International Journal of Science and Research Archive

eISSN: 2582-8185

Cross Ref DOI: 10.30574/ijsra

Journal homepage: https://ijsra.net/

(REVIEW ARTICLE)

Check for updates

Orthomolecular therapy for blocking the agonizing clinical course of Varicella-Zoster Virus (VZV) Infection

Oyindamola Olaniyi Oyesaga *

Department of Medical Research, Helium Integrative Medicine Centre Ltd, Victoria Island, Lagos, Nigeria.

International Journal of Science and Research Archive, 2024, 12(01), 2580–2585

Publication history: Received on 06 May 2024; revised on 15 June 2024; accepted on 18 June 2024

Article DOI: https://doi.org/10.30574/ijsra.2024.12.1.1100

Abstract

The two conditions, chickenpox (varicella) and shingles (zoster), are caused by a single virus; Varicella-Zoster Virus (VZV). Chickenpox is a mild, highly contagious disease, mainly of children. Shingles is a sporadic incapacitation disease of adults or immunocompromised individuals, and it is characterized by rash which is limited to the skin innervated by a single sensory ganglion. Varicella and zoster occur worldwide. Meanwhile, varicella is a common epidemic of childhood mostly under the age of 10 and it is highly communicable. For zoster, it occurs sporadically mainly in adults and without seasonal prevalence.

The varicella rash occurs approximately 2 weeks after respiratory infection and usually travels in multiple waves. In zoster, there is an acute inflammation of the sensory nerves and ganglia. Treatment of VZV is usually the symptomatic relief of symptoms. Topical calamine lotion may relieve pruritus and daily cleansing with warm water will help avoid secondary bacterial infection. In children, acyclovir usually decreases the symptoms by one day if taken within 24 hours of the start of the rash, but it has no effect on the complication rates. In adults, infection tend to be more severe and treatment with acyclovir and valacyclovir is advised if it can be accessed within 1 to 2 days of rash onset.

The clinical course of Varicella-Zoster Virus infection is usually associated with intense pain and discomforts, which can be very agonizing to both children and adults. However, various clinical and anecdotal evidence have confirmed the effectiveness of a combination of Quercetin, Zinc, and vitamin C in blocking the agonizing clinical course of VZV. This same therapeutic effect has been recorded in other highly virulent viruses.

Keywords: Chickenpox; Shingles; Varicella-Zoster Virus; Quercetin, Zinc; Vitamin C

1. Introduction

The two conditions, chickenpox (varicella) and shingles (zoster), are caused by a single virus; Varicella-Zoster Virus (VZV). Acute infections with VZV causes chickenpox while the latent reactivation of VZV causes shingles [1]. VZV is also known as human herpesvirus (HSV), and like HSVs it is an alpha herpesvirus [2, 3].

Chickenpox is a mild, highly contagious disease, mainly of children. And it is characterized by a generalized vesicular eruption of the skin and mucous membranes. This disease can be severe in immunocompromised children and adults [3]. Shingles is a sporadic incapacitation disease of adults or immunocompromised individuals, and it is characterized by rash limited to the skin innervated by a single sensory ganglion [3].

Chickenpox is a highly communicable disease which is spread by infected droplets from the nose and throat [4]. The disease is mostly communicable during the short prodromal stage and during the early stage of eruption. But patients

* Corresponding author: Oyindamola Olaniyi Oyesaga

are not infective to others after the final lesions have crusted, and the incubation period is usually between fourteen to sixteen days [4].

2. Discussion

2.1. Epidemiology

Varicella and zoster occur worldwide. Meanwhile, varicella is a common epidemic of childhood mostly under the age of 10 and it is highly communicable. But it also occurs in adults. In the temperate regions, it is more common in winter and springs than in summer [3].

For zoster, it occurs sporadically mainly in adults and without seasonal prevalence. Also, it has been estimated that about 10 to 20 percent of adults will experience at least one zoster attack during their lifetime, and that will usually occur after the age of 50 [3].

Varicella spreads readily by airborne droplets and also by direct contact. However, contact infection is less common in zosters, probably because the virus is absent in typical cases from the upper respiratory tract [3].

