

Acute Angle-Closed Glaucoma and Meteorological Factors in Split, Croatia

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ABSTRACT

This study is a retrospective analysis of medical findings of patients treated at the Department of Ophthalmology, Clinical Hospital Split, Croatia in the period of 1995–1999. Seventy-three cases of acute closed-angle glaucoma were analyzed and compared in relation to the meteorological factors – hours of sunshine, air temperature and atmospheric pressure. No significant statistical correlation was found between the development of acute closed-angle glaucoma and air temperature, atmospheric pressure and mean sunshine hours in all months, except in November ($z = 2.1$; $p = 0.03$). The mean daily sunshine hours on the day of the acute closed-angle glaucoma onset were found to be lower than the mean monthly sunshine hours. An increased incidence of acute closed-angle glaucoma was found in the winter months ($\chi^2 = 14.4$; $p < 0.01$). Seasonal variations of the incidence of acute closed-angle glaucoma in Split cannot be directly attributed to the meteorological factors, although the correlation between acute glaucoma and sunshine seems to have a slightly inverse ratio.

Introduction

Acute closed-angle glaucoma is manifested by the rapid rise of intraocular pressure (IOP) due to the obstruction of drainage angle of the anterior chamber. It develops in eyes with characteristic anatomical configuration. The incidence of acute closed-angle glaucoma varies in different areas of the world^{1–5}. The acute, symptomatic phase of acute closed-angle

glaucoma is usually of limited duration. In clinical practice single cases of acute glaucoma are more commonly observed than the group cases and they appear to be more common in winter months. Different authors have already reported on the incidence of acute closed-angle glaucoma in relation to sunshine hours^{6–9}. The aim of the study was to assess the influence of the meteorological factors such

as air temperature, atmospheric pressure and the amount of sunshine on the incidence of the development of acute closed-angle glaucoma in the population of Split, Croatia during the period 1995–1999.

Material and Methods

This is a retrospective study of 73 cases (57 women, aged 67.8 ± 9.8 and 16 men aged 64.9 ± 8.4) of acute closed-angle glaucoma treated at the Department of Ophthalmology, Clinical Hospital Split from January 1995. till December 1999. In each case the diagnosis was confirmed by a chart review. Patients were considered ill from the day of the onset of symptoms rather than the day of their admissions to hospital. Meteorological data were collected from the Navy Meteorological Center Split. Investigated meteorological factors were daily and monthly mean sunshine hours, daily and monthly mean air temperature and mean atmospheric pressure. Population data were based on the population findings of the year 1991¹⁰. Statistical analysis was performed using the t-test, Chi square test, Mann-Whitney U test, correlation and descriptive statistics.

Results

The mean age-specific incidence (on 100 000 per year) is shown in Table 1. The highest incidence for both sexes was observed in the group of patients of 60 years of age and older. The highest specific incidence among men was 6.8 cases (100 000 per year) and 23.6 among women. The mean frequency of acute closed-angle glaucoma was 4.6 ± 4.3 (range 9–18). The found correlation between the incidence and sex (predominantly women) was $\chi^2 = 21.7$ ($p < 0.01$). The distribution of 73 cases of acute glaucoma during the period 1995–1999 is shown in Figure 1. An increased statistically significant incidence

TABLE 1
THE MEAN AGE-SPECIFIC INCIDENCE (ON 100 000 PER YEAR) OF ACUTE CLOSED-ANGLE GLAUCOMA IN SPLIT, CROATIA, DURING THE PERIOD 1995–1999

Age (yr.)	Population	Cases	Incidence rate
0–9	63799	0	0
10–19	71009	0	0
20–29	69551	0	0
30–39	73486	1	1.36
40–49	58210	4	6.87
50–59	55924	4	7.15
60–69	42368	33	77.9
> 70	31600	31	98.1

TABLE 2
THE MEAN MONTHLY AND DAILY SUNSHINE HOURS ON THE DAY OF THE ACUTE CLOSED-ANGLE GLAUCOMA ONSET

Months	Sunshine hours		
	Monthly	Daily	P-value*
January	4.7 ± 0.7	3.2 ± 4.3	NS
February	6.3 ± 1.4	3.7 ± 4.9	NS
March	7.0 ± 1.5	5.8 ± 4.2	NS
April	7.2 ± 0.3	5.7 ± 5.4	NS
May	9.2 ± 1.0	4.7 ± 6.0	NS
June	11.0 ± 0.5	10.5 ± 2.3	NS
July	11.7 ± 0.5	10.3 ± 4.5	NS
August	10.0 ± 0.6	9.7 ± 4.4	NS
September	8.0 ± 1.4	7.1 ± 0.8	NS
October	6.7 ± 1.5	5.9 ± 2.5	NS
November	4.1 ± 0.7	1.7 ± 1.6	0.03
December	3.7 ± 1.2	2.9 ± 3.3	NS

Given are mean values \pm SD

* Mann – Whitney U test

was observed in winter months ($\chi^2 = 14.4$; $p < 0.01$). The mean monthly and daily sunshine hours on the day of the onset of closed-angle glaucoma are shown in Table 2. In this study no significant correlation was found between acute glaucoma and air temperature or atmospheric pressure. No significant difference was found between the mean daily sunshine hours

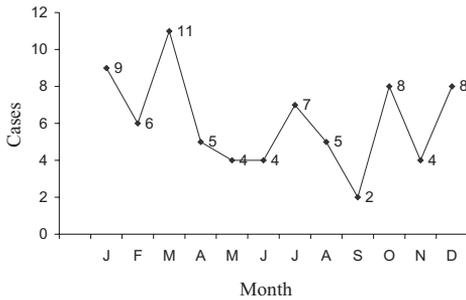


Fig. 1. Monthly distribution of 73 cases of acute closed-angle glaucoma in the period 1995–1999.

acute glaucoma onset are presented in Table 3.

