Original Article

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The Association of Underlying Diseases and Age-Related Cataracts in Iranian Patients

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Abstract

Background: Age-Related Cataracts (ARC) is a multifactorial ocular dysfunction resulting inblurred lens, visual reduction, and blindness. Various underlying diseases are involved in increasing the risk of ARC. The purpose of this study was to investigate the association of underlying diseases and related medications with ARC in Iranian patients.

Methods: In this case-control study, 353 patients (age between 40 to 70 years) with ARC were referred to Rouhani Hospital, Babol, Iran, and 343 control individuals (age between 40 to 70 years) participated. The history of underlying diseases of participants was collected by history-taking and self-expression. The cataract intensity and type determination was based on the Lens Opacities Classification System III (LOCS III).

Results: Our results show that obesity ($p < 0.001$), diabetes mellitus (OR = 0.422, 95% CI [0.285, 0.625], $p<0.001$) ,and hypertension (OR = 0.518, 95% CI [0.378, 0.712], $p<0.001$) are associated with prevalence of ARC (more prevalent in ARC patients compared to controls). The posterior subcapsular ARC is more prevalent in asthmatic ARC patients compared to non-asthmatic ARC patients ($p=0.019$). The prevalence of cortical ARC is higher in anemic ARC patients compared to non-anemic ARC patients ($p=0.031$). Cortical and posterior subcapsular ARC prevalence is higher in rheumatic ARC patients than non-rheumatic ARC patients ($p=0.006$). Also, atorvastatin use plays a preventive role in ARC ($p=0.031$).

Conclusion: Our results established that obesity, diabetes mellitus, hypertension, and asthma are associated with the prevalence of ARC. Also, atorvastatin, as a routine medication, plays a preventive role in ARC. Furthermore, asthma, anemia, and rheumatism are involved in prevalence of certain types of ARC.

Keywords: Age-related cataract, Diabetes mellitus, Hypertension, Asthma

Introduction

Age-Related Cataract (ARC) is a multifactorial ocular dysfunction resulting in blurred lenses, visual reduction, and blindness (1). Approximately, 50% of the causes of ARC are genetic, and the rest are related to aging, environmental, and systemic factors (2). Poor nutrition, male sex, white race, and age are involved in the development of ARC (3). Other factors include the use of drugs (corticosteroids), eye inflammation, diabetes, alcohol consumption, smoking, hypertension, body mass index, gender, trauma, eye diseases, and eye surgery. Therefore, the risk factors play an essential role in ARC. Surgery, which has many side effects and has many financial and economic costs, is the only therapeutic approach for ARC treatment. Therefore, applying a preventive approach to ARC leads to a reduction of ARC's prevalence. Alongside correction of lifestyle-related risk factors, the treatment or control of underlying diseases is helpful in a decrease in ARC development. Identifying the possible risk factors for ARC can lead to effective prevention and treatment of the disease (4).

Various underlying diseases are involved in increasing the risk of ARC, *i.e.* secondary ocular diseases (retinopathy of prematurity, retinal detachment, aniridia, retinitis pigmentosa, and uveitis), congenital diseases (cytomegalic inclusion disease, cockayne syndrome, congenital syphilis, and rubella), genetic disorders (Down syndrome, Edwards syndrome, and Patau syndrome), infectious diseases (onchocerciasis, toxoplasmosis, leprosy, cysticercosis, and varicella), and metabolic diseases (cerebrotendinous xanthomatosis, diabetes mellitus, Fabry disease, Lowe syndrome, Wilson disease, galactosemia cataract, homocystinuria, hypoparathyroidism, hypothyroidism, hyperparathyroidism, hypervitaminosis D, hypocalcemia, and mucopolysaccharidoses) (5-8). However, the association of other underlying diseases with ARC is not fully characterized yet (9).