2.2. Pathophysiology of Varicella-Zoster Virus

The varicella rash occurs approximately 2 weeks after respiratory infection and usually travels in multiple waves, centrifugally from the torso to the head and extremities. Each lesion progresses rapidly from a macule to a vesicle, and it usually looks like a dewdrop on a rose petal [1].

Also, for varicella, the route of infection is either the mucosa of the upper respiratory tract or the conjunctiva. After initial replication in the regional lymph nodes, primary viremia spreads virus and leads to replication in the liver and spleen [3]. It is after the primary viremia that secondary viremia involving infected mononuclear cells transports virus to the skin where the typical rash develops and eventually accumulation of tissue fluids results in vesicle formation [3].

For zoster, there is an acute inflammation of the sensory nerves and ganglia, but only a single ganglion may be involved and the distribution of lesions in the skin corresponds closely to the areas of innervation from an individual dorsal root ganglion [3]. However, it is not clear what usually triggers reactivation of latent varicella-zoster virus infections in the ganglia. But it believed that reduced immunity allows viral replication to occur in a ganglion which then usually results into intense inflammation and pain [3].

2.3. Clinical Features

The prodromal symptoms of VZV in adolescents and adults are aching muscles, nausea, decreased appetite and headache. All those symptoms are then followed by a rash, oral sores, malaise, and a low-grade fever [5]. However, in children the symptoms may not be preceded by prodromal symptoms and the initial sign could just be a rash or oral cavity lesion. The rash usually progresses to small bumps, blisters, and pustules over the following 10 to 12 hours [5]. A common complication is a secondary bacterial infection that can present as cellulitis, impetigo, and erysipelas. Disseminated primary varicella is usually seen in immunocompromised individuals and carries a very high mortality rate. Primary varicella infection during pregnancy can also affect the fetus, who may later present with chickenpox [5].

2.4. Immunity and Laboratory Diagnosis

Varicella and zoster viruses are identical. Basically, the two diseases are result of differing host responses. Antibodies induced by varicella vaccine can persist for about 20 years and previous infection with varicella is believed to provide lifelong immunity of the individual to the virus [3].

The diagnosis of varicella infection is usually based on the signs and symptoms. However, confirmation is based on examination of the fluid within the vesicles, scraping of lesions that have not crusted, or by blood for evidence of an acute immunologic response [5]. In stained smears, or scrapings, or swabs of the base of vesicles, multinucleated giant cells are seen. Rapid diagnostic procedures are clinically useful for varicella-zoster virus. The virus can be isolated from vesicle fluid early in the course of illness using cultures of human cells in about 3 to 7 days [3].

The differential diagnosis of VZV are insect bites, impetigo, small pox, drug eruptions and dermatitis herpetiformis. In healthy children, the prognosis is excellent. However, in immunocompromised individuals, the infection has high morbidity [5].

2.5. Treatments

Viruses are the ultimate expressions of parasitism. This is because they not only take nutrition from the host cells, but they also direct its metabolic machinery to synthesize new virus particles. Viral chemotherapy is therefore difficult in that it would require interference with cellular metabolism in the host [6].

Treatment of VZV is usually the symptomatic relief of symptoms. And as a precaution the infected individual is usually advised to stay indoors or be isolated during the early stages of the infection in order to prevent the spread to others [5]. Topical calamine lotion may relieve pruritus and daily cleansing with warm water will help avoid secondary bacterial infection. Acetaminophen may be used to reduce fever, but aspirin should be avoided as it may cause Reye syndrome [5].

In children, acyclovir usually decreases the symptoms by one day if taken within 24 hours of the start of the rash, but it has no effect on the complication rates. So, it is usually not recommended for individuals with normal immune function [5]. In adults, infection tends to be more severe and treatment with acyclovir and valacyclovir is advised if it can be accessed within 1 to 2 days of rash onset. Meanwhile, supportive care such as the use of antipyretics and antihistamines are an important part of the management. However, antivirals are usually indicated in adults, including pregnant women, as this group is more prone to complications [5, 6].

