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THE VITAMIN C AND THE COMMON COLD: A NARRATIVE REVIEW

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Abstract

Background: Common cold is a widespread viral infection that despite its usually mild symptoms, contributes to considerable health and economy burden. It remains one of the most frequent human infection. Vitamin C is a water soluble vitamin with potent antioxidant properties and important roles in immune function. Common dietary sources include for example citrus fruits, kiwi and bell peppers. Because vitamin C levels decline rapidly during infection due to increased metabolic demand and oxidative stress, its potential role in preventing or reducing the severity of the common cold has been widely studied.

Aim: This review aims to evaluate current evidence regarding the use of vitamin C in the prevention and treatment of the common cold, highlighting its infection-related biological functions and potential mechanism of action.

Methods: A narrative review of the literature was conducted by searching Pubmed and Google Scholar for English language studies investigating the role of Vitamin C in the prevention and management of the common cold.

Results: Regular vitamin C supplementation modestly shortens the duration of colds by about 8% in adults and 14% in children. Current evidence does not show that vitamin C reduces the incidence of the common cold in the general population.

Conclusions: Although vitamin C does not prevent the onset of colds in healthy individuals, it may provide mild symptom relief and reduce illness duration. Further studies are needed to clarify the role of vitamin C, particularly in different populations and under varying conditions of nutritional status.

Keywords: Common Cold, Ascorbic Acid, Antioxidants, Oxidative Stress, Rhinovirus

1. INTRODUCTION

Vitamin C ($C_6H_8O_6$) belongs to the group of water soluble vitamins. It has got plenty of biological functions in human organism. Vitamin C is recognized as an essential medicine by the WHO and appears in the 2023 Model List of Essential Medicines under the category of vitamins and minerals, reflecting to its viral role in human health. It can be found in two main forms ascorbic acid and dehydroascorbic acid [1]. Another name of the Vitamin C - Ascorbic Acid has its roots in Latin and it means without scurvy [2]. Scurvy is a condition caused by a lack of Vitamin C and it has been known from the ancient times[3]. Human cannot produce vitamin C because of mutation in L-gulonolactone oxidase enzyme, which is required for the final step of the vitamin C synthesis. As a result it must be taken from external sources, primarily through diet [3]. Some of the richest sources of vitamin C include red and green bell peppers, kiwi, strawberries, oranges, among vegetables, parsley and broccoli also contain high amounts. For example red bell pepper can provide over 100 mg of vitamin C per 100 g, which is several times higher than the amount in oranges. Diet without the vitamin C for one to three months can lead to scurvy [4]. In 1747 James Lind carried out an experiment on sailors suffering from scurvy. He was testing several possible remedies. By comparing different treatments, he discovered that citrus fruits such as oranges and lemons, which are rich in vitamin C, were the most effective treatment[5]. The discovery of vitamin C was between 1928 and 1932 by Albert Szent-Györgyi- when he first isolated a compound he called hexuronic acid- later identified as vitamin C [2,3,6]. Vitamin C is known for its antioxidative properties, it helps neutralize free radicals in the body, protecting cells from oxidative stress. During infection vitamin C levels in plasma and leukocytes decline rapidly, reflecting its heightened utilization in immune defense and antioxidant protection. This antioxidant activity contributes to overall immune support, as it helps maintain the integrity of immune cells like white blood cells and enhances their ability to fight pathogens. Vitamin C also is essential for collagen synthesis, which supports the health of skin and mucous membranes - as the first line of defense against infections. It is actively accumulated in phagocytic cells, such as neutrophils and macrophages, where it enhances their ability to engulf and kill pathogens. This accumulation helps maintain the function of these immune cells during infections and oxidative stress.

Besides it is also supporting the function of lymphocytes (T cells and B cells) by promoting their proliferation, differentiation and signaling which are critical for adaptive immune responses. [7]

The common cold is a viral infectious disease of the upper respiratory tract. It is characterized by symptoms such as mild cough, nasal congestion, sore throat. Average incubation period is 2 days[8] and symptoms usually last for about 7-10 days [9]. Common cold spreads primarily via droplet transmission and can be caused by over 200 viruses, with rhinoviruses accounting for the majority of cases [10,11,12].

The first rhinovirus was isolated in the 1956 by Dr. Winston H. Price at Johns Hopkins University [13]. Since then human rhinoviruses have been under the extensive research.

Originally, human rhinoviruses were classified into 100 consecutive serotypes, now with advances in molecular techniques, they are genetically categorized into three species: Rhinovirus A, rhinovirus B and Rhinovirus C. [14,15,16]. Common cold can be caused by a large number of respiratory viruses and it is defined by a set of symptoms rather than a single causative agent. Symptoms of the common cold largely result from the host immune response [17] within the local immune reaction in the infected epithelium following viral infection of upper airways [18]. Insight into the mechanisms underlying common cold symptoms is essential, given the most interventions are purely symptomatic [18]. The initial sensation of a scratchy throat frequently marks the onset of a common cold and may be the result from bradykinin production in the respiratory tract [19]. General symptoms are caused by cytokines such as IL-6, IL-8 and TNF-alpha released from leukocytes. Viral recognition by PRRs (pattern Recognition Receptors) triggers the production of interferons and interleukins, which circulate in the blood and lead to fever, headache, fatigue.