The risk factors of ARC for the Asian population are not well-known (10). Most studies have assessed risk factors for different types of cataracts in Western countries. A small number of studies on cataracts have recently been performed in Asian countries such as Japan, Taiwan, Singapore, and China (10-13). In Iran, accurate statistics on the number of people with cataracts are not available, and it is estimated that about 100,000 cataract surgeries are performed annually in Iran (14). In this study, the purpose was to investigate the association of underlying diseases (*i.e.* obesity, diabetes mellitus, anemia, hypertension, rheumatoid arthritis, and asthma) with ARC in Iranian patients.

Materials and Methods

Sample

In this case-control study, 353 patients with ARC were referred to Rouhani Hospital, Babol, Iran, and 343 control individuals participated. The history of underlying diseases of participants was recorded through history-taking and self-expression. Also, participants without ARC and other ocular complications were considered as controls.

The criteria for admission were patients having ARC for more than years confirmed by clinical examination by an ophthalmologist recommending surgery. In this study, patients with congenital cataracts, a history of other eye surgeries on the eye with cataract, a history of trauma to the eye with cataract, secondary cataracts, patients with lens opacity due to contact with certain chemicals, patients with retinal and uveal disorders (like uveitis, Retinitis Pigmentosa (RP), toxoplasmosis scars), diabetic retinopathy patients, as well as patients younger than 40 years were excluded from the study. Also, individuals older than 70 years were excluded from this study (in the patient and control group) due to the normalization of participants regarding age.

Clinical experiments

The cataract intensity and type determination were based on the Lens Opacities Classification System III (LOCS III) (15). Accordingly, the nuclear cataract has six degrees (N1-N6), the cortical cataract has six degrees (C1-C5), and the posterior subcapsular cataract has 5 degrees (P1-P5). The types of ARC were divided into four types based on the degrees obtained with the LOCS III system: 1) Nuclear type (N≥4, C≤ 2 and P≤ 2), 2) Cortical type (C≥3, P≤2 and N≤3), 3) Posterior subcapsular type (P≥3, C≤2 and N≤3), 4) Mixed type (which can be in four modes: (i) N≥4, C≥3, and any P, (ii) N≥4, P≥3, and any C, (iii) N≤3, C≤2 and P≤2, and (iv) P≥3, C≥3 and any N). The intensity of ARC was divided into mild (NC≤4,

C≤3 and P≤3), moderate (N=5, C=4, and P=4), and severe (N=6, C=5, and P=5). Also, anemia status was classified as anemic (hemoglobin less than 12 *mg/dl*) and normal (hemoglobin equal and more than 12 *mg/dl*) states. Hypertension was defined as systolic pressure of at least 140 or diastolic pressure of at least 90 *mmHg*. Also, diabetes mellitus was defined by fasting plasma glucose level of 126 *mg/dL* (7.0 *mmol/L*) or higher. Other diseases were diagnosed by specialist physicians.

Statistical analysis

All statistical analyses were performed using SPSS v.21 (IBM, USA). Due to two answer choices regarding the disease (yes/no), the number of participants in each group was reported via percentage (%). The level of significance was considered 5% ($p<0.05$). Also, one-way ANOVA followed by post-hoc multiple comparisons (*via* Bonferroni method) and chi-square were used for statistical analysis.

Results

Demographic statistics

In this cross-sectional study during 2017-2018, 353 patients with ARC (58.82±5.32-year-old) and 342 controls (58.07±4.05-year-old) have participated. From 353 ARC patients, 213 (60.3%) and 140 (39.7%) individuals were female and male, respectively. The results show that the prevalence of ARC in males is higher than in females ($p<0.001$). Also, there is no significant association between sex and type of ARC ($p=0.107$); nuclear ARC is more prevalent in males than females. Regarding ARC severity, 110 (31.2%) patients were diagnosed with mild ARC. Also, 108 (30.6%) and 135 (38.2%) cases were classified as patients with moderate and severe ARC, respectively. The association of obesity, diabetes mellitus, hypertension, and asthma with the prevalence of ARC Obesity significantly increases the risk of ARC ($p<0.001$). In normal Body Mass Index (BMI) (18.5 to 25 kg/m^2), there was no significant difference between patients and controls, but chi-square analysis showed that the prevalence of ARC is more in obese individuals. Also, diabetes mellitus (OR=0.422, 95% CI [0.285, 0.625], $p<0.001$) and hypertension (OR=0.518, 95%CI [0.378, 0.712], $p<0.001$) were significantly more prevalent in ARC patients compared to normal individuals.