3. Quercetin, Zinc & Vitamin C as Anti-viral Therapy for Varicella-Zoster Virus

The clinical course of Varicella-Zoster Virus infection is usually associated with intense pain and discomforts, which can be very agonizing to both children and adults. Also, during the clinical course of the infection, the rashes and vesicles usually results into dark spots of the skin and sometimes a widespread skin damage. However, various clinical and anecdotal evidence have confirmed the effectiveness of a combination of quercetin, zinc, and vitamin C in blocking the clinical course of VZV. And this same therapeutic effect has been recorded in other highly virulent viruses [7].

If this therapy is used, either as a standalone or as an adjunct with conventional treatment made up of acyclovir, valacyclovir, famciclovir or foscarnet; it will enable the patient to prevent agonizing pains and discomforts usually associated with the infection. It will also shorten the duration of the illness and eventually reduce the damages done to the skin of infected individual.

Quercetin is a well-known flavonoid whose antiviral properties have been investigated and proven in numerous studies. While ascorbic acid is a crucial vitamin necessary for the correct functioning of the immune system. It plays a role in stress response and has shown promising results when administered to the critically ill. There is evidence that ascorbic acid and quercetin co-administration exerts a synergistic antiviral action due to overlapping antiviral and immunomodulatory properties and the capacity of vitamin C to recycle quercetin thereby increasing its efficacy [8].

Zinc is essential to preserve the natural tissue barriers such as the respiratory epithelium, prevent pathogen entry, ensure a balanced function of the immune system and the redox system. Therefore, zinc deficiency can be added to the factors predisposing individuals to infection and detrimental progression of VZV [7].

3.1. Quercetin

Cell entry is a crucial step during viral infection and therefore it has been studied as a potential target of antiviral treatments. In an experiment with H1N1 and H3N2 influenza infection of MDCK cells, quercetin demonstrated reduced deadly effect of the virus and that was due to the binding of Heamagglutinin Proteins (HA). Specifically, quercetin bound the HA subunit responsible for membrane fusion during virus entry and virus-mediated hemolysis [9].

Also, the antiviral effects of quercetin on other viruses like Herpesviruses (HSV-1, 2) and Adenoviruses (ADV-3,–8,–11) suggest inhibition of the early stage viral replication of the viruses in a dose dependent manner, as well as the inhibition of the viral DNA and RNA polymerase. Meanwhile, vitamin C has been shown to prevent quercetin spontaneous degradation thereby suggesting necessary co-administration with Vitamin C to exert its antiviral effect [9].

The beneficial effects of quercetin against other viruses, like; Poliovirus infection, Coxsackie virus and HIV have all been recorded in various experiments based on its ability to bind essential proteins required during the transcription from minus-strand RNA into positive polarity RNAs. Also, its ability to inhibit crucial enzymes such as Reverse Transcriptase (RT), Integrase (IN), and Protease (PR) thereby reducing the levels of viral infectivity [9].

Quercetin has an interesting inhibitory effect on inflammatory responses, and it not only inhibits the production of NLRP3 inflammasome, but it also suppresses inflammation through interference in various signaling pathways. Finally, it should be noted that quercetin is characterized by three crucial properties: antioxidant, anti-inflammatory and immunomodulatory. So, the combination of those three properties allows quercetin to be a potential candidate to support all unhealthy conditions where oxidative stress, inflammation and immunity are involved – like VZV infection [10].

3.2. Zinc

Zinc is an essential trace element that is crucial for growth, development, and the maintenance of immune function. Infact, its influence reaches all the organs and cell types, representing an integral component of approximately 10% of the human proteome, and encompassing hundreds of key enzymes and transcription factors [11].

Zinc deficiency is strikingly common, and it affects up to 25% of the population in developing countries. It also affects distinct populations in the developed world because of lifestyle, age, and disease-mediated factors. Consequently, zinc status is a critical factor that can influence antiviral immunity, particularly as zinc-deficient populations are often most at risk of acquiring viral infections such as HIV or Hepatitis C virus. There are various scientific studies in the last 50 years that have confirmed the anti-viral ability of zinc against a variety of viruses through different mechanisms of action [11].

