

# Protective Effect of Vitamin C on Peroxidation Injury in Cataract Patients

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**Abstract:** ***Background:** Pathogenesis of senile cataract is multifactorial. Serum Ascorbic acid is proposed to be one of the factors in the complex process of cataract formation. **Objective:** The aim of the study is comparison and evaluation of serum Vitamin C levels in elderly patients suffering from cataract to healthy controls. **Methodology:** For the study, hundred successive elderly patients with cataract together with hundred healthy controls were considered. Statistical analysis was done using t - test. Significance was set at  $p < 0.05$ . **Results:** Serum levels of Vitamin C between cataract cases and control groups were found to be statistically significant ( $P < 0.0001$ ). **Conclusion:** The present study suggested that low levels of antioxidants may have a role in the etiopathogenesis of the senile cataract.*

**Keywords:** Antioxidant, Senile cataract, Serum Vitamin C

## 1. Introduction

A cataract is a clouding of the natural intraocular crystalline lens that focuses the light entering the eye onto the retina. Age - related (or senile) cataract is defined as cataract occurring in people more than 50 years of age, unrelated to known mechanical, chemical, or radiation trauma<sup>[1]</sup>.

Cataract is the leading cause of vision loss in the world. The World Health Organization (WHO) has estimated that 18 million people are bilaterally blind due to cataract and that the condition causes 48% of cases of blindness worldwide.<sup>[2]</sup> In spite of the progress made in surgical techniques for cataract removal all over the world during last ten years; still cataract remains the leading cause of visual impairment.<sup>[3]</sup>

The pathophysiology behind senile cataracts is complex and yet to be fully understood. In all probability, its pathogenesis is multi - factorial involving complex interactions between various physiologic processes modulated by environmental, genetic, nutritional, and systemic factors. As the lens ages, its weight and thickness increases while its accommodative power decreases.<sup>[4]</sup>

The oxidation of lens proteins by free radicals plays an important part in the process leading to lens opacification.<sup>[5]</sup> This is modified by micronutrients with an antioxidant capacity, such as tocopherol,  $\beta$  carotene, ascorbic acid and selenium. Some experimental and cross sectional case - control studies support this hypothesis.<sup>[6, 7]</sup>

Effective removal of the reactive oxygen species can be achieved by a number of enzymatic and non - enzymatic antioxidant mechanisms.<sup>[8]</sup>

Cellular defense mechanism plays a vital role in defense against cataractogenesis, because it protects the lens against

the harmful effects of oxidative insult.<sup>[9]</sup> Antioxidants are compounds that clear out, scavenge and suppress the free radicals formation or oppose their actions.<sup>[10]</sup>

Vitamin C is also an effective antioxidant soluble in water, so gets distributed to all parts of the body. Vitamin C has been suggested to make a contribution up to 24% of the total peroxy radicals trapping antioxidant activity in human plasma. Vitamin C acts as an antioxidant in biological fluids which scavenges reactive oxygen and nitrogen species.<sup>[11]</sup>

## 2. Material and Methods

The study group consisted of 100 patients with senile cataracts. The control group comprised of 100 healthy subjects. Both the study and control groups were of same socio - economic status with similar diet habits. Patients were randomly selected irrespective of their caste and creed. The patients having a medical condition that is likely to involve the free radicals or influence the oxidative process were excluded from the study. These were the patients on antioxidant drug therapy, chronic smokers, alcoholics, rheumatoid arthritis, hypertension, toxic cataract trauma, ocular surgery, ischemic heart disease, infections, inflammatory conditions, etc.

### Measurements

Blood samples were obtained by vein puncture and collected in a clean dry centrifuge tube. Standard precautions for biochemical determination were taken, hemolysed samples were discarded. The blood was centrifuged at 3000rpm for 10 minutes and serum was separated and analyzed for Vitamin C. It was estimated in serum according to the method of Roe and Kuethe's (1943),<sup>[12]</sup> using 2, 4 - di nitro phenyl hydrazine. Values were expressed in mg/dl.

