

Incidence of Acute Angle-Closure Glaucoma in Dalmatia, Southern Croatia

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Aim. To investigate the incidence of acute angle-closure glaucoma among residents of Dalmatia, southern part of Croatia.

Methods. We reviewed hospital records of 176 patients with acute angle-closure glaucoma treated between January 1995 and December 2001 at the Departments of Ophthalmology at four hospitals in Dalmatia. There were 122 women, aged between 29 and 89 years (median age; 68 years), and 54 men, aged between 33 and 88 years (median age, 70 years).

Results. The unadjusted crude incidence was 2.9/100,000 (95% confidence interval [CI], 1.6-4.5). The unadjusted crude incidence among men and women was 1.9 (95% CI, 0.3-3.8) and 3.9 (95% CI, 1.7-6.1) cases/100,000 per year, respectively. The relative risk (RR) of developing acute angle-closure glaucoma was 2.1 (95% CI, 1.5-2.9) times higher for women as compared to men. The RR of acute angle-closure glaucoma was 1.9 (95% CI, 0.6-6.2) in the 40-49 years group, 6.5 (95% CI, 2.3-18.8) in the 50-59 years group, 17 (95% CI, 6.3-47.8) in the 60-69 years group, and 28 (95% CI, 10.4-77.3) in the over 69 years group. The median time from the onset of symptoms to presentation at the hospital was 2 days (range, 1-15 days). In 87 (48%) patients intraocular pressure control was achieved by medical treatment, 41 (23%) patients underwent peripheral iridectomy, and 48 (27%) patients required a trabeculectomy. In 35 (73%) out of 48 patients managed by filtering surgery, the delay in treatment was 3 or more days. In 34 (19%) eyes with final visual acuity 0.1 or worse, the delay in presentation was 3 days or more. No statistically significant association was found between acute angle-closure glaucoma and seasonal variation (chi-square=0.85; p=0.8).

Conclusion. Earlier recognition of the patients with acute angle-closure glaucoma and a shorter time of delay in presentation could have saved many patients from surgery and vision loss each decade.

Key words: Croatia; glaucoma, angle-closure; incidence; seasons; therapy

Angle-closure glaucoma is a form of glaucoma where the anterior chamber tends to be smaller than average (1). There is a relative block to the passage of aqueous from the posterior to the anterior chamber, because of the contact of the iris with the lens around the pupil. This area is greater if the eye is shorter, as it is in women compared with men, and in hyperopia; or the lens larger, as it is in the older population due to gradual growth of lens; or if the pupil is mid-dilated, as it is when the light is dim (1). A relative pupillary block leads to the accumulation of aqueous in the posterior chamber, which then pushes the root of the iris forward, secondarily closing the chamber angle. When the angle is completely blocked, an acute glaucoma attack occurs (1).

Acute angle-closure glaucoma with pupillary block is the condition of rapid rise of intraocular pres-

sure due to obstruction of the drainage angle of the anterior chamber, with severe pain and loss of vision (1,2). Acute angle-closure glaucoma is commonly regarded as an ophthalmologic emergency. Screening programs based on epidemiologic research are needed to minimize the blinding impact of acute angle-closure glaucoma (3).

Although the epidemiology of acute angle-closure glaucoma has been investigated (4,5), its real incidence has not been fully determined (6,7). The highest incidence was recorded among Eskimos in Greenland and Canada (8,9), and the lowest was found among African-Americans (10). Existing population-based data on acute angle-closure glaucoma have been limited to prevalence surveys among different populations, which are not strictly comparable (5,11). Furthermore, the acute, symptomatic phase of

acute angle-closure glaucoma is usually of limited duration (11), which is why prevalence is less useful than incidence as an index of population morbidity (12). Knowledge of the incidence of acute angle-closure glaucoma is important in planning preventive and therapeutic strategies. Since the incidence of acute angle-closure glaucoma in Split, Croatia, is relatively high (13,14), we decided to determine the population-based incidence of acute angle-closure glaucoma in Dalmatia, the southern part of Croatia, from 1995 to 2001.