Therefore, increasing the intracellular concentration of zinc in the body can efficiently reduce the replication of a variety of RNA viruses, including poliovirus and influenza virus. For some viruses, the effect has been attributed to interference with viral polyprotein processing. So, zinc inhibits the RNA-synthesizing ability of viruses and enzymatic studies revealed that zinc directly inhibited the activity of polymerases [12].

Finally, zinc deficiency compromises its biological functions and its effect on the immune system. That then result into a compromised antiviral activity and thereby increasing vulnerability to infectious diseases such as VZV, especially considering that various scientific literature has shown the importance of zinc as an essential mineral immunomodulator with relevant antiviral activity in the body and cells of humans [13].

3.3. Vitamin C

In order to effectively manage VZV, there is a need to fully utilize readily available pharmaceutical and nutritional therapeutic agents with proven antioxidant, anti-inflammatory and immunosupportive properties like vitamin C. Supplemental vitamin C may also provide additional benefits for the prevention of viral infections, shorten the disease course and lessen complications of the disease [14].

Viruses cause infections that are often associated with redox modification characteristic of oxidative stress. So, changes in redox homeostasis in infected cells are one of the key events in the pathogenesis of respiratory viral infections in all phases of the disease, contributing to severe inflammatory reaction and subsequent tissue damage. Redox changes to an oxidized state also play a critical role in the activation of numerous cell pathways that are hijacked by viruses to assure their replication and to suppress the patient's immune response [14].

Also, research has shown that vitamin C is an essential factor in the production of Type I interferons during the antiviral immune response. Vitamin C has been shown to upregulate Natural Killer (NK) cell and Cytotoxic T-Lymphocyte activity which then serves as an inactivating agent both for RNA and DNA viruses thereby lessening viral infectivity [14].

In addition, vitamin C can detoxify viral products that produce pain and inflammation. Studies has shown the effectiveness of vitamin C in treating pneumonia and infection owing to its direct inhibitory effects on pathogens. Also, vitamin C is present in the epithelial lining of the respiratory tract where it functions as a local mucosal protecting agent, helping to ameliorate symptoms of upper respiratory tract infection [14].

A high dose of Vitamin C therefore can be used as proven therapeutic agent that not only reduces oxidative stress and inflammation during VZV infection, but also suppresses viral replication and improves antiviral immune defense and adrenal function. Moreso, Clinical trials have reported positive results for vitamin C therapy in respiratory infections. In the critically ill patient population, there was a significant reduction in the death rate of patients supplemented with Vitamin C [14]. In addition, the likelihood of arterial ischemic stroke, which is usually associated with childhood chickenpox, will be reduced due to the presence of vitamin C in this therapy [15].

4. Conclusion and Suggestions

Chickenpox is rarely fatal, however non-immune pregnant women and those immunocompromised are at highest level of risk. Arterial ischemic stroke associated with childhood chickenpox is a significant risk. Varicella pneumonia is the most common cause of fatality in adults, which may be further complicated in those requiring mechanical ventilation.

In pregnant women, antibodies produced because of immunization or previous infection are transferred via the placenta to the fetus. And if infection occurs during the first 28 weeks of pregnancy, congenital varicella syndrome may develop. Effects on the fetus may include underdeveloped toes and fingers, structural eye damage, neurological disorder and other malformations. But if maternal infection occurs 7 days before delivery and up to 8 days after birth, the baby may develop neonatal varicella with presentation ranging from mild rash to disseminated infection. Maternal herpes zoster, on the other hand, constitute little risk of neonatal complications or congenital varicella syndrome.

Going by all the likely complications that can result from VZV infection, the need for an easily available and affordable anti-viral therapy that is effective in blocking or reducing the full clinical course of VZV infection becomes very important. The author has prescribed this same combination therapy made up of quercetin, zinc, and vitamin C at various times to clients, family and friends for the management of VZV infections. The outcome was positive.