TABLE 3
DESCRIPTIVE STATISTICS OF METEOROLOGICAL DATA ON THE DAY OF THE ACUTE CLOSED-ANGLE GLAUCOMA ONSET $\bar{X} \pm SD$; RANGE

Mean temperature (°C)	15.5 ± 6.4 (5.1–32.1)
Mean atmospheric pressure (hPa)	999.4 ± 6.1 (987.9–1016.0)
Mean sunshine hours (h)	6.8 ± 4.1 (0.1–13.7)

Discussion

on the day of the acute glaucoma onset and the mean monthly sunshine hours in all months except in November ($z = 2.1$; $p = 0.03$), although the mean daily sunshine hours were lower than the mean monthly sunshine hours. The distributions of mean monthly and daily sunshine hours on the day of the acute glaucoma onset are shown in Figure 2. No significant correlation was found between the incidence of acute closed-angle glaucoma and air temperature ($r = -0.53$; $p = 0.07$) or atmospheric pressure ($r = -0.07$; $p = 0.81$). Descriptive statistics of the sunshine hours, temperature and atmospheric pressure on the day of the

It has been suggested that meteorological factors play a great role in the development of acute closed-angle glaucoma in an anatomically predisposed person^{5–9}. In this study no correlation was found between acute glaucoma and air temperature or atmospheric pressure. Seah et al. found a significantly positive correlation between the attack rate and high temperatures⁵. In Israel the incidence of the development of acute closed-angle glaucoma was highest in summer and winter months, which coincided with the periods of extreme temperatures¹¹.

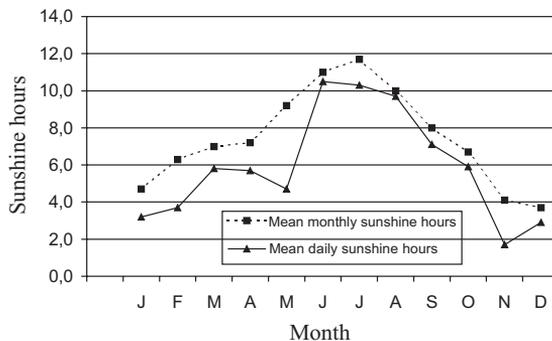


Fig. 2. The distributions of mean monthly and daily sunshine hours on the day of the acute closed-angle glaucoma onset.

Many authors have already confirmed the correlation between acute closed-angle glaucoma and sunshine hours. Hillman and Turner proved the association between the hours of sunlight and the number of cases of acute closed-angle glaucoma⁸. Teikari et al. found that the number of hours without sunshine is positively associated with the incidence of acute glaucoma⁹. In this study the relationship between acute closed-angle glaucoma and sunshine hours tends to have a slightly inverse ratio, although this relationship was not statistically significant, except in November.

There might be a possibility of the underlying meteorological risk factors, most particularly sunshine hours, causing the daily variations of the depth of the anterior chamber, as well as the variations in

the incidence rate of the development of acute closed-angle glaucoma^{12,13}. In this study the age-specific incidence among males was 6.8 cases/100 000 per year and 23.6 among females. This study confirms the prevalence of the acute glaucoma in female patients, compared to other studies, but gives a somewhat smaller age-specific incidence in the case of male patients^{1,2,6}. The prevalence of gonioscopically narrow angles and acute closed angle glaucoma is greater among women than among men of different races^{14,15}. From these results the seasonal variations of the incidence of acute closed-angle glaucoma in Split cannot be directly attributed to the meteorological factors, although the relationship between acute closed-angle glaucoma and sunshine hours tends to have a slightly inverse ratio.

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AKUTNI GLAUKOM ZATVORENOG KUTA I METEOROLOŠKI ČIMBENICI U SPLITU, HRVATSKA

S A Ž E T A K

Retrospektivno su ispitane povijesti bolesti Očne klinike Kliničke bolnice Split, Dalmacija, Hrvatska, u razdoblju od 1995. do 1999. godine. Prikazana su 73 slučaja akutnog glaukoma zatvorenog kuta i uspoređena s meteorološkim podacima o satima sijanja sunca, temperaturi i tlaku zraka. Nije nađena signifikantna statistička povezanost između akutnog glaukoma zatvorenog kuta i temperature, tlaka zraka te sati sijanja sunca u svim mjesecima osim za trajanje sijanja sunca u studenome ($z = 2,1$; $p = 0,03$), iako su srednje vrijednosti dnevnih sati sijanja sunca na dan pojave akutnog glaukoma bile niže od prosječnih mjesečnih sati. Incidencija akutnog glaukoma zatvorenog kuta veća je u zimskim mjesecima ($\chi^2 = 14,4$; $p < 0,01$). Sezonske varijacije u incidenciji akutnog glaukoma zatvorenog kuta u Splitu nisu izravno povezane s meteorološkim čimbenicima, iako se čini da postoji obrnuto proporcionalna povezanost između trajanja sijanja sunca i akutnog glaukoma.