Relation between cataract and metabolic syndrome and its components

A. PAUNKSNIS[1], F. BOJARSKIENE[1], A. CIMBALAS[1], L.R. CERNIAUSKIENE[2], D.I. LUKSIENE[2], A. TAMOSIUNAS[2]

[1]Institute for Biomedical Research
[2]Institute of Cardiology, Kaunas University of Medicine, Kaunas - Lithuania

PURPOSE. *To estimate the prevalence of cataract in the middle-aged urban population and the relation between cataract and metabolic syndrome and metabolic syndrome components.*

METHODS. *The survey was carried out in Kaunas City, Lithuania, from 2001 to 2002, according to WHO MONICA study protocol. The ophthalmologic investigation was performed for 1282 respondents (573 men and 709 women) aged 35-64 years. Cataract was defined at slit lamp using LOCS III method. Metabolic syndrome was defined by ATP III criteria.*

RESULTS. *Cataract was found in 17.6% of men and 19.0% of women (p>0.05). Metabolic syndrome was detected in 19.5% of men and 25.7% of women (p<0.05). After distribution of persons into 10-year age groups (35-44, 45-54, 55-64), the prevalence of cataract and metabolic syndrome among men and women significantly increased with age. A relation between cataract and metabolic syndrome was found for men aged 55-64 years and for women aged 45-64 years: the prevalence of cataract in men with metabolic syndrome was 1.3 times higher (43.8% vs 32.9%; OR=1.59 [95% CI, 0.77-3.26]) and in women with metabolic syndrome 1.4 times higher (31.8% vs. 22.6%; OR=1.60 [95% CI, 1.03-2.49]) than in persons of the same age and sex without metabolic syndrome. For men aged 4-64 years cataract was significantly related to central obesity (OR=1.80 [95% CI, 1.01-3.20]) and for women aged 45-64 years cataract was significantly related to higher arterial pressure (OR=1.98 [95% CI, 1.21-3.25]), central obesity (OR=1.54 [95% CI, 1.01-2.35]), and elevated level of serum triglycerides (OR=1.86 [95% CI, 1.20-2.90]).*

CONCLUSIONS. *The results of this study show that the prevalence of cataract in urban women 45-64 years of age with metabolic syndrome was significantly higher than in women of this age without metabolic syndrome. (Eur J Ophthalmol 2007; 17: 605-14)*

KEY WORDS. *Cataract, Metabolic syndrome, Risk factors, Hyperglycemia, Obesity, Hypertension, Dyslipidemia*

INTRODUCTION

The number of people with visual impairment worldwide in 2002 exceeded 161 million; approximately 37 million of them were blind. Surveys made by the World Health Organization (WHO) show that cataract is a major cause of blindness and remains the leading cause of visual impairment in all regions of the world, except most developed countries (1). As data of epidemiologic studies show, there are many risk factors of cataract and cataract is a multifactorial disease. The prevalence of cataract is related to climate, social-economic, and ecologic status of a country. It is related to prevalence of deleterious habits, nutritional and lifestyle factors, and other factors. Hypertension, hyperglycemia, obesity, and dyslipidemia are factors determining not only the start of cataract but also the

start and progress of other noncommunicable diseases. The above mentioned individual risk factors are components of the metabolic syndrome. Currently much attention is paid to metabolic syndrome, because this complex of individual risk factors significantly increases risk of cardiovascular diseases (CVD) and diabetes mellitus (2). The main components of metabolic syndrome are central obesity, atherogenic dyslipidemia (elevated triglyceride level and low high-density lipoprotein [HDL] cholesterol level), higher arterial blood pressure, and immunity of insulin or intolerance of glucose.

In previously published scientific articles, we have not found relevant data about the relation between cataract and metabolic syndrome, while relations between cataract and metabolic syndrome components are broadly investigated. Systolic or diastolic hypertension increases risk of cataract (3-12). Diabetes and hyperglycemia increase risk of cataract and directly depend on duration of diabetes (3, 5, 6, 8, 10, 14-16). According to the data, obesity or central obesity increase risk of cataract (8, 10, 16, 17) and serum lipids variously relate to cataract (18-20).