Our results show that there is a reveres significant association between heart failure (OR=3.727, 95% CI [2.173, 6.394], $p<0.001$), renal failure (OR=3.203, 95% CI [1.256, 8.169], $p=0.010$), osteoporosis (OR=5.269, 95% CI [2.940, 9.442], $p<0.001$), osteoarthritis (OR=16.604, 95% CI [0.347, 26.645], $p<0.001$), and allergy (OR=15.636, 95% CI [6.700, 36.490], $p<0.001$) with ARC. In other words, the mentioned diseases are less prevalent in ARC patients compared to the normal group. Furthermore, our results established no association between anemia (OR=1.129, 95% CI [0.821, 1.552], $p=0.454$) and rheumatism (OR=1.602, 95%CI [0.914, 2.807], $p=0.098$) with the prevalence of ARC (Tables 1 and 2).

The association of anemia and rheumatism with the type of ARC

Anemia is not associated with ARC, but in ARC patients, anemia status was significantly associated with the type of ARC ($p=0.031$). The prevalence of cortical ARC is higher in anemic ARC patients compared to non-anemic ARC patients. Also, rheumatism was not associated with the prevalence of ARC, but in ARC patients, rheumatism status was significantly associated with the type of ARC ($p=0.006$). The prevalence of cortical and posterior subcapsular ARC is higher in rheumatic ARC patients compared to non-rheumatic ARC patients. Other underlying diseases and medications are not associated with the type of ARC. Also, none of the underlying diseases and medications are associated with the intensity of ARC (Table 3).

The association of atorvastatin and corticosteroids with prevalence of ARC, its type, and intensity

Our statistical analysis shows a significant association between the use of atorvastatin and the prevalence of ARC ($p=0.031$). In other words, atorvastatin plays a preventive role in ARC. However, there were no associations between atorvastatin and corticosteroids with the type ($p=0.192$ and 0.435, respectively) and intensity of ARC ($p=0.463$ and 0.935, respectively).

Discussion

ARC are multifactorial ocular pathologic states culminating in blurred vision and blindness (1). As a

Table 1. The association of underlying diseases and ARC

Type	Parameters			Group		Total	OR (95%CI)	p-value
				Case	Control			
Demographic data	Sex	Female	Count	213	255	468	1.905 (1.379, 2.630)	<0.001
			% within sex	45.5%	54.5%	100.0%		
		Male	Count	140	88	228		
			% within sex	61.4%	38.6%	100.0%		
	Body Mass Index (BMI)	Normal (18.5 to 25)	Count	86	93	179	-	<0.001
			% within BMI	48.0%	52.0%	100.0%		
		Fat (25 to 30)	Count	138	180	318		
			% within BMI	43.4%	56.6%	100.0%		
		Obese (more than 30)	Count	129	70	199		
			% within BMI	64.8%	35.2%	100.0%		
Underlying diseases	Diabetes mellitus	Disease	Count	93	45	138	0.422 (0.285, 0.625)	<0.001
			% within diabetes	67.4%	32.6%	100.0%		
		Normal	Count	260	298	558		
			% within diabetes	46.6%	53.4%	100.0%		
	Hypertension	Disease	Count	150	95	245	0.518 (0.378, 0.712)	<0.001
			% within hypertension	61.2%	38.8%	100.0%		
		Normal	Count	203	248	451		
			% within hypertension	45.0%	55.0%	100.0%		
	Heart failures	Disease	Count	19	60	79	3.727 (2.173, 6.394)	<0.001
			% within heart failures	24.1%	75.9%	100.0%		
		Normal	Count	334	283	617		
			% within heart failures	54.1%	45.9%	100.0%		
	Renal failures	Disease	Count	6	18	24	3.203 (1.256, 8.169)	0.010
			% within renal failures	25.0%	75.0%	100.0%		
		Normal	Count	347	325	672		
			% within renal failures	51.6%	48.4%	100.0%		
	Anemia	Anemic	Count	109	115	224	1.129 (0.821, 1.552)	0.454
			% within anemia	48.7%	51.3%	100.0%		
		Normal	Count	244	228	472		
			% within anemia	51.7%	48.3%	100.0%		
	Asthma	Disease	Count	9	0	9	-	0.003
			% within asthma	100.0%	0.0%	100.0%		
		Normal	Count	344	343	687		
			% within asthma	50.1%	49.9%	100.0%		
	Osteoporosis	Disease	Count	15	65	80	5.269 (2.940, 9.442)	<0.001
			% within osteoporosis	18.8%	81.3%	100.0%		
		Normal	Count	338	278	616		
			% within osteoporosis	54.9%	45 .1%	100.0%		

