Evaluation of Impact of Life-Style-Related Risk Factors in Age-Related Cataract

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Abstract- Cataract is a multifactorial ocular disease, resulting in turbidity or opacity of the lens of the eyes, which leads to blindness or reduction of visuality. The different environmental, socio-economical, and lifestyle factors indicate as risk factors of age-related cataracts. The aim of this study was the evaluation of daily activity, dietary regimen, residence location and *etc.,* as risk factors of age-related cataracts. In this census, a cross-sectional study was performed on 353 patients with age-related cataract underwent surgery, who referred to Rouhani Hospital in Babol, Iran from 2018 to 2019, and 343 healthy individuals. The lifestyle-related information was collected from all individuals via the designed questionnaire. Our results showed that there were significant correlations between the birth/residence in the village (comparing to city, *P*<0.001), abnormal sleeping time (*P*<0.001), daily activity (and being outdoor, *P*<0.001), and use of solid oil (*P*<0.001) with increasing in age-related cataracts. Furthermore, the use of antioxidant-containing fruits significantly reduces the risk of age-related cataracts. Our results established that lifestyle clearly has a golden impact on age-related cataracts. The reduction in daily activity, normal sleeping time, and more use of antioxidant-containing dietary regimen play a preventive role in age-related cataracts.

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Keywords: Age-related cataract; Life-style; Risk factor; Dietary regimen

Introduction

A cataract is a multifactorial ocular disease, resulting in turbidity or opacity of the lens of the eyes (1). In 2007, cataracts led to reducing vision in 80 million people worldwide and blindness in 18 million people (2). Blurred vision, faded colors, and low vision at night are symptoms of a cataract. Nuclear sclerotic or brunescent cataracts are two major symptoms with poor prognosis, which often led to reduction of vision. The sclerotic nuclear state is corresponding to distant visual impairment. Various studies established the role of UV-/X-ray radiations, toxins, background diseases (i.e., diabetes mellitus and hypertension), age, trauma, genetics, skin diseases, smoking and alcohol, inadequate vitamin C, medications, postoperative implications and *etc.* as the risk factor of cataract (3-7).

The most important indicator in a cataract is aging. In age-related cataracts, the proteins in the lens are degraded over time. However, there are various risk factors corresponding to accelerating this protein denaturation, for example, diabetes mellitus and hypertension, which are common in the aged population (8). Also, there is an accumulation of destructive effects of toxins and radiation (9).

Due to the high prevalence of cataracts among people and its high financial burden for governments, the prevention of cataracts is highly-important (10). Identifying risk factors for cataracts can lead to effective prevention and treatment that reduce the economic burden and health of the disease. Also, the last studies indicated that lifestyle plays a key role in the development of cataracts. The correction of lifestyle leads to the prevention of various multifactorial diseases, i.e., age-

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related cataracts. Due to the fact that oxidative reactions are effective in lens pathology (11), it is assumed that foods containing antioxidants and vitamins E and C will be effective in reducing lens damage (12). Furthermore, less exposure to radiation and other mentioned risk factors is the desired approach for the prevention of cataracts. In this study, we evaluated the impact of lifestyle-related risk factors in the development of age-related cataract.

Materials and Methods

Case and control sampling

This census cross-sectional study performed on all patients who referred to Rouhani Hospital in Babol, Iran from 2018 to 2019, and were diagnosed with cataracts and surgical indications (including (i) the patient's desire to improve vision, (ii) medical problems caused by cataracts such as glaucoma and uveitis, and (iii) observation of ocular fundus in diabetic patients). Also, the control group were passed the ophthalmological examinations to make sure from healthy state in terms of cataracts. The life-style-related information was collected from all patients who underwent surgery and normal individuals, based on designed questionnaire. This study was approved in ethic committee of Babol University of Medical Sciences, Babol, Iran (IR.MUBABOL.HRI.REC.1398.091).

Inclusion and exclusion criteria

The inclusion criteria include (i) age between 40 to 70 years for case and control groups, (ii) confirmed age-related cataracts (for case group) and confirmed healthy status (for control group) via clinical examinations by ophthalmologist, and (iii) surgical indication for case group.

Also, the patients with congenital cataracts, history of surgeries in the cataracted eye, history of trauma in the cataracted eye, secondary cataract, opacity of the lens due to contact with certain chemicals, and patient with age less than 40 years and more than 70 years (due to the normalization with the control group) were excluded from this study.

Statistical analysis

All statistical analysis was performed using SPSS22 via descriptive statistics and chi-squared tests. Also, 5% ($P<0.05$) were admitted as a significant level.

Results

Demographic results

In this census cross-sectional study, 353 patients (as case group) and 343 healthy individuals (as the control group) participated. The averages of ages were 58.82 ± 5.32 and 58.07 ± 4.05 in the case and control group, respectively.

Correlation of birth and residence location with cataract prevalence

The result of the analysis of the correlation of birth and residence location with cataract prevalence showed that there is a significant correlation between the birth and residence location and cataract prevalence. ($P<0.001$) In another world, birth and residence in the village is a risk factor for cataract. In this study, 268 (75.9%) of the patients are born in the village, and 212 (60.1%) are lived in the village. While in the control group, 168 people (49.0%) were born in the village, and 141 people (41.1%) lived in the village (Table 1).