The aim of this study was to estimate the prevalence of cataract in the middle-aged Kaunas urban population cohort and the relation between cataract and metabolic syndrome and its components.

MATERIALS AND METHODS

Study subjects

The survey according to the WHO MONICA study (MONItoring of trends and determinants in CArdiovascular disease) protocol (21) was carried out in Kaunas City (Lithuania) from 2001 to 2002. A random sample of subjects aged 35 to 64 years was selected. The sample was stratified by age and sex so that at least 200 men and women would be screened in every 10-year age group (35-44, 45-54, 55-64). Health survey was performed by the scientific staff of the Institute of Cardiology of Kaunas University of Medicine. A total of 1403 persons were screened (626 men and 777 women: response rate 62.4%). There were no significant differences among participants and non-participants of the WHO MONICA study by age and sex.

Ophthalmologic investigation was performed for 95.3% of respondents in the random sample of health survey. The responders were investigated for age-related maculopathy, cataract, and glaucoma. The ophthalmologic investigation was performed by the scientific staff of the Laboratory of Ophthalmology of the Institute for Biomedical Research of Kaunas University of Medicine (head, Prof. A. Paunksnis).

In this article we analyzed data received from 1282 subjects (573 men and 709 women cohort from Kaunas City population) aged 35 to 64 years, having complete data of all five metabolic syndrome components and cataract. We excluded from the analysis 121 persons (53 men and 68 women) who did not have complete data of all five metabolic syndrome components and cataract. The total number of responders of the health survey and the number of responders from the study for ophthalmologic and metabolic syndrome investigation distributed into 10-year age groups are shown in Table I.

TABLE I - NUMBER OF ALL RESPONDERS OF HEALTH SURVEY AND NUMBER OF RESPONDERS INVESTIGATED OPTHALMOLOGICALLY AND FOR METABOLIC SYNDROME DISTRIBUTED INTO 10-YEAR AGE GROUPS

Age groups, yr	All responders of the health cohort			Number of persons from the health survey cohort examined for survey and metabolic syndrome		
	Both sexes	Men	Women	Both sexes*	Men*	Women*
35-44	425	201	224	403 (94.8)	192 (95.5)	211 (94.2)
45-54	482	204	278	435 (90.2)	187 (91.7)	248 (89.2)
55-64	496	221	275	444 (89.5)	194 (87.8)	250 (90.9)
Total	1403	626	777	1282 (91.4)	573 (91.5)	709 (91.2)

Values are n or n (%).
*Percent of responders of the study examined for cataract and metabolic syndrome

Ophthalmologic investigations

Participants of the health survey underwent a comprehensive ophthalmic examination, which included distance visual acuity test, using the chart of C optotypes arranged after the Snellen principle, subjective refraction with spherical and cylindrical lens, Schiotz tonometry (Riester, Germany) under local anesthesia, 0.5% proparacaine hydrochloride eye drops, anterior eye segment examination by slit lamp, lens grading and stereoscopic fundus examination using a slit lamp biomicroscope, and indirect ophthalmoscope with a superfield lens (Volk, Mentor, OH) after pupil dilatation.

The grading of lens opacity was performed by a trained ophthalmologist, according to a written standard protocol, using Lens Opacity Classification System III (LOCS III). LOCS III was used to measure the degree of nuclear, cortical, and posterior subcapsular opacification (PSC), with possible grades ranging from 0.1 to 5.9 for cortical and PSC opacities and from 0.1 to 6.9 for nuclear opacities (22). After dilatation of pupils ≥6 mm, with 0.5% tropicamide eye drops (repeated twice if necessary), the participant was examined at slip lamp (Carl Zeiss Germany) (angle 45 degree for nuclear assessment and angle 0 degree for cortical and subcapsular assessment) and the presence and severity of specific lens opacity were compared and documented according to LOCS III standard photographs. Cataract was determined when nuclear opalescence (NO) and/or nuclear color (NC) ≥2, and/or cortical (C) ≥2, and/or posterior subcapsular (P) ≥1 or mixed cataract (any combination of these) and/or a sub-

ject had cataract surgery not for congenital, traumatic, or other complicated genesis in at least one eye. When data analysis dealt with subjects as well as type of cataract, this was done by the worse eye, if not indicated otherwise. Cataract surgery was determined when the subject had cataract surgery in both eyes or when the subject had cataract surgery in one and clear lens in the other eye.