Cont Table 1

Medications	Rheumatism	Disease	Count	22	33	55	1.602 (0.914, 2.807)	0.098
			% within rheumatism	40.0%	60.0%	100.0%		
		Normal	Count	331	310	641		
			% within rheumatism	51.6%	48.4%	100.0%		
	Osteoarthritis	Disease	Count	23	184	207	16.604 (10.347, 26.645)	<0.001
			% within osteoarthritis	11.1%	88.9%	100.0%		
		Normal	Count	330	159	489		
			% within osteoarthritis	67.5%	32.5%	100.0%		
	Allergy	Disease	Count	6	73	79	15.636 (6.700, 36.490)	<0.001
			% within osteoarthritis	7.6%	92.4%	100.0%		
		Normal	Count	347	270	617		
			% within osteoarthritis	56.2%	43.8%	100.0%		
	Corticosteroids	Using	Count	19	9	28	0.474 (0.211, 1.062)	0.064
			% within corticosteroids	67.9%	32.1%	100.0%		
		Not using	Count	334	334	668		
			% within corticosteroids	50.0%	50.0%	100.0%		
	Atorvastatin	Use	Count	75	131	206	2.290 (1.638, 3.203)	<0.001
			% within atorvastatin	36.4%	63.6%	100.0%		
		Not using	Count	278	212	490		
			% within atorvastatin	56.7%	43.3%	100.0%		

Table 2. The association of underlying diseases and type of ARC

Type	Parameter			Type of ARC					p-value
				Nuclear	Cortical	Posterior subcapsular	Mixed	Total	
Demographic	Sex	Female	Count	42	41	55	75	213	0.107
			% within sex	19.7%	19.2%	25.8%	35.2%	100.0%	
		Male	Count	43	21	29	47	140	
			% within sex	30.7%	15.0%	20.7%	33.6%	100.0%	
	Body Mass Index (BMI)	Normal (18.5 to 25)	Count	27	17	16	26	86	0.057
			% within BMI	31.4%	19.8%	18.6%	30.2%	100.0%	
		Fat (25 to 30)	Count	36	28	29	45	138	
			% within BMI	26.1%	20.3%	21.0%	32.6%	100.0%	
		Obese (more than 30)	Count	22	17	39	51	129	
			% within BMI	17.1%	13.2%	30.2%	39.5%	100.0%	
	Diabetes mellitus	Disease	Count	16	15	22	40	93	0.155
			% within diabetes	17.2%	16.1%	23.7%	43.0%	100.0%	
		Normal	Count	69	47	62	82	260	
			% within diabetes	26.5%	18.1%	23.8%	31.5%	100.0%	

