Original Article

ANTIOXIDANT STATUS IN PERSONS WITH AND WITHOUT SENILE CATARACT

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ABSTRACT

Objective: To investigate the relationships between dietary intake of antioxidant vitamin C, E and A and nuclear, cortical and posterior sub capsular cataracts in a group of elderly men and women.

Design: Cross-sectional survey based on a retrospective case-control study.

Subjects: 40 patient men and women aged 40-79 years old with senile cataract and 26 persons without cataract the same age range were selected among the patient referred to the ophthalmic clinic of Motahary Center.

Setting: The lens-opacities classification system (LOCS) III was used to grade nuclear, cortical, and posterior sub capsular lens opacities. Fasting blood samples were taken to assess plasma concentrations of vitamin C. Food frequency questionnaires were incorporated for recognition of their food habits.

Results: Plasma level of vitamin C in cataract patient (0.9 ± 0.6 mg/dl) were significantly ($p<0.002$) lower than control group (1.4 ± 0.5 mg/dl). Dietary intake of vitamin C ($p<0.001$), vitamin E ($p<0.001$) and vitamin A ($p<0.04$) in cataract patient were significantly lower than control group. In this group of elderly cataract patient we found statistically significant association between nuclear ($p<0.006$) and posterior sub capsular opacities ($p<0.01$) and dietary intake of antioxidant vitamin C, E and A.

Conclusion: These findings suggest that a diet rich in antioxidant vitamin C, E and A may have implications for delay or prevention of senile cataract formation.

KEYWORDS: Senile cataract, Dietary antioxidant vitamin C, A, E,; Shiraz-IRAN.

Pak J Med Sci April-June 2004 Vol. 20 No. 2 121-123

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* Received for publication: November 13, 2003

Revision received: February 21, 2004

Revision accepted: March 30, 2004

INTRODUCTION

It is commonly believed that oxidative stresses play an important role in the etiology of senile cataract[1]. Over the last decade there has been growing interest in the possibility that a diet rich in antioxidant vitamins might be able to reduce the risk of cataract by protecting the lens proteins from oxidative modification. Vitamin C and E are known to be effective at scavenging free radicals and eliminating pro-oxidants[2]. Animal models have demonstrated that supplements of vitamin C or E can limit lens damage after oxidative insult[3], and observational studies have provided some evidence that higher intakes of these vitamins may be protective in humans[4]. We used the lens opacities classification system (LOCS) III[5] to assess

nuclear, cortical, and posterior sub capsular lens opacities in a group of elderly men and women. Our aim was to investigate the relationship between nutritional status (dietary intake of vitamin A, E and C) and the presence of senile cataract.

SUBJECT AND METHODS

Subjects

Forty patients with cataract which were referred to ophthalmic clinic in Motahary Center and 26 persons without cataract of the same age (± 2) were selected.

Participants underwent an examination by an ophthalmologist who asked about history and after pupil dilatation, made a quantitative assessment of nuclear, cortical, and posterior sub capsular lens opacities at slit lamp, according to the LOCS III[6]. The presence of nuclear cataract was defined by a grade of ≥ 3 on the nuclear opalescence scale, cortical cataract by a grade of ≥ 2.0 on the cortical opalescence scale, and posterior sub capsular cataract by a grade of ≥ 0.5 on the posterior sub capsular scale.

Measurements

At the clinic, 5ml of fasting venous blood sample were taken for measurement of plasma concentration of vitamin C via 2, 4 dinitrophenyl hydrazine with use of UV/vis spectrophotometer at 520 nm. To determine Vitamine A, E, and C in the diet, food frequency questionnaire were analyzed with Nutrition III software.

Statistical analysis:

The statistical package for social sciences (SPSS) was used for statistical analysis. Student t-test, chi-square, and analysis of variance were used in the statistical analysis.