Cutoff points of risk factors of CVD

Responders were tested by a standard questionnaire. Arterial blood pressure was measured two times of 2 mm accuracy, and the average values were used for the analysis. Higher arterial blood pressure was defined as systolic blood pressure of >130 mmHg and/or diastolic blood pressure of >85 mmHg. Waist circumference was measured (without upper clothes) by standard meter of 0.5 cm accuracy. Central obesity was defined as waist circumference >102 cm for men and >88 cm for women.

Biochemical analyses were done for responders (fasting for at least for 12 hours) on an empty stomach. Concentration of glucose in capillary blood was determined by individual glucometer "Gliucotrent" (23). Hyperglycemia was defined as a fasting glucose level >6.1 mmol/L. Serum triglycerides and high-density lipoprotein (HDL) cholesterol concentrations were determined enzymatically: triglycerides by GPO-PAP method (24) and HDL cholesterol by CHOD-PAP Monotest, Boehringer-Mannheim method, after precipitation serum very low-density lipoprotein (VLDL) and low-density lipoprotein (LDL) (25).

TABLE II - PREVALENCE OF CATARACT AND METABOLIC SYNDROME AMONG MIDDLE-AGED MEN AND WOMEN FROM HEALTH SURVEY COHORT DISTRIBUTED INTO 10-YEAR AGE GROUPS

Age groups, yr	Men, n/N	%	Women, n/N	%	p
Cataract					
35-44	9/192	4.7	8/211	3.8	0.843
45-54	23/187	12.3	26/248	10.5	0.660
55-64	69/194	35.6	101/250	40.4	0.347
All 35-64	101/573	17.6	135/709	19.0	0.563
Metabolic syndrome					
35-44	29/192	15.1	25/211	11.8	0.417
45-54	35/187	18.7	63/248	25.4	0.124
55-64	48/194	24.7	94/250	37.6	0.006
All 35-64	112/573	19.5	182/709	25.7	0.012

n = Number of cataract or metabolic syndrome; N = Number of persons investigated for all five parameters of metabolic syndrome and ophthalmologically; p = Significance of difference of rate between men and women

TABLE III - PREVALENCE OF COMPONENTS OF METABOLIC SYNDROME AMONG MIDDLE-AGED MEN AND WOMEN DISTRIBUTED INTO 10-YEAR AGE GROUPS FROM HEALTH SURVEY COHORT

Age groups, yr	Men, n/N	%	Women, n/N	%	p
Higher arterial pressure					
35-44	100/192	52.1	62/211	29.4	<0.001
45-54	127/187	67.9	147/248	59.3	0.080
55-64	145/194	74.7	190/250	76.0	0.846
All 35-64	372/573	64.9	399/709	56.3	0.002
Hyperglycemia					
35-44	25/192	13.0	22/211	10.4	0.512
45-54	26/187	13.9	34/248	13.7	1.000
55-64	41/194	21.1	41/250	16.4	0.250
All 35-64	92/573	16.1	97/709	13.7	0.266
Central obesity					
35-44	23/192	12.0	36/211	17.1	0.194
45-54	28/187	15.0	94/248	37.9	<0.001
55-64	50/194	25.8	133/250	53.2	<0.001
All 35-64	101/573	17.6	263/709	37.1	<0.001
Elevated triglycerides level					
35-44	67/192	34.9	41/211	19.4	0.001
45-54	76/187	40.6	64/248	25.8	0.002
55-64	68/194	35.1	92/250	36.8	0.779
All 35-64	211/573	36.8	197/709	27.8	0.001
Low HDL cholesterol level					
35-44	44/192	22,9	50/211	23.7	1.000
45-54	27/187	14.4	54/248	21.8	0.068
55-64	22/194	11.3	72/250	28.8	<0.001
All 35-64	93/573	16.2	176/709	24.8	<0.001