Table 1. The correlation of birth and lodging location with cataract prevalence.

	Location	Group	Case	Control	Total	*P*
Birth/ location	**City**	N	85	175	260	<0.001
		%	24.1	51.0	37.4	
	Village	N	26	168	436	
		%	75.9	49.0	62.6	
Residence/ location	**City**	N	141	202	343	<0.001
		%	39.9	58.9	49.3	
	Village	N	212	141	353	
		%	60.1	51.1	50.7	

Correlation of daily behaviors with cataract prevalence

In this study, the correlation of daily behaviors (i.e., daily activity, being outdoors, and sleeping time) with cataract prevalence was investigated. Regarding daily activity, our result shows that there is a clear and significant correlation between the activity time and cataract. ($P<0.001$) In other words, long-term activity (more than three hours per day) is a risk factor for cataracts. Furthermore, increasing in outdoor-time significantly correlates with increases in the cataract risk factor. ($P<0.001$) Regarding sleeping time, our results

showed that excessive sleeping time (more than nine hours per day) significantly increases the risk of cataracts.

(*P*<0.001) (Table 2).

Table 2. The correlation of daily activity, being outdoors, and sleeping time with cataract prevalence

	Schedule	Group	Case	Control	Total	*P*
Daily activity	Few (less than one hours per day)	N	53	99	152	<0.001
		%	15.0	28.9	21.8	
	Moderate (between one to three hours per day)	N	106	244	350	
		%	30.0	71.1	50.3	
	Long time (more than three hours per day)	N	194	0	194	
		%	55.0	0.0	27.9	
Being outdoors	Few (less than one hours per day)	N	93	187	280	<0.001
		%	26.3	54.5	40.2	
	Moderate (between one to three hours per day)	N	119	156	275	
		%	33.7	45.5	39.5	
	Long time (more than three hours per day)	N	141	0	141	
		%	39.9	0.0	20.3	
Sleeping time	Sleep deprivation (less than six hours per day)	N	18	30	48	<0.001
		%	5.1	8.7	6.9	
	Normal sleep (between six to nine hours per day)	N	280	313	593	
		%	79.3	91.3	85.2	
	Excessive sleeping (more than nine hours per day)	N	55	0	55	
		%	15.6	0.0	7.9	

Correlation of daily regimen and risk of cataract

Daily regimens were categorized to the antioxidant-containing fruits (i.e., citrus, pomegranate, apple, banana, tomato, spinach, pepper, olive, garlic, and onion), drinks (beverages, i.e., water, yogurt drink, soft drink, and herbal tea), carbohydrates (i.e., potato and bread), lipids (i.e., solid oil, liquid oil, and tail oil), dairy and honey. The statistical analysis showed that daily use of antioxidant-containing fruits including citrus (*P*=0.003), pomegranate (*P*<0.001), apple (*P*<0.001), banana (*P*=0.01), tomato

(*P*<0.001), pepper (*P*<0.001), olive (*P*<0.001) and garlic (*P*<0.001), drinks including yogurt drink (*P*<0.001), soft drink (*P*<0.001) and herbal tea (*P*<0.001), carbohydrate including bread (*P*=0.006) and potato (*P*<0.001), lipids including liquid oil (*P*<0.001) and tail oil (*P*<0.001), and honey (*P*<0.001) play a preventive role in cataracts. On the other hand, daily use of spinach (*P*<0.001), onion (*P*<0.001), solid oil (*P*<0.001), and diary (*P*<0.001) are significantly related to more prevalence of cataracts (Table 3).

Table 3. The correlation of dietary regimen with cataract prevalence.

Groups				Case	Control	Total	*P*
Beverages		Water	N	348	290	638	<0.001
			%	98.6	84.5	91.7	
		Yogurt drink	N	3	9	12	
			%	0.8	2.6	1.7	
		Soft drink	N	0	35	35	
			%	0.0	10.2	5.0	
		Herbal Tea	N	2	9	11	
			%	0.6	2.6	1.6	
Fruits	Citrus	Use	N	326	334	660	0.003
			%	92.4	97.4	94.8	
		No use	N	27	9	36	
			%	7.6	2.6	5.2	
	Pomegranate	Use	N	115	237	352	<0.001
			%	32.6	69.1	50.6	
		No use	N	238	106	344	
			%	67.4	30.9	49.4	
	Apple	Use	N	320	334	654	<0.001
			%	90.7	97.4	94.0	
		No use	N	33	9	42	
			%	9.3	2.6	6.0	
	Banana	Use	N	186	148	324	0.01
			%	52.7	43.1	48.0	
		No use	N	167	195	362	
			%	47.3	56.9	52.0	

