

Review Article

CURE AND PREVENTION OF DISEASES WITH VITAMIN C INTO PERSPECTIVE: AN OVERVIEW

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Abstract

Vitamin C is an organic compound with chemical formula C₆H₈O₆ and earlier called as Hexuronic acid. In many plant and creature species, it is essential to life and is central to people's fundamental dietary chart. There is always a popular topic of debate and study about how vitamin C is beneficial to alleviate different human health conditions. Upon review of numerous pieces of literature, researchers found that vitamin C would actually treat many health conditions in humans to a certain degree. This review highlights the role of Vitamin C on Common Cold, Asthama, BP, Fertility, Immunity, tissue Regeneration and Cancer. Vitamin C, in particular, is an appealing product for advertisers to understand the implications and results of the consumption of vitamin C. However, this can differ from one patient to another. The ill impact of vitamin C utilization as core drug should not be overlooked either.

Keywords: Vitamin C, Common Cold, Asthama, Blood Pressure, Fertility, Immunity, Tissue Regeneration and Cancer

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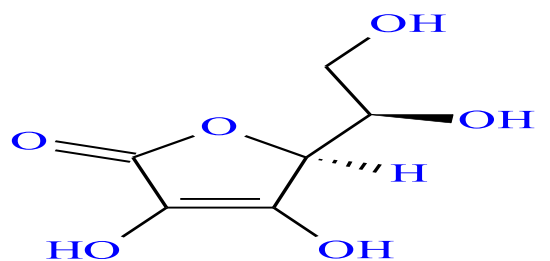
INTRODUCTION

For the body, its cell to function correctly, growth, development and for other uses, the vitamins are essential organic compounds. For a healthy and sustainable existence, vitamins are required in varying amounts. These vitamins can be extracted majorly from food by the human body. The human body is designed in a way that cannot generate (all or some in number) its own essential vitamins for a healthy life. There is a particular need for vitamins in every portion of the body. Multiple supplements often serve a distinct role. For instance, human consume vitamin C for a variety of use and cannot produce its own, thus it has to extract vitamin C from food. On the other hand, dogs can produce ample vitamin C for their own needs.

A minimum of 13 kinds of vitamins are found, including vitamins A, B, C, D, E, K, B₂, B₃, B₅, B₆, B₇, B₉ and B₁₂. Carbon is always present in vitamins and is therefore defined as organic. Vitamins are either Liposoluble (fat) or Hydro soluble (water). Fat soluble, though, is safer for our bodies than water for storage purposes.

The supplements obtained from nutrients cater to the need of the body for performing fundamental functions, for example,

1. Creation of skin, bone and muscle.
2. Reinforcing of the immune system.
3. Upkeep and repair of cells, tissues and organs.
4. Conversion of food into energy.



IUPAC Name : (5S)-5-[(1R)-1,2-dihydroxyethyl]-3,4-dihydroxyfuran-2(5H)-one

Figure-1: Structure of Ascorbic acid

Ascorbic Acid, conventionally familiar as Hexuronic acid was secluded from chicken juice, orange juice and adrenal oxen in 1928 by Nobel laureate Albert Szent-Györgyi. The chemical description was nevertheless incomplete until Waugh and King identified it as vitamin C, in 1932, and in 1933 von Norman Haworth [23] synthesized it. Vitamin C is indeed an important human health micro-nutrient.

Humans cannot synthesize ascorbic acid de novo and need to depend on dietary sources for the use of vitamin C and dehydroascorbic acid as its oxidation product. In fact, Ascorbic Acid plays a key part in the development of essential proteins including collagen, norepinephrine and serotonin (Aditi and Graham 2010) [2]. A wide range of products, such as pepper, sprouts, peach, lemons, cauliflower, cold meats, turnip tops, cabbage, tomatoes, spinach and potatoes, are well-off in ascorbic acid and are now supplemented by industrial vitamin C in many prepared foods. A detailed list of Vegetables and Salads with their relevant vitamin C composition has been shown in Table 1.

Table 1: Sources of Vitamin C content from Vegetables and Salads.