Local symptoms like sore throat, sneezing, runny nose result from inflammatory mediators such as prostaglandins and bradykinin. Bradykinin affects blood vessels and nerves causing the symptoms like sore throat, sneezing, runny nose, dilatation of nasal blood vessels, while prostaglandins are formed when epithelial cells release arachidonic acid, which is converted by cyclooxygenase [18]. Since symptoms of the common cold largely result from the host immune response [17] rather than direct viral damage, interventions such as vitamin C have been investigated for their potential to support immunity and influence symptom severity and duration.

2. Methodology:

This narrative review was conducted using the following scientific databases: Pubmed and Google Scholar publicized between 2010 and 2025. However, older studies were also included when they provided important historical context or key findings. Several keywords have been used: Common cold, Ascorbic Acid, Antioxidants, Oxidative stress. Articles in English only with full text available and relevant to the topic were used. Original articles, reviews, meta-analyses, epidemiological studies, randomized controlled trials were included. The studies were too different for meta-analysis, so main findings were summarized in a descriptive way.

3. Results

Vitamin C has been used for both preventive and therapeutic purposes for several decades. In recent years, a growing number of studies have focused on its effects on the frequency and course of infections in children and adults. In this analysis we present the latest evidence on the effectiveness of vitamin C supplementation in reducing the risk and severity of infection. Below, we present, the most important studies and meta-analyses on vitamin C and the common cold.

Table 1. Summary of key meta-analyses and reviews on vitamin C and the common cold

Study (Year)	Population	Vitamin C dose	Results	Source / PMID
Hemilä, H., & Chalker, E. 2013	29 trials with 11306 participants General population (adults + children)	From 200 mg/day	No significant reduction in cold incidence	Vitamin C for preventing and treating the common cold. PMID: 23440782
Hemilä, H., & Chalker, E. 2013	Adults and children	From 200 mg/day	Reduced common cold duration by: 8% in adults 14% in children and 18% in children with the dose of 1-2g/day	Vitamin C for preventing and treating the common cold. PMID: 23440782
Hemilä, H., & Chalker, E. 2013	Groups under high physical stress	From 200 mg/day	About 50% reduction in cold incidence	Vitamin C for preventing and treating the common cold. PMID: 23440782
Hemilä, H., & Chalker, E. 2023	15 comparisions from 10 trials with both mild and severe symptoms	From 1g/day	About 15% reduction in cold severity	Vitamin C reduces the severity of common colds: a meta-analysis PMID: 38082300
Hemilä, H., & Chalker, E. 2023	Groups with severe symptoms episodes	From 1g/day	Abour 26% reduction in duration of the cold	Vitamin C reduces the severity of common colds: a meta-analysis PMID: 38082300

3.1 Hemilä, H., & Chalker, E. Vitamin C reduces the severity of common colds: a meta-analysis [20]

A 2023 meta-analysis investigated the effect of regular vitamin C supplementation on the severity of common cold. The analysis included 15 comparisons from 10 trials with reported mild and severe symptoms of common cold. Vitamin C was supplemented for people in good health with doses of at least 1g/day. Outcomes on duration and severity of cold episodes were reported. The pooled evidence suggests that consistent vitamin C supplementation modestly reduces the severity of cold symptoms. Participants receiving vitamin C experienced a 15% reduction in common cold symptom severity compared with placebo (95% Cl: 9-21%). When focusing specifically on the more severe phases of cold, supplementation was connected with 26% reduction in days with pronounced symptoms, whereas mild symptoms were largely unaffected. It is important that these benefits were observed during regular, ongoing supplementation, rather than sporadic doses initiated at symptom onset. Although the absolute reduction in symptom severity is moderate, the findings indicate a small meaningful effect, particularly in those experiencing more intense cold episodes and it may slightly reduce the severity and duration of more pronounced symptoms when is supplemented consistently.

3.2 Hemilä & Chalker, Vitamin C for preventing and treating the common cold [21]

Twenty nine trials with the number of 11306 participants with the dose of vitamin C from 200 mg/day. The review included trials conducted in both adult and children. The main outcomes were incidence, duration and severity of cold episodes. In general population among healthy adults and children regular vitamin C supplementation 200 mg and more had no significant effect on the risk of developing a cold. When it comes to the duration of colds, 31 comparisons with 9745 episodes, adults experienced on average an 8% (3%-12%) shorter duration, children though experienced about 14%(7% to 21%) reduction in cold length. The severity of colds was also reduced when vitamin C is supplemented regularly. It suggests that vitamin c may slightly accelerate recovery. In five trials with 598 people - where people were exposed to extreme physical stress (marathon runners, skiers) supplementation was associated with reduction of about 50% in the risk of developing a common cold.