### Statistical analysis

The data for biochemical analysis were expressed as mean  $\pm$  SD. Student t - test was used to determine the significance of biochemical parameters between the patient and control groups. A p - value of  $<0.05$  was considered significant.

### 3. Results

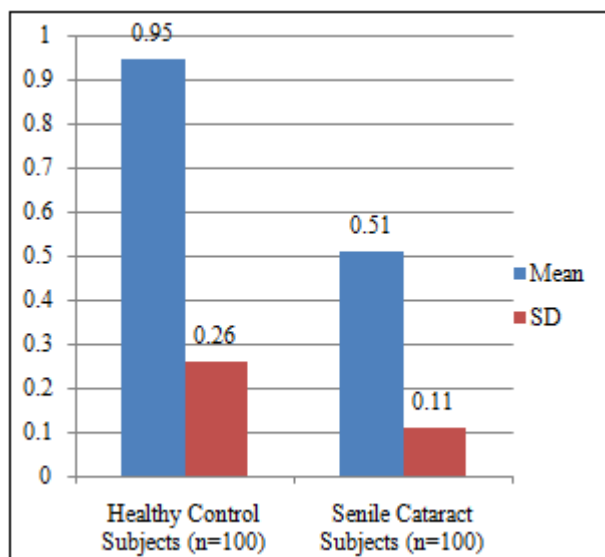
The level of non - enzymatic antioxidant Vitamin C was significantly decreased in cataract patients ( $p<0.0001$ ) compared to the healthy subjects. (Table1).

**Table 1:** Serum Vitamin C in Senile cataract patients and healthy subjects

Values	Healthy Control Subjects (n=100)	Senile Cataract Subjects (n=100)
Mean	0.95	0.51
Range	0.38 - 1.58	0.29 - 0.71
SD	0.26	0.11
T	15.99	
DF	198	
p - value	$<0.0001$	

n= Number of cases or control groups  
HS=Highly significant

All values are expressed in mean  $\pm$  SD



**Figure 1:** Comparison of Vitamin C level of the healthy controls and senile cataract subjects

### 4. Discussion

The study had shown certain significant findings. The pathophysiology behind the age - related cataract is complex and it has yet to be fully understood. It is believed that oxidation is a very early or initial event in the overall process in the sequence of events that lead to cataracts. [13]

D'Silva et al. [14] reported a significant decrease in serum levels of vitamin C in senile cataract patients with respect to control groups. Our study also shows significantly decreased levels of Vitamin C in senile cataract which may be due to its utilization by counteracting reactive oxygen species or due to its oxidation by superoxide which has been reported earlier [15]

Decrease in the levels of non - enzymatic antioxidants such as Vitamin C, suggests that there is an increased defense mechanism against oxidative damage in cataract. The decrease in the levels of non - enzymatic antioxidant parameters may be due to an increased turnover for preventing oxidative damage in these patients. [16] Jacques et al. [17] reported decreased incidence of cataract with elevated vitamin C level in blood. An inverse relation of plasma vitamin C with cataract in older Indian population has also been reported. [18]

The observations of present study are in close agreement with previous studies by Ghazala et al. [19] and Bhatia et al. [20], but the studies conducted by Nourmohammadi et al. [21] and Delcourt et al. [22] showed over expression of antioxidants to be associated with cataract.

Vitamin C is considered the most important antioxidant in extracellular fluids and the only endogenous antioxidant that can completely protect the lipids from detectable peroxidative damage induced by aqueous peroxy radical. Vitamin C acts as a co - antioxidant by regenerating  $\alpha$  - tocopherol from  $\alpha$  - tocopheroxy radical produced during the scavenging of ROS [23]

A Study by Valero and co - workers observed that high plasma level of vitamin was associated with reduced risk of cataract in a Mediterranean population characterized by high intake of vitamin C. Studies suggest protective role of vitamin C on the ageing lens. [24]

### 5. Conclusion

In conclusion, the present study revealed that serum vitamin C level in senile cataract patients was lower than normal individuals. Antioxidant therapy may have a role to play in delaying the onset and progression of senile cataract.

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