, has antimicrobial activities, it helps in relief from discomfort, stiffness, chills, influenza, colds, solid throbs and fever, is used in treatment of vitiligo and is useful in preventing neurodegenerative diseases and diseases related to heart. Owing to its antiviral properties and its role of acting as an immunity booster it has a significant importance in the current covid scenario. Black pepper is considered as a kind of cancer prevention agent that assists with bringing down the danger of ongoing ailments like aterosclerosis, CVSinfection, and CNS conditions. This substance positively affects supplement bioavailability too. At the point when you season your food with black pepper, you increment the measure of supplements ingested within your circulatory system.

Indians have utilized these natural substances since ancient times, and they have given the Indian people immunity, which is likely the main cause for India's low death rate. Excessive use of spices and herbs, on the other hand, can cause in stomach acid reflux, heartburn, constipation, diarrhoea, ulcers in the mouth, high blood pressure, and other issues. As a result, additional research is needed into the bioactive components present in common Indian herbs and spices, as well as their efficacy and method of action against deadly viruses.

REFERENCES:

1. Black Pepper: Health Benefits, Nutrients per Serving, Preparation Information, and More [Internet]. [cited 2021 Aug 25]. Available from: https://www.webmd.com/diet/health-benefits-black-pepper

2. Zheng J, Zhou Y, Li Y, Xu D-P, Li S, Li H-B. Spices for Prevention and Treatment of Cancers. Nutrients. 2016 Aug 12;8(8):495.

3. Do MT, Kim HG, Choi JH, Khanal T, Park BH, Tran TP, et al. Antitumor efficacy of piperine in the treatment of human HER2-overexpressing breast cancer cells. Food Chem. 2013 Dec 1;141(3):2591–9.

4. Doucette CD, Hilchie AL, Liwski R, Hoskin DW. Piperine, a dietary phytochemical, inhibits angiogenesis. J Nutr Biochem. 2013 Jan;24(1):231–9.

5. Vasanthi HR, Parameswari RP. Indian spices for healthy heart - an overview. Curr Cardiol Rev. 2010 Nov;6(4):274–9.

6. Tsui P-F, Lin C-S, Ho L-J, Lai J-H. Spices and Atherosclerosis. Nutrients. 2018 Nov 10;10(11):1724.

7. Singh NA, Kumar P, Jyoti null, Kumar N. Spices and herbs: Potential antiviral preventives and immunity boosters during COVID-19. Phytother Res PTR. 2021 Jan 29;

8. Hussain G, Rasul A, Anwar H, Aziz N, Razzaq A, Wei W, et al. Role of Plant Derived Alkaloids and Their Mechanism in Neurodegenerative Disorders. Int J Biol Sci. 2018;14(3):341–57.

9. Hritcu L, Noumedem JA, Cioanca O, Hancianu M, Kuete V, Mihasan M. Methanolic extract of Piper nigrum fruits improves memory impairment by decreasing brain oxidative stress in amyloid beta(1-42) rat model of Alzheimer's disease. Cell Mol Neurobiol. 2014 Apr;34(3):437–49.

10. Mikkilineni S, Cantuti-Castelvetri I, Cahill CM, Balliedier A, Greig NH, Rogers JT. The anticholinesterase phenserine and its enantiomer posiphen as 5'untranslated-region-directed translation blockers of the Parkinson's alpha synuclein expression. Park Dis. 2012;2012:142372.

11. Subedee L, Suresh R, MK J, HL K, AM S, VH P. Preventive Role of Indian Black Pepper in Animal Models of Alzheimer's Disease. J Clin Diagn Res JCDR. 2015 Apr;9(4):FF01–4.

12. Rinwa P, Kumar A. Quercetin along with piperine prevents cognitive dysfunction, oxidative stress and neuro-inflammation associated with mouse model of chronic unpredictable stress. Arch Pharm Res. 2017 Oct;40(10):1166–75.