3.3 Does vitamin C prevent the common cold?

Evidence from large randomized controlled trials shows that routine, daily supplementation with vitamin c in the general population does not significantly reduce the incidence of developing a cold. This finding has been content across decades of research. However, a key nuance emerges in certain subgroups. Studies involving people exposed to extreme physical stress - or high performance athletes - show that vitamin C reduces the incidence of colds by approximately 50% in these groups. The proposed explanation is that intense physical extortion can transiently weaken parts of the immune system, making the body more reliant on oxidant protection.

3.4 Does vitamin C shorten cold duration or reduce severity?

Although vitamin C may not prevent most colds, evidence consistently shows that regular supplementation and not taken after symptoms start can modestly reduce the duration and severity of colds.

4. DISCUSSION

The relationship between vitamin C and the common cold has been examined for over half a century, generating extensive scientific debate and public interest. The evidence accumulated from randomized control trials, observational data and mechanistic studies highlights a complex and nuanced interaction between vitamin C intake, immune function and respiratory illness. This discussion synthesizes these findings, evaluates implications and explores reasons for persistent misconceptions regarding vitamin C's effectiveness. The main conclusion margined from decades of research is that vitamin C does not significantly reduce the incidence of the common cold in general population. The consistency of this outcome across large, well designed trials (Hemilia & Chalker, 2013) suggests that routine supplementation is unlikely to act as a universal preventive measure. This finding challenges early hypotheses, particularly those advanced by Linus Pauling in the 1970s, which proposed that high daily doses could lower infection rates. Although Pauling arguments helped raise public awareness about micronutrients and immunity, later studies demonstrated that his claims were not so promising when it comes to the wider population. However, the data also reveal important exceptions indicating that vitamin C impact may depend on the physiological and environmental context. Among individuals exposed to intense physical activity- vitamin C supplementation has shown to reduce the risk of developing a cold by up to 50%. This substantial protective effect suggests that vitamin C's role becomes more pronounced under conditions of heightened oxidative stress or temporary immune suppression. Physical extortion, thermal stress and environmental challenges can weaken immune defenses potentially increasing the body 'reliance on readily available antioxidants. As a result, supplemental Vitamin C may serve as a buffer that helps maintain immune competence in these high-stress scenarios. This context depend benefit underscores the need for caution when generalizing result from one population to another.

While prevention outcomes are mixed, the evidence regarding cold duration and severity is more consistently favorable. Numerous trials have reported small but statistically meaningful reductions in the length of cold symptoms when individuals take daily vitamin C supplements before falling ill. Reduction in duration of the cold is present in the group of adults(8%) and children(14%).

Although these improvements may not appear dramatic, at a population level they could translate fewer missed workdays, reduced healthcare usage, and milder symptom burden.

Importantly, these benefits are most evident when vitamin C is taken prophylactically, rather than as a treatment initiated after symptom onset. This suggests that vitamin C may enhance baseline immune function rather than acting directly against viral replication once infection has occurred. The failure of therapeutic vitamin C administered after symptoms begin - to consistently reduce illness duration has important mechanistic implications. It suggests that vitamin C's primary value lies in maintaining adequate immune readiness rather than serving as an antiviral agent. Infection places increased metabolic demand on antioxidant reserves, often lowering plasma and leukocyte vitamin C levels. Individuals who begin an illness with marginal or borderline vitamin C status may be more vulnerable to prolonged or severe symptoms, which could help explain why small but measurable reductions in illness duration are observed in those who supplement regularly.

Another important dimension concerns dosage and safety. Trials vary widely in the amount of vitamin C ranging from 100-200 mg. The body tightly regulates vitamin C absorption and excretion, therefore, high doses rarely result in proportionally higher plasma concentrations. While vitamin C is generally safe, excessive intake may cause gastrointestinal discomfort. Thus, future research may benefit from exploring optimal dosing strategies tailored to specific populations.

5. CONCLUSIONS

Taken together the findings point to a nuanced conclusion: vitamin C is not a universally effective cold prevention strategy, but it is a safe, low cost nutrient that provides small yet consistent benefits in reducing cold duration and severity, especially in individuals with higher physiological demands or suboptimal baseline status. Its preventive effectiveness is highly context-dependent, showing strong benefits in people exposed to for example physical stress. These results illustrate the importance of considering individual variability, baseline nutritional status and lifestyle factors when evaluating micronutrient interventions.

Future research should continue exploring personalized approaches to supplementation, including the interplay between vitamin C status, diet quality, genetic variation, needed to clarify the thresholds at which vitamin C deficiency or insufficiency begins to compromise immune resilience. Understanding these factors may help refine public health recommendations and prevent unrealistic expectation about what vitamin C supplementation can achieve.

DISCLOSURE

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