

Original Article**Vitamin C concentration of Aqueous humor in senile Cataract**

A.M. Miratashi MD\*, M.R. Besharati MD\*, M.R. Shoja MD\*\*

**ABSTRACT**

**Background:** Oxidative agents like ultraviolet are one of the important cause of cataract and vitamin C is an important water soluble antioxidant agent in the aqueous humor. This study aimed to evaluate the concentration of vitamin C in the aqueous and plasma of patients with senile cataract.

**Methods:** In a descriptive cross- sectional study on 85 patients (41 men and 44 women) admitted for cataract surgery, aqueous (0.2 ml) and blood (5ml) were sampled just before operation under general anesthesia from anterior chamber and vein, respectively. Spectrophotometer measured the concentration of vitamin C in both samples.

**Results:** The mean age was  $64.3 \pm 11.1$  years. Aqueous and plasma concentration of vitamin C was  $4.29 \pm 1.11$  mg/dl and  $0.77 \pm 0.0332$  mg/dl, respectively. The differences were statistical significant ( $P \approx 0$ ). Vitamin C of aqueous were equal in both sexes, but vitamin C of plasma in women were higher than men ( $P = 0.043$ ). The concentration of vitamin C showed no relation to the type of cataract.

**Conclusions:** Vitamin C of aqueous and plasma in senile cataract are lower than normal. More study is recommended for evaluating preventive effect of high vitamin C diets or supplements.

**Key words:** Senile Cataract, Vitamin C, Aqueous, Plasma

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Cataract is one of the most important preventive causes of blindness in the world, which has caused 15 million blind nesses. Senile cataract is the most prevalent form of it and has great social and economical important <sup>1</sup>. The most important risk factors of senile cataract is ultraviolet (UV), especially UV-B, which acts as oxidant agent <sup>2-6</sup>. Senile changes of crystals of lens such as oxidation leading lens to gloom and cataract <sup>7</sup>.

Vitamin C is one of the most important antioxidant agents <sup>8</sup>. Many studies on animals showed that the food without vitamin C (produced by shining of UVB as an oxidative stress) result in cataract after some weeks <sup>4</sup>.

The risk of cataract has been lower in people who consume 60 mg or more vitamin C (by food or its substitute) daily <sup>9</sup>. This finding is also confirmed through epidemiologic studies

and clinical experiments that vitamin C reduces oxidative damages <sup>10</sup>. In one study on operated lenses, the amount of lens opacity was in harmony with vitamin C concentration of lens <sup>11</sup>.

Because there is too much sunshine in Iran, especially in Yazd, the prevalence of cataract may be relatively high. Our aim was to measure the concentrations of vitamin C in aqueous and plasma in patients with senile cataract.

**Subjects and Methods**

This descriptive, cross- sectional, consecutive study was done at Rah-Ahan hospital, Yazd, Iran. The subjects were senile cataract patients who consulted ophthalmology ward for cataract surgery at the time of study. They were 40 to 85 years-old with no history of any disease.

\*Associate professor, Department of ophthalmology, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

\*\*Assistant professor, Department of ophthalmology, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

Correspondence to: Dr Ali Mohammad Miratashi, Rejaie Ave, University of Medical Sciences Yazd, Iran.

E-mail: Dr-miratashi@yahoo.com

Following anesthesia and just before cataract surgery in every case, 0.2 ml of aqueous was withdrawn from the anterior chamber through limbus, and then capsulotomy was done by a needle connected to ringer serum. At the same time, 5 ml of patient's blood was sampled too.

Spectrophotometer and colorimeter measured the concentration of vitamin C in both samples. At first, wave lengths of the specimens were identified, and then changed to measurement of vitamin C, using special curves.

**Results**

In 85 patients (41 men and 44 women), the mean of senile slope was 64.3±11.1, ranged from 40 to 85.

Vitamin C concentration of aqueous was 4.292± 1.11 (mg/dl), ranged from 0.76 to 6.06 mg/dl, with confidence interval 95% from 4.05 to 4.54 mg/dl. Vitamin C concentration of aqueous and plasma according to the age and sex are shown in Table 1 and Figure 1 (P value=0.461).

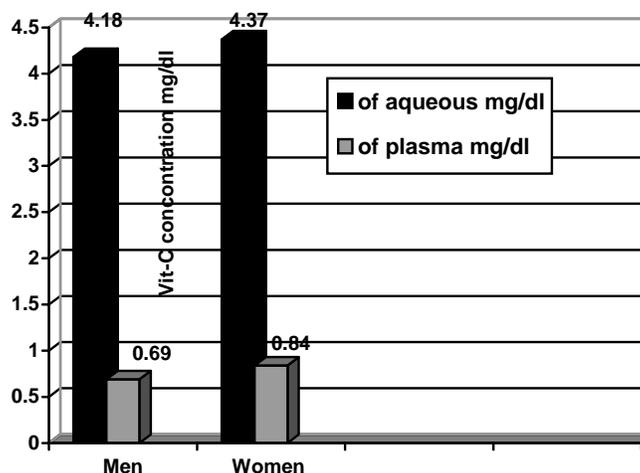
The mean plasma concentration of vitamin C in patients was 0.77± 0.332(mg/dl) ranged from 0.26 to 2.2 mg/dl, with confidence inter-

val 95% from 0.70 to 0.84 (mg/dl).The relation between vitamin C concentration of aqueous and of plasma was accounted by Pearson relation coefficient (r= 0.175, P value=0.11), but its difference with zero was not significant. In addition, there was a positive relation; as the mean vitamin C of plasma increases, vitamin C density of aqueous increases, too.