Patients and Methods

Patients

We retrospectively analyzed the hospital records of 176 patients, aged between 30-89 years (median age, 68 years), who presented with acute angle-closure glaucoma and were treated at the Departments of Ophthalmology at Split University Hospital, Šibenik General Hospital, Zadar General Hospital, and Dubrovnik General Hospital from January 1995 to December 2001. There were 122 women aged between 29 and 89 years (median age; 68 years) and 54 men aged between 33 and 88 years (median age, 70 years). In each case, the diagnosis was confirmed by a hospital records review and cases were registered according to the date of onset of symptoms rather than the date of admittance at hospital. In this study, acute angle-closure glaucoma cases were defined as cases in which the patients had severe and sudden symptoms, intraocular pressure >30 mmHg, and an angle assessed to be at least 75% closed on the basis of gonioscopic examination (15). Gonioscopy of the fellow eye confirmed the presence of narrow angle defined as non-visibility of the filtering trabecular meshwork for 180 degrees or more, no peripheral anterior synechiae in the angle, and intraocular pressure <21 mmHg. Patients with secondary angle-closure, such as lens-induced glaucoma, neovascular glaucoma, and uveitis, were specifically excluded.

Methods

The initial medical treatment for acute angle-closure glaucoma was similar in every patient. This consisted of intravenous mannitol, acetazolamide tablets 250 mg two times daily, topical pilocarpine 2% four times daily, and timolol 0.5% two times daily, followed by peripheral iridectomy or filtering surgery (trabeculectomy) when the pressure had been controlled (<21 mmHg). Laser iridotomy or peripheral iridectomy is the preferred definitive treatment of acute angle-closure glaucoma. Filtering

surgery is recommended if the attack of acute angle-closure glaucoma has lasted longer than 48 h and peripheral anterior synechiae covered more than 50-75% of the trabecular meshwork (15). If extensive peripheral anterior synechiae (as a result of prolonged attack) have been found on gonioscopy, a filtering surgery should be performed rather than a peripheral iridectomy.

The population data for the Dalmatia region were based on the Census 2001, when the total population was 861,482 (16). The displaced population from Bosnia and Herzegovina arriving to Dalmatia during the war was included in *de facto* population estimates. Patients with acute angle-closure glaucoma who resided outside Dalmatia were not recorded.

Statistical Analysis

We used chi-square test and descriptive statistics for statistical analysis. Confidence intervals (CI) for the incidence and relative risk were calculated at the level of 95% (17). Incidence rates were adjusted to the age and sex distribution by using the European standard population (18). Statistical package used for data analysis was Statistica for Windows 5.0 (StatSoft, Inc. Tulsa, OK, USA).

Results

The annual incidence was 2.9 per 100,000 (95% CI, 1.6-4.5). The incidence among men and women was 1.9 (95% CI, 0.3-3.8) and 3.9 (95% CI, 1.7-6.1) cases/100,000 per year, respectively (Table 1). The corresponding age- and sex-adjusted incidences (adjusted to the age and sex distribution of the European standard population) were 2.8 per 100,000 person-years, 2.0 for men and 3.6 for women. The relative risk for women vs men was 2.1 (95% CI, 1.5-2.9). The confidence interval does not include 1, which indicates that relative risk is statistically significantly higher for women than for men. The peak incidence in both sexes was observed in the group of 60 years of age and older. The 60 years and older age group accounted for 81% of all cases. Compared with 30-39 years of age (the youngest age decade with at least one incident case), the relative risk of acute angle-closure glaucoma in the 40-49 years group was 1.9 (95% CI, 0.6-6.2). Compared with 30-39 years of age, the relative risk was 6.5 (95% CI, 2.3-18.8) in the 50-59 years group, 17 (95% CI, 6.3-47.8) in the 60-69 years group, and 28 (95% CI, 10.4-77.3) in the over 69 years group.

In 87 eyes, control of intraocular pressure was achieved by topical glaucoma medications, acetazolamide, and osmotic diuretics. Forty-one eyes underwent peripheral iridectomy and 48 eyes required a trabeculectomy to achieve intraocular pressure control. In this study, 34 (19%) eyes had a poor outcome with final visual acuity 0.1 or worse.

The median time between onset of angle-closure glaucoma attack and the data of admittance and starting of therapy was 2 days (range, 1-15 days). A half (47%) of our patients were seen within first day and

Table 1. Age and sex-specific incidence of acute angle-closure glaucoma*

Age groups (years)	Patients with acute angle-closure glaucoma			
	men		women	
	No.	incidence (95% CI) [†]	No.	incidence (95% CI)
0-39	2	0.5 (0-2.6)	2	0.5 (0-2.6)
40-49	3	0.7 (0-3.1)	5	1.1 (0-4.3)
50-59	7	2.1 (0-6.9)	15	4.3 (0-11.1)
60-69	18	5.7 (0-13.9)	40	11.1 (0.3-21.9)
>69	24	10.7 (0-24.1)	60	15.9 (3.3-28.6)

*Values are given as incidence per 100,000 population per year.