Sr. No	Vegetables/Salad Name	Vitamin C in mg per 100 grams
1.	Pepper	146
2.	Rocket	110
3.	Turnip Tops	110
4.	Brussels Sprouts	81
5.	Broccoli	77
6.	Cauliflower	59
7.	Spinach	54
8.	Lemon	50
9.	Endive	35
10.	Broad Bean	33
11.	Celery	32
12.	Tomato	23
13.	Radish	18
14.	Lettuce	16

15.	Potatoes	15
16.	Soya Bean Sprout	13
17.	Fennel	12
18.	Carrot	4

Vitamin C was recognized in the mid-twentieth century in the quest for a material, the lack of which would source scurvy (Carpenter, 1986) [12]. Vitamin C is a labile particle, promptly oxidized within the sight of air, and is a notable reducing agent. Vitamin C is an antioxidant that helps for healthy gums and helps to hold teeth in their proper socket. It is an essential vitamin to heal human wounds. It helps to reduce risk from a few cancer diseases, heart problems and other diseases. It also helps to keep our blood vessel strong. The primary task of Vitamin C is to assimilate iron and preserve healthy tissues. Vitamin C is a water-soluble nutrient. Excess consumption of Vitamin C may be unharmed as it can be flushed out from the body through urine. Doctors recommend 90 mg for male and 75 mg in case of women to daily intake vitamin C. However, the upper limit is 2000mg.

Table 2: Sources of Vitamin C from Fruits

Sr. No	Fruit Name	Vitamin C in mg per 100 grams
1.	Guava	243
2.	Currant	200
3.	Kiwi	85
4.	Papaya	60
5.	Strawberry	54
6.	Clementine	54
7.	Orange	50
8.	Tangerine	42
9.	Grape Fruit	40
10.	Melon	22
11.	Banana	16
12.	Apple	8
13.	Pear	4
14.	Peach	4

A choice of fruits of interest for human nourishment has been taken from a database on food chemical creation as shown in Table 2 (<http://www.iew.it/bda2008/homepage.aspx>). Just the nutrient C component of the edible moieties has been accounted for. The chemical structure of Ascorbic acid is shown in Figure-1. Identifying and reviewing vitamin C and confirming the progressive reversal or prevention of certain diseases by using the specific dietary supplements brought the research process to a stage that led to the ongoing research to be focused on the part of vitamin C in the Cure and deterrence various diseases.

BIOCHEMICAL FUNCTION OF VITAMIN C

Vitamin C has an outstanding part to play in human well-being. The biochemical functions of the body are remarkably influenced by the Ascorbic Acid's oxidation-reduction properties (Levin 1986) [29]. The major biochemical functions include energy/fostering of few enzymes, collagenic biosynthesis, hormone action, detoxification of histamine, phagocytic leukocyte inputs, and a nitrosamine arrangement. The wellbeing impacts of nutrient C status are identified by these capabilities.

VITAMIN C AND COMMON COLD

Li Ran et al., (2018) [30] tried to investigate of Vitamin C on common cold with an additional dose of vitamin C. Researchers concluded, after extensive literature reviews by the Cochrane National Library of Medicine, that supplementing vitamin C helps to reduce cold Cough and also to relieve pain in the chest. In their work on the impact of vitamin C on the treatment and prevention of common colds, Hemila and Chalker (2013) [25] concluded that in spite of the fact that vitamin C has not succeeded in reducing

the incidences of common cold, daily vitamin C supplements have shown to lessen the period of cold. They also added that the patient should evaluate themselves to ensure that vitamin C is beneficial to them or not. Harri Hemila (2017) [22] observed that cold events, in general, do not decrease in population, adding that however, it does minimize the cold in real active citizens to half. In comparison, ordinarily regulated vitamin C has reduced the cold cycle, suggesting an organical impact. The function of nutrient C is, however, somewhat questionable, in the cold treatment. Two recent regulated responses of up to 6–8 g per day of nutrient C indicate a measurably impressive component reaction over the regular cold side effects. In this way, with low dosages of 3–4 g / day of nutrient C, the adverse findings from some helpful basic virus studies may be explained. Sasazuki et al. (2006) [34] conducted their investigation in Japan on 40-60 years of men and women that supplementation with vitamin C significantly decreases the recurrence of regular virus cold yet had no obvious effect on the term or frequency of the common cold. The experiment of Robert M. D., Chalker E. B. (2000) [33] has investigated the high dose effect of vitamin C for the motive of reducing the common cold incidents. They found no clear indication in the reduction of common cold with vitamin C. Nevertheless, a big quantity of Vitamin C was modestly helpful than the lower dose.