n = Number of persons with respective components of metabolic syndrome; N = Number of persons investigated for all five parameters of metabolic syndrome and ophthalmologically; p = Significance of difference of rate between men and women; Higher arterial pressure = Systolic blood pressure ≥130 mmHg and/or diastolic blood pressure ≥85 mmHg; Hyperglycemia = Fasting plasma glucose ≥6.1 mmol/L; Central obesity = Waist circumference >102 cm for men and >88 cm for women; Elevated triglycerides level = Serum triglycerides level ≥1.7 mmol/L; Low HDL cholesterol level = Serum high-density lipoprotein cholesterol level <1.04/1.3 mmol/L (men/women)

Fasting elevated triglycerides level was defined as a serum triglycerides level ≥1.7 mmol/L and low HDL cholesterol level was defined as a serum level <1.04 mmol/L for men and <1.3 mmol/L for women.

Metabolic syndrome was defined based on the WHO consultation of diabetes mellitus and its complications and The USA National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) recommendations (2, 26). Metabolic syndrome was defined as the presence of three or more of five components: systolic/diastolic blood pressure ≥130 and/or 85 mmHg; fasting plasma glucose ≥6.1 mmol/L; central obesity (waist circumference >102 cm for men and >88 cm for women); fasting triglycerides ≥1.7 mmol/L; HDL cholesterol <1.04 for men and <1.3 mmol/L for women.

Statistical methods

We defined a subject as having cataract if the subject had cataract or cataract surgery in at least one eye. Baseline characteristics of patients between groups were compared using single factor analysis of variance (ANOVA).

TABLE IV - ODDS RATIO (OR) WITH 95% CONFIDENCE INTERVALS (CI) OF CATARACT AND METABOLIC SYNDROME AMONG 10-YEAR AGE GROUPS FOR MEN AND WOMEN

Age groups, yr	Men		Women	
	OR (95% CI)	p	OR (95% CI)	p
Cataract				
35-44	1		1	
45-54	2.85 (1.21-6.86)	0.013	2.97 (1.25-7.31)	0.011
45-54	1		1	
55-64	3.94 (2.26-6.90)	<0.001	5.79 (3.50-9.62)	<0.001
35-44	1		1	
55-64	11.22 (5.19-25.07)	<0.001	17.20 (7.81-39.42)	<0.001
Metabolic syndrome				
35-44	1		1	
45-54	1.29 (0.73-2.30)	0.423	2.53 (1.49-4.34)	0.001
45-54	1		1	
55-64	1.43 (0.85-2.40)	0.194	1.77 (1.18-2.65)	0.005
35-44	1		1	
55-64	1.85 (1.08-3.19)	0.025	4.48 (2.68-7.55)	<0.001

p = Significance of difference of prevalence of cataract and metabolic syndrome between 10-year age groups

TABLE V - PREVALENCE OF CATARACT (PERCENT) AMONG MEN AND WOMEN AGED 35-64 YEARS WITH AND WITHOUT METABOLIC SYNDROME IN 10-YEAR AGE GROUPS

Age groups, yr	With metabolic syndrome, N = 294, n/N	%	Without metabolic syndrome, N = 988, n/N	%	OR (95% CI); p
Men					
35-44	0/29	0.0	9/163	5.5	– (0.95-3.35); 0.413
45-54	3/35	8.6	20/152	13.2	0.62 (0.14-2.39); 0.645
55-64	21/48	43.8	48/146	32.9	1.59 (0.77-3.26); 0.234
All 35-64	24/112	21.4	77/461	16.7	1.36 (0.79-2.34); 0.299
Women					
35-44	0/25	0.0	8/186	4.3	– (0.96-5.16); 0.617
45-54	8/63	12.7	18/185	9.7	1.35 (0.51-3.52); 0.670
55-64	42/94	44.7	59/156	37.8	1.33 (0.76-2.31); 0.349
All 35-64	50/182	27.5	85/527	16.1	1.97 (1.3-2.99); 0.002