[†]Confidence interval.

Table 2. The seasonal incidence of acute angle-closed glaucoma*

Season	Patients with acute angle-closure glaucoma					
	men		women		total	
	incidence (95% CI) [†]	No.	incidence (95% CI) [†]	No.	incidence (95% CI) [†]	No.
Spring	0.4 (0-1.2)	13	1.6 (0-2.0)	31	0.7 (0-1.4)	44
Summer	0.4 (0-1.1)	12	0.8 (0-1.8)	25	0.6 (0-1.2)	37
Autumn	0.5 (0-1.3)	15	1.1 (0-2.3)	34	0.8 (0-1.5)	49
Winter	0.5 (0-1.3)	14	1.0 (0-2.2)	32	0.8 (0-1.5)	46

*Values are given as incidence per 100,000 population per year.

[†]Confidence interval.

43 (24%) were seen within second day of onset of the glaucoma attack.

In 57 (65%) out of 87 patients the delay in the treatment was 1 day, in 24 (28%) patients the delay was 2 days, and in only 6 patients the delay of treatment was 3 days. In 35 (73%) out of 48 patients managed by filtering surgery, the delay in treatment was 3 or more days.

There was no significant seasonal variation of the acute angle-closure glaucoma (chi-square=0.85; df=3; p=0.8; Table 2).

Discussion

The number of acute angle-closure glaucoma cases during the 7-year study period was relatively small. It is possible that some cases may have been unregistered, and others recognized and treated in other hospital in Croatia. Moreover, census data are seldom accurate (19), although census 2001 was carried out after the observation period.

Women accounted for 70% of the patients in our study, similar as in Finland (20), which was consistent with the general proportion of women among patients with acute angle-closure glaucoma. In other words, 7 out of 10 patients with acute angle-closure glaucoma are expectedly women. This pattern of a female preponderance in acute angle-closure glaucoma cases is not surprising: the prevalence of gonioscopically diagnosed narrow angles and acute angle-closure glaucoma is greater among women than men (21). Caucasian women have a 2-4 times higher risk than men for primary angle closure glaucoma (20,22). The relative risk of developing acute angle-closure glaucoma was twice as high for women as it was for men in our study.

The relative risk of acute angle-closure glaucoma was the highest among elderly population in our study (>69 years). A similar age-related increase in incidence was reported in Finland (20) and Singapore (6). The observation that the prevalence of gonioscopically occludable angles increases with age seems to explain this finding (21,23).

From a public health perspective, it is useful to use our results to predict the number of patients with acute angle-closure glaucoma that may be expected annually in the population of the Croatia. Applying our incidence rate obtained for Dalmatia region to the 2001 Croatian population, we estimated that 76 patients annually would have an attack of angle-closure glaucoma in the population of Croatia. Presuming that Dalmatia is representative of Croatia as a whole, 105 patients will need filtering surgery and 75 patients will end up with 0.1 vision or worse because of the angle-closure glaucoma attack during the next five years.

It is difficult to prevent attacks of acute angle-closure glaucoma, but shorter delay after the onset of symptoms (less of 2 days) could prevent more than half of the filtering surgeries and poor visual outcomes found in this study. The median time of delay of 2 days is less than the median time of delay of 3 days reported by Seah et al (6). Most of the patients re-

sponded well in terms of control of intraocular pressure to both the initial medical and later surgical treatment. The unsatisfactory visual results in 34 eyes despite apparently good response of intraocular pressure were found in patients with delay in presentation more than 1 day (in 94% of patients the delay was 3 or more days).

An association between the incidence of acute closed-angle glaucoma and season as well as sunshine activity has been proposed (24,25). In Finland, acute angle-closure glaucoma incidence was highest during autumn and winter, coinciding with prolonged hours of darkness (20). In our study, no significant association between acute angle-closure glaucoma and seasonal variations was found. However, Croatia and Finland are not comparable by daytime duration, especially in summer and winter.

The patients with acute angle-closure glaucoma are occasionally referred to the surgeon or neurologist because of vomiting and headache. A better recognition of the angle-closure glaucoma attack by the general practitioner and timely treatment could prevent visual impairment. The public should be educated about the necessity of seeking medical treatment early if certain eye symptoms, such as sudden blurring of vision, occur.

In conclusion, earlier recognition of the patients with acute angle-closure glaucoma and shorter time of delay in presentation could have saved many patients from surgery and vision loss each decade.

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