VITAMIN C AND ASTHAMA

Farhad et al., (2016) [16] looked through the Pubmed and Scopus database and attempted to distinguish the commitment of Vitamin C in the children old enough gathering 1–17 years individually. 13 studies of 6503 patients met the criteria for inclusion in the study and found the amount of consumption of vitamin C in patients with asthma to be very low compared to those without asthma. They concluded that low vitamin C intake is directly associated with asthma risk, and added that patients who consume vitamin C show significant improvement in their health. Susan T, (2001) [37] conducted an asthma prevention study in the United States to indicate that some asthmatics, particularly those who are under monotone oxidant stress, for instance, smokers or those with symptoms that have been incited, may benefit. Harri Hemila (2014) [21] examined the value of vitamin C supplementation in enhancing lung function for 158 children diagnosed with air pollution. Researchers Bielory L and Gandhi R. (1994) [10] tried to determine the effect of vitamin C in the treatment of Asthama and found no significant participation of vitamin C. In addition, the study concluded that its effect on asthma must be explored in the extensive use of Vitamin C. The same result was confirmed by Kaur B., Rowe B.H., Stovold E. (2013) [9] in their research work titled "Vitamin C supplementation on Asthama".

VITAMIN C AND BLOOD PRESSURE

Stephen P (2012) [36] examined Medline, EMBASE and Central databases for the period from 1966 to 2011 with the goal of thoroughly evaluating and meta-analyzing clinical trials investigating the effect of Ascorbic Acid supplements on blood pressure (BP) and measuring the middle portion at 500 mg per day, the mid-term at 8 weak and the preliminary sizes went from 10 to 120 participants. The combined improvements in Systolic BP and Diastolic BP were -3.84 mm Hg (95 percent CI: -5.29 , -2.38 mm Hg; $P < 0.01$) and -1.48 mm Hg (95 percent CI: -2.86 , -0.10 mm Hg; $P = 0.04$), respectively. In hypertensive Participants, -4.85 mm Hg ($P < 0.01$) and -1.67 mm Hg were linked to reductions in Systolic BP and Diastolic BP. The falls of Systolic BP and Diastolic BP for the preliminary hypertensive participants were -4.85 mm Hg ($P < 0,01$) and $-1, 67$ mm Hg ($P = 0,17$) and vitamin C supplements contracted both systolic BP and diastolic BP dramatically. Gladys B. (2008) [20] Plasma Vitamin C was seen as contrarily connected with BP. Findings support the risk that C-nutrient will influence BP in healthy young adults. Zibae Nizhad MJ et. al (2009) [41] investigated on

50 patients with hypertension. BP, weight, height was measured before and after the intervention. After 1 month, the consumption of vitamin C indicated a reduction of both types of blood pressure. Therefore, it suggests that consumption of 500 mg daily for one month can have a beneficial impact on BP and thus reduce the risk of future complication. Gity et. al., (2002) [19] experimented on 56 hyperandrogenic women with age group of 18-45 years. The daily intake of vitamin C 1000 mg and vitamin E 900 mg was recommended for three months. The outcome provided evidence of Systolic and Mean BP being reduced. Fabio Lira et. al., (2011) [15] surveyed covering young ones aged between 8-12 years with an aim to know the chronic effect of supplementation in Vitamin C on BP. The result revealed that Vitamin C Group revealed a decrement in MAP (Mean Arterial Pressure) at rest (81 ± 2 vs 75 ± 1 mmHg, $p= 0.01$). In addition to this, CVA (Cerebrovascular Accident) improved in rest (3.40 ± 0.5 vs 5.09 ± 0.6 units, $p= 0.04$) and during mental stress (3.92 ± 0.5 vs 6.68 ± 0.9 units, $p= 0.03$). The research was concluded claiming vitamin C supplementation lead to lower BP and improve peripheral vasodilator reaction in obese children.