N = Number of persons investigated for all five parameters of metabolic syndrome and ophthalmologically; n = Number of cataract; p = Significance of difference of rate of cataract between persons with and without metabolic syndrome

The prevalence rates were given in percentages. The logistic regression analysis was performed to determine risk factors for cataract using odds ratio (OR) estimates with 95% confidence intervals (CI); p values of <0.05 were considered to be significant. The data were analyzed by using the software MS Excel 2000, EPINFO 6, and STATISTICA v 6.

RESULTS

Prevalence of cataract and metabolic syndrome

The percent rate of cataract, metabolic syndrome, and its components among persons from the health survey cohort are shown in Tables II and III.

TABLE VI - PREVALENCE OF TYPES OF CATARACT AMONG MEN AND WOMEN FROM HEALTH SURVEY COHORT AGED 35-64 YEARS AND THEIR RELATION WITH METABOLIC SYNDROME

Type of cataract	Men			Women		
	Total	With metabolic syndrome	Without metabolic syndrome	Total	With metabolic syndrome	Without metabolic syndrome
35-44 years age group	**N=192**	**N=29**	**N=163**	**N=211**	**N=25**	**N=186**
Posterior subcapsular	1 (0.5)	0	1 (0.6)	2 (0.9)	0	2 (1.1)
Nuclear	5 (2.6)	0	5 (3.1)	5 (2.4)	0	5 (2.7)
Cortical	0	0	0	1 (0.5)	0	1 (0.5)
Mixed	2 (1.0)	0	2 (1.2)	0	0	0
Cataract surgery	1 (0.5)	0	1 (0.6)	0	0	0
All types	9 (4.6)	0	9 (5.5)	8 (3.8)	0	8 (4.3)
45-54 years age group	**N=187**	**N=35**	**N=152**	**N=248**	**N=63**	**N=185**
Posterior subcapsular	0	0	0	3 (1.2)	0	3 (1.6)
Nuclear	15 (8.0)	1 (2.9)	14 (9.2)	13 (5.2)	5 (7.9)	8 (4.3)
Cortical	5 (2.7)	1 (2.9)	4 (2.6)	8 (3.2)	1 (1.6)	7 (3.8)
Mixed	0	0	0	2 (0.8)	2 (3.2)	0
Cataract surgery	3 (1.6)	1 (2.9)	2 (1.3)	0	0	0
All types	23 (12.3)	3 (8.7)	20 (13.1)	26 (10.4)	8 (12.7)	18 (9.7)
55-64 years age group	**N=194**	**N=48**	**N=146**	**N=250**	**N=94**	**N=156**
Posterior subcapsular	2 (1.0)	0	2 (1.4)	4 (1.6)	0	4 (2.6)
Nuclear	45 (23.2)	16 (33.3)*	29 (19.9)*	61 (24.4)	22 (23.4)	39 (25.0)
Cortical	15 (7.7)	4 (8.3)	11 (7.5)	22 (8.8) 1	3 (13.8)	9 (5.8)
Mixed	7 (3.6)	1 (2.1)	6 (4.1)	13 (5.2)	6 (6.4)	7 (4.5)
Cataract surgery	0	0	0	1 (0.4)	1 (1.1)	0
All types	69 (35.5)	21 (43.7)	48 (32.9)	101 (40.4)	42 (44.7)	59 (37.9)

Values are n (%).
Difference of prevalence of nuclear cataract among men with and without metabolic syndrome.
n = Number of type of cataract; N = Number of investigated persons with metabolic syndrome and without metabolic syndrome in adequate age groups

After investigating 1282 persons (573 men and 709 women) aged 35 to 64 years, cataract was diagnosed for 236 persons: 101 men (17.6%) and 135 women (19.0%). Metabolic syndrome was diagnosed for 294 persons: 112 men (19.5%) and 182 women (25.7%). The percent rate of metabolic syndrome was significantly higher in women than in men (Tab. II). Among persons with metabolic syndrome cataract was diagnosed for 74 persons: 24 men (21.4%) and 50 women (27.5%).