Cont Table 2

Underlying diseases	Hypertension	Disease	Count	28	30	34	58	150	0.141
			% within hypertension	18.7%	20.0%	22.7%	38.7%	100.0%	
		Normal	Count	57	32	50	64	203	
			% within hypertension	28.1%	15.8%	24.6%	31.5%	100.0%	
	Heart failures	Disease	Count	1	4	5	9	19	0.251
			% within heart failures	5.3%	21.1%	26.3%	47.4%	100.0%	
		Normal	Count	84	58	79	113	334	
			% within heart failures	25.1%	17.4%	23.7%	33.8%	100.0%	
	Renal failures	Disease	Count	1	0	2	3	6	0.601
			% within renal failures	16.7%	0.0%	33.3%	50.0%	100.0%	
		Normal	Count	84	62	82	119	347	
			% within renal failures	24.2%	17.9%	23.6%	34.3%	100.0%	
	Anemia	Anemic	Count	19	27	22	41	109	0.031
			% within anemia	17.4%	24.8%	20.2%	37.6%	100.0%	
		Normal	Count	66	35	62	81	244	
			% within anemia	27.0%	14.3%	25.4%	33.2%	100.0%	
	Asthma	Disease	Count	0	1	6	2	9	0.019
			% within asthma	0.0%	11.1%	66.7%	22.2%	100.0%	
		Normal	Count	85	61	78	120	344	
			% within asthma	24.7%	17.7%	22.7%	34.9%	100.0%	
	Osteoporosis	Disease	Count	1	4	4	6	15	0.407
			% within osteoporosis	6.7%	26.7%	26.7%	40.0%	100.0%	
		Normal	Count	84	58	80	116	338	
			% within osteoporosis	24.9%	17.2%	23.7%	34.3%	100.0%	
	Rheumatism	Disease	Count	0	4	11	7	22	0.006
			% within rheumatism	0.0%	18.2%	50.0%	31.8%	100.0%	
		Normal	Count	85	58	73	115	331	
			% within rheumatism	25.7%	17.5%	22.1%	34.7%	100.0%	
	Osteoarthritis	Disease	Count	5	1	6	11	23	0.283
			% within osteoarthritis	21.7%	4.3%	26.1%	47.8%	100.0%	
		Normal	Count	80	61	78	111	330	
			% within osteoarthritis	24.2%	18.5%	23.6%	33.6%	100.0%	
	Allergy	Disease	Count	1	1	3	1	6	0.481
			% within osteoarthritis	16.7%	16.7%	50.0%	16.7%	100.0%	
		Normal	Count	84	61	81	121	347	
			% within osteoarthritis	24.2%	17.6%	23.3%	34.9%	100.0%	

Cont Table 2

Medications	Corticosteroids	Use	Count	1	3	7	8	19	0.192
			% within Corticosteroids	5.3%	15.8%	36.8%	42.1%	100.0%	
		Not use	Count	84	59	77	114	334	
			% within Corticosteroids	25.1%	17.7%	23.1%	34.1%	100.0%	
	Atorvastatin	Use	Count	14	14	16	31	75	0.435
			% within atorvastatin	18.7%	18.7%	21.3%	41.3%	100.0%	
		Not use	Count	71	48	68	91	278	
			% within atorvastatin	25.5%	17.3%	24.5%	32.7%	100.0%	