VITAMIN C AND FERTILITY

J. Miller (1992) [28] specified that the consumption of vitamin C should be enhanced with increasing age as it has been observed that older people are highly mortal compared with young peoples. Vitamin C helps in maintaining fertility rate and supports the population to grow. Vijay Prasad, Ghongane and Nayak (2017) [39] suggested that vitamin C had a significant impact on semen viability and dignity, promoting spermatogenesis in humans. Agarwal, Ikemoto & Loughlin (1994) [3] have clarified that vitamin A deficiency can cause oxidative damage caused by reactive oxygen (ROS) species and that enhanced ROS was found in infertile man semen by 25–45 percent. So, Vitamin A was presumed to be necessary in order to make men fertile. Verma and Kanwar (1998) [38] clarified the likelihood of increasing sperm quality by supplementing with vitamin C as a subordinated antioxidant in males. Bahare R., Hossein Mohammad M. Nasrin R. And Nasrin R. (2016) [8] studied 200 normal obese males and found a significant change in semen production and concentration due to weight reduction. They further added an expending Vitamin C essentially improves sperm focus and portability, yet the semen volume and the level of ordinary morphology won't change fundamentally.

VITAMIN C AND IMMUNITY

Abel et. al., (2018) [1] believe that Vitamin C supports the immune system. Therefore, certain enzymes have a high response to vitamin C to strengthen the body's immune system. Davood J. et. al., (2019) [14] opined that immune system is the first wall to defend against any disease. They believed that there were many factors causing an individual to become sick. Nutrition has a strong role to play in defending human beings from sickness. Vitamin C helps reduce tissue cell damage and establish a strong immune system. Alexander and Andreas (2009) [5] have shown that Nutrients definitely steer a strong immune system. Many immune system cells can no doubt be able to demand and accumulate nutrient C, particularly white blood cells and phagocytes. A vitamin C insufficiency thus decreases resistance to certain pathogenic agents while a greater intake enhances certain parameters of the immune system. Hence Vitamin C is an essential human micronutrient, as Anitra and Silvia (2017) [6] have reported. Through promoting the different cell capacities, vitamin C improves invulnerable resistance. Vitamin C bolsters epithelial hindrance work against pathogens and advances the oxidant rummaging action of the skin, in this manner possibly securing against ecological oxidative pressure. Vitamin C insufficiency brings about impeded insusceptibility and higher weakness to contaminations. Vitamin C strengthens the epithelial barrier against the intrusion of pathogenic agents

and enhances the skin's oxidizing effect, likely shielding from the ambient oxidative strain. Inadequacy of Vitamin C contributes to decreased corrosion insensitivity and enhanced fatigue. Anurag B. (2019) [7] established a significant model of the interactions between phagocytic and vitamin C cells using the elements between the cell and exterior infection / microbial cell. Vitamin C can be used as an independent drug, by way of treatment, with effective implantation to kill a bacterial disease. Vitamin C can be utilized one after another with another enemy of bacterial/hostile to viral medicine to help patients. This, in addition, could aid limit the measure of reactions to counter bacterial/against viral medication and hinder bacterial development.