				Con table 3.			
	Tomato	Use	N	335	343	678	<0.001
			%	94.9	100.0	97.4	
		No use	N	18	0	18	
			%	5.1	0.0	2.6	
	Spinach	Use	N	238	181	419	<0.001
			%	67.4	52.8	60.2	
		No use	N	115	162	277	
			%	32.6	47.2	39.8	
	Pepper	Use	N	112	239	351	<0.001
			%	31.7	69.7	50.4	
		No use	N	241	104	345	
			%	69.9	30.3	49.6	
	Olive	Use	N	77	161	238	<0.001
			%	21.8	46.9	34.2	
		No use	N	276	182	458	
			%	78.2	53.1	65.8	
	Garlic	Use	N	220	275	495	<0.001
			%	62.3	80.2	71.1	
		No use	N	133	68	201	
			%	37.7	19.8	28.9	
	Onion	Use	N	329	273	602	<0.001
			%	93.2	79.6	86.5	
		No use	N	24	70	94	
			%	6.8	20.4	13.5	
	Potato	Use	N	320	334	654	<0.001
			%	90.7	97.4	94.0	
		No use	N	33	9	42	
			%	9.3	2.6	6.0	
Carbohydrates	Bread	Use	N	333	337	670	0.006
			%	94.3	98.0	96.3	
		No use	N	20	6	26	
			%	5.7	1.7	3.7	
	Solid oil	Use	N	139	51	190	<0.001
			%	39.4	14.9	27.3	
		No use	N	214	292	506	
			%	60.6	85.1	72.7	
Lipids	Liquid oil	Use	N	253	28	539	<0.001
			%	71.7	83.4	77.4	
		No use	N	100	57	157	
			%	23.8	16.6	22.6	
	Tail oil	Use	N	38	93	131	<0.001
			%	10.8	27.1	18.8	
		No use	N	315	250	565	
			%	89.2	72.9	81.2	
Dairy		Use	N	313	251	564	<0.001
			%	88.7	73.2	81.0	
		No use	N	40	92	132	
			%	11.3	26.8	19.0	
Honey		Use	N	184	241	425	<0.001
			%	52.1	70.3	61.1	
		No use	N	169	102	271	
			%	47.9	29.7	38.9	

Discussion

Cataract, as an ocular disease that leads to blindness or loss of visuality, is a multifactorial disease, and approximately 50% of the causes of cataracts are age-related and genetic-related, and the rest are environmental and systemic factors. Individual factors (nutrition, disease, and medical factors) and environmental factors (UV and infrared rays), race, age, height, and socioeconomic status are involved in the development of age-related cataract (1,13).

At present, there is no effective treatment for cataracts other than surgery, which has many side effects and has many financial and economic costs. If a cataract is left untreated, the person will experience blindness and shortcomings in daily life that will be accompanied by

physical, emotional, and spiritual effects, as well as feelings of anger, frustration, and sadness. If the start of cataracts can be delayed by ten years, the number of surgeries will be reduced by 45% (4). Identifying risk factors for cataracts can lead to effective prevention and treatment that reduce the economic burden and health of the disease (14). In this study on climatic conditions (place of birth and residence) and their relationship with cataracts, our result showed that people living in the village had more age-related cataracts than people living in the city. This can be explained by the fact that most villagers are more exposed to sunlight and UV waves when they are engaged in agriculture, and most of them do not wear sunglasses. A 2011 study by Joan Robert in New York found that UV-A and UV-B induce cataract formation, and eliminating these waves reduces cataract risk and retinal damage (15).

The results of our study showed that daily outdoor activity for more than three hours was significantly associated with age-related cataracts. In other words, increasing daily activity and being outdoors is a risk factor for cataracts. Similar to our findings, Tang *et al.,* in China examined the relationship between outdoor activity and age-related cataract risk and concluded that outdoor activity was a cortical cataract risk factor (16). In our study, daytime sleepiness was shown to be associated with a significant chance of cataracts. It can be said that having a normal sleep between six and nine hours plays an effective role in preventing age-related cataracts.

In our study, the diets of patients and control individuals in terms of consumption of fruits, vegetables, bread, oil, dairy products, etc. were examined; which among the items examined, there was a statistically significant correlation between use of citrus, pomegranate, apple, banana, tomato, spinach. Pepper, potatoes, onions and garlic, liquid oil, olives, tail oil, dairy, bread and honey, and prevention of age-related cataracts. In other words, the use of these substances has been shown to be effective in preventing age-related cataracts. Also, in our study there was a significant relationship between solid oil consumption and age-related cataract, and it can be said that reducing solid oil consumption is effective in reducing age-related cataracts. A 2014 study by Karen *et al.,* in the United States found that cataract risk could be reduced with diets rich in vitamin C and lutein, vitamin B, omega-3 fatty acids, multivitamins and carbohydrates (17). A meta-analysis published by Chui *et al.,* in 2013 found that vitamin E and α-carotene and vitamin A were inversely related to age-related cataracts (18). Also, β-carotene and lycopene are not significantly associated with cataract

risk. A study by Ghanavati *et al.,* found that high intake of fruits, vegetables and dietary antioxidants reduce the risk of cataract (19). Our results also confirm these findings.

Acknowledgments

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