Compliance with ethical standards

Disclosure of conflict of interest

The author has no conflicts of interest to declare.

References

[1] V. Kuma, A. Abbas, N. Fausto. Robbins and Cotran Pathologic Basis of Disease, 7th Edition 2005. Elsevier Saunders.

[2] D. A. Padgett, M. T. Bailey, J. F. Sheridon. Herpesviruses. ScienceDirect. 7 September 2007. https://doi.org/10.1016/B978-012373947-6.00193-8

[3] G. F. Brooks, J. S. Butel, S. A. Morse. Jawetz, Melnick, & Adelberg's Medical Microbiology, 23rd Edition, International Edition 2004. McGraw-Hill Education.

[4] A. O. Falase, O. O. Akinkugbe. A Compendium of Clinical Medicine, New Edition 2007. Spectrum Books Limited

[5] F. Ayoade, S. Kumar. Varicella-Zoster Virus (Chickenpox). National Institute of Health, National Library of Medicine, National Centre for Biotechnology Information. October 15, 2022.

[6] K. D. Tripathi. Essentials of Medical Pharmacology, 5th Edition 2003. Jaypee Brothers Medical Publishers.

[7] Dr. Oyindamola Olaniyi Oyesaga. Orthomolecular Therapy for Management & Prevention of SARS-CoV-2 Disease. Volume. 9 Issue.5, May - 2024 International Journal of Innovative Science and Research Technology (IJISRT), www.ijisrt.com. ISSN - 2456-2165, PP :-1632-1637:- https://doi.org/10.38124/ijisrt/IJISRT24MAY1290

[8] Ruben Manuel Luciano, Colunga Biancatelli, Max Berrill , John D Catravas, Paul E Marik. Quercetin and Vitamin C: An Experimental, Synergistic Therapy for the Prevention and Treatment of SARS-CoV-2 Related Disease (COVID-19). Front Immunol. 2020 Jun 19;11:1451. doi: 10.3389/fimmu.2020.01451. eCollection 2020

[9] Inga Wessels, Benjamin Rolles, Lothar Rink. The Potential Impact of Zinc Supplementation on COVID-19 Pathogenesis. Front. Immunol., 10 July 2020. https://doi.org/10.3389/fimmu.2020.01712

[10] S. A. Read, S. Obeid, C. Ahlenstiel, G. Ahlenstiel. The Role of Zinc in Antiviral Immunity. Adv Nutr. 2019 Jul; 10(4): 696–710. Published online 2019 Apr 22. doi: 10.1093/advances/nmz013

[11] Aartjan J. W. te Velthuis, Sjoerd H. E. van den Worm, Amy C. Sims, Ralph S. Baric, Eric J. Snijder, Martijn J. van Hemert. Zn2+ Inhibits Coronavirus and Arterivirus RNA Polymerase Activity In Vitro and Zinc Ionophores Block the Replication of These Viruses in Cell Culture https://doi.org/10.1371/journal.ppat.1001176

[12] Antiviral and immunological activity of zinc and possible role in COVID-19 https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/antiviral-and-immunological-

activity-of-zinc-and-possible-role-in-covid19/21DD0E9EDABC96DC94715DB30BAB11DE [cited 2022 January 11]

[13] Ba X.Hoang, GraemeShaw, WillianFang, BoHana. Possible application of high-dose vitamin C in the prevention and therapy of coronavirus infection. Elsevier Journal of Global Antimicrobial Resistance. Volume 23, December 2020, Pages 256-262

[14] Raxit J. Jariwalla, Steve Harakeh. Antiviral and Immunomodulatory Activities of Ascorbic Acid. Subcellular Biochemistry pp 215-23

[15] Dr. Oyindamola Olaniyi Oyesaga. Cardiovascular Stroke Prevention and Management Using the Principles of Cellular Medicine. Volume. 9 Issue.5, May - 2024 International Journal of Innovative Science and Research Technology (IJISRT), www.ijisrt.com. ISSN - 2456-2165, PP :-1619-1622:- https://doi.org/10.38124/ijisrt/IJISRT24MAY1738