Table 3. The association of underlying diseases and intensity of ARC

Type	Parameter			Intensity				p-value
				Mild	Moderate	Severe	Total	
Demographic	Sex	Female	Count	59	66	88	213	0.181
			% within sex	27.7%	31.0%	41.3%	100.0%	
		Male	Count	51	42	47	140	
			% within sex	36.4%	30.0%	33.6%	100.0%	
Underlying diseases	Body Mass Index (BMI)	Normal (18.5 to 25)	Count	28	26	32	86	0.866
			% within BMI	32.6%	30.2%	37.2%	100.0%	
		Fat (25 to 30)	Count	44	45	49	138	
			% within BMI	31.9%	32.6%	35.5%	100.0%	
		Obese (more than 30)	Count	38	37	54	129	
			% within BMI	29.5%	28.7%	41.9%	100.0%	
	Diabetes mellitus	Disease	Count	24	27	42	93	0.241
			% within diabetes	25.8%	29.0%	45.2%	100.0%	
		Normal	Count	86	81	93	260	
			% within diabetes	33.1%	31.2%	35.8%	100.0%	
	Hypertension	Disease	Count	42	41	67	150	0.102
			% within hypertension	28.0%	27.3%	44.7%	100.0%	
		Normal	Count	68	67	68	203	
			% within hypertension	33.5%	33.0%	33.5%	100.0%	
	Heart failures	Disease	Count	4	6	9	19	0.576
			% within heart failures	21.1%	31.6%	47.4%	100.0%	
		Normal	Count	106	102	126	334	
			% within heart failures	31.7%	30.5%	37.7%	100.0%	
	Renal failures	Disease	Count	1	2	3	6	0.724
			% within renal failures	16.7%	33.3%	50.0%	100.0%	
		Normal	Count	109	106	132	347	
			% within renal failures	31.4%	30.5%	38.0%	100.0%	

Cont Table 3

Medications	Anemia	Anemic	Count	34	33	42	109	0.996
			% within anemia	31.2%	30.3%	38.5%	100.0%	
		Normal	Count	76	75	93	244	
			% within anemia	31.1%	30.7%	38.1%	100.0%	
	Asthma	Disease	Count	2	2	5	9	0.556
			% within asthma	22.2%	22.2%	55.6%	100.0%	
		Normal	Count	108	106	130	344	
			% within asthma	31.4%	30.8%	37.8%	100.0%	
	Osteoporosis	Disease	Count	3	3	9	15	0.208
			% within osteoporosis	20.0%	20.0%	60.0%	100.0%	
		Normal	Count	107	105	126	338	
			% within osteoporosis	31.7%	31.1%	37.3%	100.0%	
	Rheumatism	Disease	Count	5	8	9	22	0.659
			% within rheumatism	22.7%	36.4%	40.9%	100.0%	
		Normal	Count	105	100	126	331	
			% within rheumatism	31.7%	30.2%	38.1%	100.0%	
	Osteoarthritis	Disease	Count	4	11	8	23	0.138
			% within osteoarthritis	17.4%	47.8%	34.8%	100.0%	
		Normal	Count	106	97	127	330	
			% within osteoarthritis	32.1%	29.4%	38.5%	100.0%	
	Allergy	Disease	Count	0	2	4	6	0.201
			% within osteoarthritis	0.0%	33.3%	66.7%	100.0%	
		Normal	Count	110	106	131	347	
			% within osteoarthritis	31.7%	30.5%	37.8%	100.0%	
	Corticosteroids	Use	Count	4	8	7	19	0.463
			% within Corticosteroids	21.1%	42.1%	36.8%	100.0%	
		Not use	Count	106	100	128	334	
			% within Corticosteroids	31.7%	29.9%	38.3%	100.0%	
	Atorvastatin	Use	Count	23	22	30	75	0.935
			% within atorvastatin	30.7%	29.3%	40.0%	100.0%	
		Not use	Count	110	108	135	353	
			% within atorvastatin	31.2%	30.6%	38.2%	100.0%	

multifactorial disease, ARC is affected by underlying diseases and lifestyles. Due to the high-cost burdens of ARC, it is crucial to reduce the risk of ARC. The correction of lifestyle is a preventive approach to reducing ARC's complications (6,16). Furthermore, the treatment of underlying diseases, which play a critical role in development of ARC, can prevent ARC. The purpose of this study was to investigate the possible associations between underlying diseases and ARC.