13. Gawkrodger DJ, Ormerod AD, Shaw L, Mauri-Sole I, Whitton ME, Watts MJ, et al. Guideline for the diagnosis and management of vitiligo. Br J Dermatol. 2008 Nov;159(5):1051–76.

14. Speeckaert R, van Geel N. Vitiligo: An Update on Pathophysiology and Treatment Options. Am J Clin Dermatol. 2017 Dec;18(6):733–44.

15. Mihăilă B, Dinică RM, Tatu AL, Buzia OD. New insights in vitiligo treatments using bioactive compounds from Piper nigrum. Exp Ther Med. 2019 Feb;17(2):1039–44.

16. Rani SKS, Saxena N. Antimicrobial Activity of Black Pepper (Piper nigrum L.). 2013;4.

17. D'Souza SP, Chavannavar SV, Kanchanashri B, Niveditha SB. Pharmaceutical Perspectives of Spices and Condiments as Alternative Antimicrobial Remedy. J Evid-Based Complement Altern Med. 2017 Oct;22(4):1002–10.

18. Db M, S S, Kr M. Role of Piperine as an Effective Bioenhancer in Drug Absorption. Pharm Anal Acta [Internet]. 2018 [cited 2021 Aug 29];09(07). Available from: https://www.omicsonline.org/open-access/role-of-piperine-as-an-effective-bioenhancer-in-drug-absorption-2153-2435-1000591-103719.html

19. Fernández-Lázaro D, Mielgo-Ayuso J, Córdova Martínez A, Seco-Calvo J. Iron and Physical Activity: Bioavailability Enhancers, Properties of Black Pepper (Bioperine®) and Potential Applications. Nutrients. 2020 Jun 24;12(6):1886.

20. Majeed: Bioperine® Nature's own thermonutrient®... - Google Scholar [Internet]. [cited 2021 Aug 29]. Available from: https://scholar.google.com/scholar?cluster=8575301553999572523&hl=en&as_sdt=2005&sciodt=0,5

21. Zayed A, Babaresh WM, Darweesh RS, El-Elimat T, Hawamdeh SS. Piperine Alters the Pharmacokinetics and Anticoagulation of Warfarin in Rats. J Exp Pharmacol. 2020 Jun 19;12:169–79.

22. Unnikrishnan, Bhaskaran, Priya Rathi, Renita Maria Sequeira, K. Kshama Rao, Swathi Kamath, and Maria K. K. Alfam. "Awareness and Uptake of Maternal and Child Health Benefit Schemes Among the Women Attending a District Hospital in Coastal South India." JOURNAL OF HEALTH MANAGEMENT 22, no. 1 (March 2020): 14–24. https://doi.org/10.1177/0972063420908371.

23. Abbafati, Cristiana, Kaja M. Abbas, Mohammad Abbasi, Mitra Abbasifard, Mohsen Abbasi-Kangevari, Hedayat Abbastabar, Foad Abd-Allah, et al. "Five Insights from the Global Burden of Disease Study 2019." LANCET 396, no. 10258 (October 17, 2020): 1135–59.

24. Abbafati, Cristiana, Kaja M. Abbas, Mohammad Abbasi, Mitra Abbasifard, Mohsen Abbasi-Kangevari, Hedayat Abbastabar, Foad Abd-Allah, et al. "Global Burden of 369 Diseases and Injuries in 204 Countries and Territories, 1990-2019: A Systematic Analysis for the Global Burden of Disease Study 2019." LANCET 396, no. 10258 (October 17, 2020): 1204–22.

25. Franklin, Richard Charles, Amy E. Peden, Erin B. Hamilton, Catherine Bisignano, Chris D. Castle, Zachary Dingels V, Simon Hay I, et al. "The Burden of Unintentional Drowning: Global, Regional and National Estimates of Mortality from the Global Burden of Disease 2017 Study." INJURY PREVENTION 26, no. SUPP_1, 1 (October 2020): 83–95. https://doi.org/10.1136/injuryprev-2019-043484.