After distribution of the investigated persons into 10-year age groups the percent rate of cataract significantly increased with age among both sexes (Tab. IV) and did not differ significantly among men and women (Tab. II).

After distribution of those persons into 10-year age groups the percent rate of metabolic syndrome remarkably increased with age among both sexes, but the increase of rate of metabolic syndrome is greater for women than for men (Tab. IV).

Cataract and metabolic syndrome and its components in investigated cohort

The percent rate of cataract was compared among men and women with metabolic syndrome and without metabolic syndrome, after distributing those persons into 10-year age groups, and these data are shown in Table V.

The percent rate of cataract was 1.3 times higher among men with metabolic syndrome aged 35 to 64 years than among men of the same age without metabolic syndrome (p>0.05). The cases of cataract were not found in men with metabolic syndrome, aged 35-45 years. The percent rate of cataract was 1.5 times lower among men with metabolic syndrome, aged 45-54 years, than among the same age men without metabolic syndrome (p>0.05). The percent rate of cataract was 1.3 times higher among men with metabolic syndrome, aged 55-64 years, than among the same age men without metabolic syndrome (p>0.05).

TABLE VII - ODDS RATIO (OR) WITH 95% CONFIDENCE INTERVALS (CI) OF CATARACT ACCORDING TO COMPONENTS OF METABOLIC SYNDROME AMONG MEN AND WOMEN AGED 45-64 YEARS

Metabolic syndrome components	Prevalence of cataract (%) and OR					
	Men (N=381)			Women (N=498)		
	n/N	45-64	OR (95% CI)	n/N	45-64	OR (95% CI)
Higher arterial pressure						
No	31/109	28.4	1	28/161	17.4	1
Yes	61/272	22.4	0.73 (0.43-1.24) p=0.269	99/337	29.4	1.98 (1.21-3.25) p=0.006
Hyperglycemia						
No	71/314	22.6	1	104/423	24.6	1
Yes	21/67	31.3	1.56 (0.84-2.90) p=0.174	23/75	30.7	1.36 (0.76-2.40) p=0.333
Central obesity						
No	66/303	21.8	1	59/271	21.8	1
Yes	26/78	33.3	1.80 (1.01-3.20) p=0.048	68/227	30.0	1.54 (1.01-2.35) p=0.047
Elevated triglycerides level						
No	61/237	25.7	1	74/342	21.6	1
Yes	31/144	21.5	0.79 (0.47-1.33) p=0.419	53/156	34.0	1.86 (1.20-2.90) p=0.005
Low HDL cholesterol level						
No	82/332	24.7	1	91/372	24.5	1
Yes	10/49	20.4	0.78 (0.35-1.72) p=0.633	36/126	28.6	1.24 (0.77-1.99) p=0.426

N = Number of persons with and without respective components of metabolic syndrome; n = Number of cataract; p = Significance of difference of rate of cataract between persons with and without respective metabolic syndrome components; Higher arterial pressure = Systolic blood pressure ≥130 mmHg and/or diastolic blood pressure ≥85 mmHg; Hyperglycemia = Fasting plasma glucose ≥6.1 mmol/L; Central obesity = Waist circumference >102 cm for men and >88 cm for women; Elevated triglycerides level = Serum triglycerides level ≥1.7 mmol/L; Low HDL cholesterol level = Serum high-density lipoprotein cholesterol level <1.04/1.3 mmol/L (men/women)

Putting together men aged 45-54 and 55-64 years, odds of cataract among men with metabolic syndrome was OR=1.38 (95% CI 0.77-2.46) (p=0.316).

The percent rate of cataract was significantly 1.3 times higher among women with metabolic syndrome, aged 35 to 64 years, than among the same age women without metabolic syndrome (p<0.05). The cases of cataract were not found in women with metabolic syndrome aged 35-45 years. The percent rate of cataract was respectively 1.3 and 1.2 times higher among women with metabolic syndrome, aged 45-54 and 55-64 years, than among the same age women without metabolic syndrome (p>0.05). Putting together women aged 45-54 and 55-64 years odds of cataract among women with metabolic syndrome was OR=1.60 (95% CI 1.03-2.49) (p=0.036).