Table-I: Characteristic of the study participants

Characteristic	*Case N=40*	*Control N=26*	*p-value*
	Mean ± SD		
Age (yrs)	64.4±8.4	63.6±6.3	NS
Weight (kg)	64.1±11.4	68.6±12.4	
Height (cm)	160.6±9.6	160±7.7	
BMI (kg/m^2)	24.8±3.4	26.8±4.3	P<0.04
Education			
ILL. (%)	47.5 (19)	15.4 (4)	
Lit. (%)	52.5 (21)	84.6 (22)	
Plasma vitamin C (mg/dl)	0.9±0.6	1.4±0.5	P<0.002
Dietary vitamin			
Vitamin C (mg/day)	100.8±75.7	205±174.3	P<0.001
Vitamin E (mg/day)	1.4±1.1	2.9±1.3	P<0.001
Vitamin A (IU/day)	6993.1±630.7	14751.6±2217.9	P<0.04

RESULTS

Table I, shows the baseline characteristics of patients with cataract and control group. The age of patients and controls at baseline ranged from 40 to 79 (mean 64) years. Forty patients (47.5% of female, 52.5% male) and 26 control group (61.5% female and 38.5% male) who were selected from patient referred to the ophthalmic clinic of Motahary Center.

Body Mass Index(BMI) was significantly higher (p<0.04) in control group than case group, control group were more educated (84.6% literate and 15.4% illiterate) as compared to case group (47.5% illiterate and 52.5% literate).

The mean plasma concentration of vitamin C in patients with cataract were significantly (p<0.002) lower than those of control group (table I). The mean dietary vitamin C, E and A intake in patient with cataract were significantly lower than those of control groups (table I). None of the study participants were taking supplementary vitamin C, E or A at the time of this study.

As shown in table II, all patient had a degree of three types of cataract, for example 25 participants (62.5%) had a nuclear cataract

Table-II: Distribution of lens opacity by location

Type / *Degree*	*Nuclear*		*Cortical*		*Posterior subcapsular*	
	No	*%*	*No*	*%*	*No*	*%*
0-trace	4	10	11	27.5	10	25
I	4	10	8	20	4	10
II	7	17.5	13	32.5	9	22.5
III	25	62.5	5	12.5	17	42.5
IV	-	-	3	7.5	-	-
Total	40	100	40	100	40	100

degree III, 5 (12.5%) had a cortical cataract degree III and 17 (42.5%) had a posterior sub capsular cataract degree III (table II).

Our result indicates that low vitamin C intake had statistically significant effect on nuclear cataract ($p<0.006$) and posterior sub capsular cataract ($p<0.01$) (table III).

Low vitamin E intake had statistically significant effect on nuclear cataract ($p<0.001$) and posterior sub capsular cataract ($p<0.01$) but low vitamin A intake had only significant effect on nuclear cataract ($p<0.038$) (table III).

Table-III: Correlation coefficient for nuclear, cortical and posterior subcapsular and dietary intake of vitamin C, E and A

Type of cataract Dietary vitamin intake	*Nuclear*		*Cortical*		*Posterior subcapsular*	
	*c.c.**	*P-value*	*c.c.*	*P-value*	*c.c.*	*P-value*
Vitamin C (mg / day)	-0.427	0.006	0.011	0.948	0.403	0.01
Vitamin E (mg / day)	-0.524	0.001	-0.17	0.294	-0.396	0.01
Vitamin A (IU / day)	-0.329	0.038	0.131	0.422	-0.275	0.286

*c.c.= spearman correlation coefficient; Significant, P-value <0.05

DISCUSSION

The mechanisms of development of cataracts related to age are still disputed, but oxidative damage of lens protein is believed to play an important part in the process[7], the resistance of the lens declines with age, as does its intrinsic defense system. Antioxidants such as vitamins C, E and β-carotene may thus modify the antioxidant defense and age related development of cataracts[7].

In this group of elderly people, we found statistically significant association between nuclear and posterior sub capsular opacities with low dietary intake of vitamin C and E. Low vitamin A intakes had only significant effect on nuclear cataract ($p<0.038$). Risk of nuclear cataract increase with low plasma concentration of vitamin C.

Our findings are also consistent with those of experimental studies in animals and three cross sectional and case-control studies reporting a high risk of cataract in people with low serum concentrations of two or more antioxidants[8,9].

Our findings also confirm those of some previous cross-sectional and case-control studies that reported an increased risk of cataract in subjects with low supplementary intake vitamin E[10]. In a prevalence survey in Australia, rates of nuclear and posterior sub capsular cataract were greater in people with lower intakes of vitamin E[11].

Findings in this study suggest that more consumption of fruit and vegetable which are rich in antioxidant vitamin C, E and A in daily dietary intake of elderly people may delay or prevent of senile cataract.

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