Vitamin C and Tissue Regeneration:

Vitamin C was ideal for the actuation of telomerase activity in periodontal stem cell ligaments (PDLSCs), which contributed to an improvement of the collagen type I extracellular lattice. PDLSCs can form cell sheet structures under Vitamin C therapy, due to the enhanced formation of cell networks. Crucial rectification of opposite tissue recovery and untreated control isolated PDLSCs were illustrated and PDLSC sheets were used for effective healing of periodontal imperfections in a swine model. (Fulan et. al, 2012) [18]. Numerous experiments have been performed to ascertain the role of vitamin C as it reconstructs collagen conglomeration in the wound healing and recovery process. Vitamin C's role in reconstructing collagen conglomerations in wound healing and recovery was investigated by numerous experiments. Appropriate Vitamin C supplementation is crucial to standard regeneration protocol particularly in post employable patients because it is recommended in order to accelerate the recovery process, from 500 mg to 100 mg per day (Hellman and Burns, 1958) [24]. Jagetia et. al., (2007) [27] found that pretreatment with vitamin C was helpful in restoring lighted injuries and recommended remedial therapies linked to nutrient C to quicken twisted repairs in such states and in cases of joint damage. Fulan et. al, (2011) [17] has suggested that Vitamin C is appropriate to incite telomerase activity in periodontal stem cell ligament (PDLSC) and facilitates the up-regulated articulation of the extracellular collagen type I plates, fibronectin, and integrin $\beta 1$, immature microorganism markers Oct4, and Nanog as well as osteogenic markers RUNX2, ALP, OCN. Under Vitamin C treatment, PDLSCs can frame cell sheet structures in view of expanded cell framework creation. They further revealed, sheets of PDLSC showed a huge up-gradation in tissue recovery contrasted and untreated control separated PDLSCs. Ah. Young et. al., (2013) [4] evaluated the impact of Vitamin C on muscle regeneration. They concluded that nutrient C not just positively affects modifying the undifferentiated organism specialist to help muscle recovery yet additionally has an antagonistic angle because of its profibrotic impact.

VITAMIN C AND CANCER

Chen Q et. al., (2005) [13] concluded that Vitamin C has a definite effect on Cancer, they further elaborated that because of high intake of Vitamin C concentration, various type of cancer does not grow that ultimately leads to reduction in cancer. S. Hickey and H. Roberts (2013) [35] disagreed that Vitamin C is conceivably a sheltered and viable enemy of Cancer, ready to destroy cancer growth cells while leaving solid cells safe. They quoted that numerous specialists and patients have come to accept that alone Injections of nutrient C was successful for treating cancer, but the researcher proposed that this view is confused and oral admissions are best. The audit by Vissers and Das features the way that nutrient C has been utilized for a long time by cancer patients in an unstructured situation, either as a dietary enhancement or in pharmacological portions directed by infusion. Every day nutrient C supplementation can almost certainly lessen the frequency of oral, gastric, pharyngeal, esophageal and cervical malignant growth, and nutrient C-rich

natural products may help forestall colon disease and lung malignant growth (Pal et. al., 2012) [32].

High-portion nutrient C has additionally been researched in individuals and appeared to refine the wellbeing related personal satisfaction of terminal cancer and irresistible ailments patients (Mikirova and Hunninghake, 2014) [31]. The experiment carried by Cabanillas F. (2010) [11] concluded stating that there is no ample data to support the clinical significance of Vitamin C intake, either inhibits growth or it leads to shrinkage of a tumor over a period of time.

Heidi Fritz et. al., (2016) [26] reported that safety and efficacy of vitamin C had shown low standard clinical evidence and thus could not be regarded as scientifically rigorous, although it showed a good safety profile and an anti-tumor activity, but more rigors were required in order to prove these effects conclusively.

CONCLUSION

The researchers sought best to bring almost all aspects of vitamin C to their readers. They have brought to light the impact of Vitamin C on Common Cold (flu), Asthama, BP, Fertility, Immunity, Tissue Regeneration and Cancer and concluded that Vitamin C has a significant part to play in health and wellbeing of humans. The dosage, method and quantity of Vitamin C can differ on a case-by-case basis. Vitamin C didn't affect the occurrence of common cold in population but minimizes cold to one-half in the genuinely affected population. Likewise, in the cases of Asthama, BP and Fertility related problems, Vitamin C alone was not sufficient but was found as an adjunct to the first line therapy. This review also establishes the role of vitamin C in the healing and regeneration of collagen during wound care. However, the researchers strongly recommend that patients strictly take Vitamin C under the direction of medical practitioner as the side effects of consuming Vitamin C cannot be ignored or ruled out.

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