The prevalence of every type of cataract (posterior sub-capsular, nuclear, cortical, and mixed) and cataract surgery among persons with metabolic syndrome and without metabolic syndrome after distribution of men and women into 10-year age groups is shown in Table VI.

Among all our investigated persons aged 35 to 64 years posterior subcapsular cataract was observed in 0.9%, nuclear cataract in 11.2%, cortical cataract in 4.0%, mixed cataract in 1.9%, and cataract surgery in 0.4% of cases. After distribution of those persons into 10-year age groups the percent rate of every type of cataract did not differ among men and women. In all 10-year age groups the percent rate of every type of cataract was not significantly different among persons with metabolic syndrome than without metabolic syndrome; it should be noted that the nuclear type of cataract was higher than borderline level of significance among men aged 55-64 years with metabolic syndrome than among men of the same age without metabolic syndrome (OR=2.02 [95% CI 0.92-4.43] [p=0.085]).

We analyzed the relation between cataract and all five metabolic syndrome components, which are considered as risk factors of noncommunicable diseases (Tab. VII).

The percent rate of cataract was compared among men and women aged 45 to 64 years with and without every metabolic syndrome component (men and women aged 35-44 years were excluded because in those groups cataract was not found among persons with metabolic syndrome).

The percent rate of cataract was significantly higher among men with central obesity than among men without this metabolic syndrome component (p<0.05). The increased tendency of the percent rate of cataract was determined in men with hyperglycemia (p>0.05). The decreased tendency of the percent rate of cataract was determined in men with higher arterial pressure, elevated triglycerides level, and low HDL cholesterol level (p>0.05). The percent rate of cataract among women was directly associated with every metabolic syndrome component. The percent rate of cataract was significantly higher among women with higher arterial pressure, central obesity, and elevated triglycerides level than among women without those metabolic syndrome components (p<0.05).

DISCUSSION

The health survey carried out according to the WHO MONICA study protocol (21) presents the prevalence data on cataract from a random sample of Kaunas population cohort that includes 1282 urban adults aged 35 to 64 years. The study investigated the prevalence of cataract and its relation to metabolic syndrome and its components. In this study 18.4% of participants (17.6% of men and 19.0% of women) had cataract in one or both eyes. The study found that the percent rate of cataract among men and women significantly increased with age. Similar data were found in many studies (3, 5, 6, 8, 15). Gender differences were not statistically significant in our study. A population-based study of US Hispanic subjects aged 40 years and older found that gender differences were not statistically significant (27). Several studies found that women had significantly higher prevalence of cataracts than men (3, 5, 8, 14, 15).

The aim of this study was to estimate the relation between cataract and metabolic syndrome and its components in the middle-aged Kaunas urban population cohort. In our cohort, in 22.9% of participants (19.5% of men and 25.7% of women) metabolic syndrome was diagnosed by ATP III criteria. Metabolic syndrome and its components are estimated as CVD risk factors in many

studies. The population-based study of middle-aged Kaunas City inhabitants showed that relation between metabolic syndrome and ischemic heart disease was found for men and women aged 45 to 64 (29). According to the data of Kaunas City inhabitants, metabolic syndrome significantly increased the risk of mortality from CVD for middle-aged women (28).

The data of our study showed that the percent rate of cataract among men and women aged 45 to 64 years with metabolic syndrome was higher among men (28.9% versus 22.8%; p=0.316) and significantly higher among women (31.8% versus 22.6%; p=0.036) versus the same age persons without metabolic syndrome.