Our results show that obesity, diabetes mellitus, hypertension, and asthma are associated with ARC in Iranian patients. A 2014 study by Rim *et al* on South Korean people over the age of 40 was conducted and examined the association of cataracts with the diet of individuals between 2008 and 2010. It was found that older age, low monthly income, low education, hypercholesterolemia, hypertension, and diabetes mellitus were independently associated with any type of cataracts (17). This study suggests that optimal control of blood pressure, blood sugar, and cholesterol can help reduce the prevalence of cataracts in the South Korean population. In a 2013 meta-analysis by Prokofyeva *et al* on a selective population ranging in age from 40 to 95 years (between 1990 and 2009) who were clinically diagnosed with cataracts, it was found that smoking, diabetes mellitus, chronic asthma, bronchitis, and cardiovascular diseases increase the risk of cataracts (18).

In our study, the frequency of mixed cataracts (43.6%) and the frequency of nuclear type (24.1%) were higher than other types. Also, the severe type of ARC with 38.2% frequency was the most prevalent one regarding intensity among patients. In our study, out of 353 patients, 213 (60.3%) were women, and this percentage was not statistically significant, but in the subgroups, according to Bonferroni's method, it was found that the frequency of nuclear cataracts in men (30.7%) is significantly more than women (19.7%). In a 2014 study by Rim *et al* in South Korea, it was found that all types of cataracts (anterior polar cataracts) were more common in women compared to men (17).

In our study, a significant difference was observed in the BMI in the control group and the patient group, and it was found that BMI>25 is associated with ARC. In a 2011 study in Tehran by Sahebalzamani *et al* on 322 patients with ARC, it was stated that most patients are in the obesse group with BMI between 25 to 30 *kg/m2* (19). In our study, diabetes mellitus was a risk factor for ARC, and statisticallysignificant differences were found between two groups of patients and controla. Similar to our findings, in the study by Prokofyeva *et al*, Hojati *et al*, and Rim *et al*, diabetes mellitus was considered a risk factor for ARC (17,18,20).

The difference between the two groups of patients and controls over asthma was statistically significant in our study, indicating that asthma is an effective factor for development of ARC. Also, Prokofyeva *et al* found that asthma and chronic bronchitis increased the risk of cataracts (18). Also, our study found a significant association between asthma and posterior subcapsular ARC.

In our study, there was no statistically significant difference between corticosteroid use and ARC. Prokofyeva *et al* found that corticosteroids increase the risk of cataracts (18). In a study by Hekari *et al*, corticosteroid was a predisposing factor for ARC (21). Also, there was no significant relationship between corticosteroid use and certain types of ARC in our study.

It is recommended that a future prospective study be implemented that put a regimen for people on a special diet for 5 to 10 years, and then investigate the reduced effect of mentioned factors on decreasing the risk of ARC.

Conclusion

ARC is a multifactorial ocular dysfunction that results from aging. There are various risk factors associated with the progression of ARC. In this study, the purpose was to investigate the possible associations between underlying diseases and ARC. In brief, it was found that obesity, diabetes mellitus, hypertension, and asthma are potential risk factors of the prevalence of ARC. Also, the use of atorvastatin as a routine medication for hyperlipidemia has a negative association with the prevalence of ARC. Furthermore, asthma, anemia, and rheumatism are involved in prevalence of certain types of ARC.

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Conflict of Interest

All authors declare that there is no conflict of interest.

References

1. Ehmann DS, Ho AC. Cataract surgery and age-related macular degeneration. Curr Opin Ophthalmol 2017;28(1):58-62.

2. Shiels A, Hejtmancik JF. Mutations and mechanisms in congenital and age-related cataracts. Exp Eye Res 2017;156:95-102.

3. Ang MJ, Afshari NA. Cataract and systemic disease: A review. Clin Exp Ophthalmol 2021;49(2):118-27.

4. Ahmadpour-Kacho M, Motlagh AJ, Rasoulinejad SA, Jahangir T, Bijani A, Pasha YZ. Correlation between hyperglycemia and retinopathy of prematurity. Pediatr Int 2014;56(5):726-30.

5. Azimi M, Rasoulinejad SA, Pacut A. Iris recognition under the influence of diabetes. Biomed Tech (Berl) 2019;64(6):683-9.