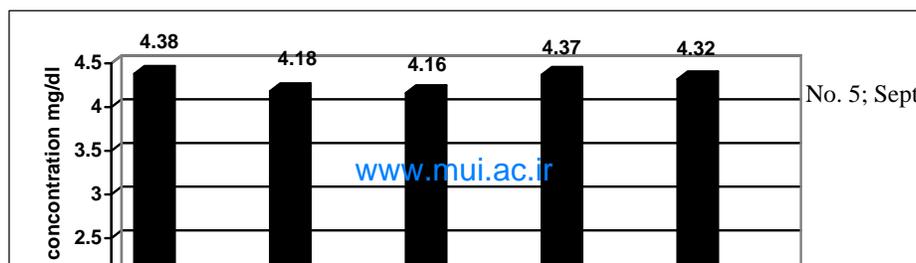
**Table 1.** Vitamin C concentrations of aqueous and plasma according to age

Age	numbers	Vitamin C concentration of aqueous		Vitamin C concentration of plasma	
		Mean mg/dl	SD	Mean mg/dl	SD
40-59	27	4.62	1.00	0.72	0.22
60-69	27	4.2	1.1	0.83	0.39
70-85	31	4.08	1.2	0.76	0.36
Total	85	4.29	1.14	0.77	0.33

Figure 2 presents vitamin C concentrations of aqueous and plasma in different types of cataract, without significant difference between them.



**Figure 1.** Vitamin C concentration of aqueous and plasma according to sex



**Figure 2.** Vitamin C concentration of aqueous and plasma in different types of cataract

## Discussion

Foodstuffs including antioxidant (such vitamin C) have protective effect against some chronic diseases such as cancer, cardiac diseases and cataract <sup>4, 9-15</sup>. Moreover, a dose of 90-100 mg vitamin C daily is advised for women and non smoker men in many epidemiologic studies <sup>4, 5, 12, 16-18, 20-23</sup>.

Recently, non surgical approaches which can delay cataract progression have been taken into consideration. If cataract formation delayed for 10 years, 45% of patients who need surgery will be reduced <sup>16</sup>.

Vitamin C is one of the most important antioxidant which solves in aqueous. Normally, its concentration in serum and aqueous is 0.6-2 mg/dl and 60-85 mg/dl, respectively, and in many cataract patients, it reach to 30-50 times of plasma, and for lens transparency it must be in the state of reduced <sup>17-19</sup>.

In our study, the mean concentration of vitamin C (either plasma or aqueous) was significantly different from normal range, especially for aqueous. The concentration of vitamin C in plasma is not related to the age (P value= 0.446) but in aqueous, it decreases as the age increases (P value=0.179). In addition, it is significantly higher in women than men (P value=0.043) (Figure 1).

Bates studied 7 patients with both- sided cataract, operated one of their eyes, analyzed materials of operated lenses, put four of them on placebo and the rest on vitamin C or other materials for 3 months. Then, he operated cataract of another eye and conclude that vitamin C concentration of aqueous and lens (of those which were put on vitamin C) had been increased <sup>20</sup>. In another study on 77 cataract patients, plasma density of vitamin C was lower than controls (P<0.05) <sup>18</sup>, which are in agreement with our study. In addition, we found that vitamin C density of aqueous is lower than normal, too.

Vitamin C concentration of plasma was not related to the age; Birlouez et al measured it in old persons who lived at nursing home and elders who lived at home, and concluded that the lack of vitamin C in the first group was related to the environmental factors rather than their age <sup>21</sup>. In our study, vitamin C density decreases as the age increases, but the decrease was not significant (P=0.179).

In some reports, senile cataract was more prevalent in women than men <sup>1</sup>. In this study, vitamin C of aqueous was slightly higher in women than men without statistical significant, however, when vitamin C concentration of plasma was compared in both sexes it was

significantly higher in women than men ( $P=0.043$ ), because women are at home more often than men and have easy access to foods with vitamin C.

Tessier et al studied vitamin C concentration of operated lenses and their relation to the intensity of lens turbidity. He found that vitamin C concentration decreased as lens turbidity increased. He concluded that vitamin C of lens is a good indicator for cataract intensity<sup>11</sup>

We compared relation of all kinds of cataract (mature, hyper-mature, cortical and posterior sub-capsular) with vitamin C density of aqueous and plasma, but our findings were not insignificant.

With regard to our results, and too much sunshine in Iran especially in Yazd, it the study of adding food- stuffs and vitamin C to the diet of cataract patients is recommended.

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***Notice of inadvertent duplicate publication***

The *JRMS* regrets that the paper "Vitamin C concentration of Aqueous Humor in Senile Cataract" by A.M. Miratashi et al (Sept & Oct 2005; 10(5):269-273) was substantially similar to a paper published in the *Asian Journal of Ophthalmology* entitled "Evaluation of Vitamin C concentration of Aqueous Humor in Senile Cataract" by Miratashi SAM, et al (2004; 6(2):6-9). However, we were not told in time of the existence of the earlier paper, in contravention of our instructions to authors and of internationally agreed guidelines.