Metabolic syndrome components could be potential risk factors of cataract, especially as all of them are associated with age. The data about relation between cataract and individual metabolic syndrome components are controversial in many studies (3, 5-18). The relation between cataract and all five metabolic syndrome components among men and women aged 45 to 64 years was estimated in our study. The results of our study showed that the percent rate of cataract was significantly higher among women with higher arterial blood pressure than among women without this metabolic syndrome component (p=0.006). However, among the investigated men, higher arterial blood pressure was associated with lower percent rate of cataract than among men without this metabolic syndrome component. Many studies have found positive association of all types of cataract with arterial hypertension (5, 6, 9), especially with systolic hypertension (5, 6) in both genders (7, 8, 10, 11) and their data support our findings for women. In the Blue Mountains Eye Study, hypertension was associated with lower prevalence of nuclear cataract (13). In the POLA Study, hypertension decreased risk of cataract surgery (14), while in a study from Italy hypertension was associated with increased risk of cataract extraction in women (12).

Our study showed that the percent rate of cataract among men and women with hyperglycemia was higher (but not significantly) than among men and women without this metabolic syndrome component. Hyperglycemia and diabetes mellitus are evaluated as very strong risk factors of all types of cataract (3, 6, 9, 10, 14), especially of posterior subcapsular cataract (5, 8, 15, 16).

In our study it was determined that the percent rate of cataract among persons with central obesity was significantly higher (p=0.048 and p=0.047 for men and women, respectively) than among persons without this metabolic

syndrome component. A similar relation between central obesity and cataract was reported in a rural population of southern India (8), in US Barbados black subjects (10), in Boston-area women (16), in the Physicians Health Study in men (17), and in a study from Italy in women (12).

In our study relation was found between fasting elevated triglycerides level as metabolic syndrome component and cataract. The percent rate of cataract among women with elevated triglycerides level was significantly higher than among women without this metabolic syndrome component (p=0.005). Among men with elevated triglycerides level the tendency of decrease of the percent rate of cataract in relation to men without this metabolic syndrome component was found. The Framingham Studies findings suggested that fasting hypertriglyceridemia ≥250 mg/dL (2.8 mmol/L) was associated with the increased risk of posterior subcapsular cataract in men but no associations were noted between serum lipid/lipoprotein variables and risk of cortical or nuclear cataract (18).

Our study found a tendency of increase in the percent rate of cataract among women with low HDL cholesterol level as metabolic syndrome component than among women with HDL cholesterol level ≥1.3 mmol/L. A tendency of decrease of the percent rate of cataract among men with low HDL cholesterol level versus men with HDL cholesterol level ≥1.04 mmol/L was found. Similar data were found in the Beaver Dam Eye Study: higher serum HDL cholesterol was associated with decreased risk of cortical cataract in women and increased risk for posterior subcapsular cataract in men (19). A strong association was found between low levels of HDL cholesterol and the development of lens opacities of adults of both genders from South Africa (20). In the Framingham Studies HDL cholesterol level ≤35 mg/dL (≤0.9 mmol/L) was associated with posterior subcapsular cataract in men at borderline level of significance (18).

Previously published scientific articles were lacking in specific information about cataract relation to metabolic syndrome. Limitations of our study compared with some other studies are younger age of our investigated persons and small number of cases of posterior subcapsular cataract: the prevalence of posterior subcapsular cataract in our study was just 0.9%, whereas prevalence of nuclear and cortical cataract, together, was 15.2% (11.2% for nuclear and 4.0% for cortical) of all investigated persons. The differences between data of our study and some other studies for individual metabolic syndrome components may be related to different definitions of elevated serum triglycerides (in our investigation ≥1.7 mmol/L) and low HDL cholesterol (<1.04/1.3 mmol/L) (men/women) levels. These findings indicate a direction for thorough future investigations in this area.

In conclusion, the results of our study show that metabolic syndrome and its individual components such as higher arterial pressure, central obesity, and elevated triglycerides level could increase the risk of cataract for middle-aged (45 to 64 years) persons, especially for women.

Proprietary interest: None

Reprint requests to:
Prof. A. Paunksnis
Institute for Biomedical Research
Laboratory of Ophthalmology
Kaunas University of Medicine
Eiveniu st. 2
Kaunas, Lithuania
apaun@medi.lt

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