6. Hedayati H, Ghaderpanah M, Rasoulinejad SA, Montazeri M. Clinical presentation and antibiotic susceptibility of contact lens associated microbial keratitis. J Pathog 2015;2015:152767.

7. Rasoulinejad SA, Montazeri M. Retinopathy of prematurity in neonates and its risk factors: A seven year study in northern Iran. Open Ophthalmol J 2016;10:17-21.

8. Rasoulinejad SA, Kasiri A, Montazeri M, Rashidi N, Montazeri M, Montazeri M, et al. The association between primary open angle glaucoma and clustered components of metabolic syndrome. Open Ophthalmol J 2015;9:149-55.

9. Rasoulinejad SA, Iri HO. Determination of serum lipid profile in patients with diabetic macular edema that referred to Shahid Beheshti and Ayatollah Rouhani Hospitals, Babol during 2011-2012. Caspian J Intern Med 2015;6(2):77-81.

10. Chua J, Koh JY, Tan AG, Zhao W, Lamoureux E, Mitchell P, et al. Ancestry, socioeconomic status, and age-related cataract in Asians: The Singapore Epidemiology of Eye Diseases Study. Ophthalmology 2015;122(11):2169-78.

11. Kuang TM, Tsai SY, Liu CJ, Ko YC, Lee SM, Chou P. Seven-year incidence of age-related cataracts among an elderly Chinese population in Shihpai, Taiwan: The Shihpai Eye Study. Invest Ophthalmol Vis Sci 2013;54(9):6409-15.

12. Zheng Y, Qu B, Jin L, Wang C, Zhong Y, He M, et al. Patient-centred and economic effectiveness of a decision aid for patients with age-related cataract in China: study protocol of a randomised controlled trial. BMJ Open 2020;10(5):e032242.

13. Chen X, Zhou DY, Shen J, Wu YB, Sun QZ, Dong JM, et al. Prevalence and risk factors on age-related cataract and surgery in adults over 50 years old in Binhu District, Wuxi, China. Int J Ophthalmol 2020;13(3):445-51.

14. Hashemi H, Pakzad R, Yekta A, Aghamirsalim M, Pakbin M, Ramin S, et al. Global and regional prevalence of age-related cataract: a comprehensive systematic review and meta-analysis. Eye (Lond) 2020;34(8):1357-70.

15. Chylack LT, Jr., Wolfe JK, Singer DM, Leske MC, Bullimore MA, Bailey IL, et al. The lens opacities classification system III. The Longitudinal Study of Cataract Study Group. Arch Ophthalmol 1993;111(6):831-6.

16. Azimi M, Rasoulinejad SA, Pacut A. Age dependency of the diabetes effects on the iris recognition systems performance evaluation results. Biomed Tech (Berl) 2020.

17. Taek Rim TH, Kim MH, Kim WC, Kim TI, Kim EK. Cataract subtype risk factors identified from the Korea National Health and Nutrition Examination survey 2008-2010. BMC Ophthalmol 2014;14:4.

18. Prokofyeva E, Wegener A, Zrenner E. Cataract prevalence and prevention in Europe: a literature review. Acta Ophthalmol 2013;91(5):395-405.

19. Sahebalzamani M, Koosha S, Heydari MB, Safavi M, Farshid P, Esmaili I. [The study of participating factors of age-related cataract among patients referred to ophthalmology centers under supervision of Tehran University of medical sciences]. Medical Sciences J Islamic Azad University 2011;20(4):273-7. Persian.

20. Hojati H, Akhondzadeh G, Aloostani S, Rasoeleslami A. [Prevalence of morphology of the age-related cataract among patients referred to ophthalmology clinics of Amol and Babol cities in 2010]. Journal Geriatric Nursing 2014;1(1):32-42. Persian.

21. Hekari D, Mohammadzadeh R, Mohammadzadeh R. [Risk factors of age-related cataract in patients admitted to]. Medical Sciences 2006;16(1):39-42. Persian.