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Epidemiological Study of Visual Functions – Refractive Errors, Macular Degeneration and Glaucoma in Children in the Karst Area of Opatija

Vesna Štefanac Nadarević[1], Božo Vojniković[2], Vladimir Mićović[3], Željko Linšak[3], Danijela Lakošeljac[3], Đulija Malatestinić[3], Tin Nadarević[4] and Željko Sesar[5]

[1] Department of Family Medicine, University of Rijeka, School of Medicine, Rijeka, Croatia
[2] »Dr. B. Vojniković« Eye Polyclinic, Rijeka, Croatia
[3] Teaching Institute of Public Health of Primorsko-goranska County, Rijeka, Croatia
[4] Clinical Hospital Center Rijeka, Rijeka, Croatia
[5] General Medical Practice Dr. Željko Sesar, Rijeka, Croatia

ABSTRACT

Authors of earlier studies examined the epidemiological characteristics of certain eye diseases: age-related macular degeneration (AMD), refractive errors and glaucoma in the area of Primorsko-goranska County (the island of Rab, Novi Vinodolski and Delnice). It was found that the occurrence of AMD is most common on the island of Rab, followed by Novi Vinodolski and it is least common in Gorski Kotar. This fact is associated with the intensity of solar radiation in the UV-A and UV-B fields. The highest percentage of the occurrence of glaucoma was also identified on the island of Rab. In comparison to this study, it was found that in the karst area of Opatija (Mune, Brgud, Žejane, Brešca, Zvoneće, Pasjak, Šapjane and Zaluki) there is a very high incidence of glaucoma (27% suspected and 7% diagnosed glaucoma) within the indigenous population. Glaucoma does not appear among children whose parents migrated to the karst area of Opatija. Refractive errors are far less common among children of indigenous population than among the children whose parents migrated to this area. The occurrence of AMD was not found in any child that was born and lives in this area, regardless of whether their parents are indigenous or not. This statement is very important because it confirms author's earlier statement which claims that at low exposure to solar UV-A and UV-B there is no occurrence of AMD.

Key words: *children, refractive errors, glaucoma, epidemiological study, karst, Opatija*

Introduction

In earlier epidemiological studies[1,2] authors have investigated the occurrence of age-related macular degeneration (AMD) and refractive errors in children in the Primorsko-goranska County. A high percentage (15%) of children from 9 to 14 years of age with AMD was found on the island of Rab due to the high level of UV radiation, compared to the highlands where AMD occurred in only 4% of cases as shown in Tables 1 and 2. Refractive errors are most common in Novi Vinodolski (40% of cases). Our measurements of ultraviolet radiation in the fields of UV-A and UV-B rays showed that there is a direct correlation and causality between the intensity of solar irradiation, i.e. the amount of exposure of children to sunlight and the occurrence of AMD. For the same reason, our epidemiological study focused to determine the occurrence of AMD in children in the karst area of Opatija where the values of solar radiation in the UV-A and UV-B fields are relatively low. A parallel study of the occurrence of glaucoma in the karst area of Opatija showed a very high presence of glaucoma in that area, especially in Mune and Brgud. This particular type of glaucoma was previously diagnosed as a separate clinical entity Glaucoma »Mune-Brgud« back in 1973 with tonographic and gonioscopic characteristics[3,4].

It is necessary to emphasize the origin of the local population of the karst area of Opatija. In the 10th century, this area was inhabited by a population from distant parts of Wallachia Romania[5]. Different names for this population of Romania exist: Rumeri, Aromuni, Cincari, Morlaci, Ćići, Ćiribirci and Istrian Vlachs. In certain areas of

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Istrian peninsula they have retained some form of their speech even today. In Žejane the local population still uses an old Istro-Romanian language.

Materials and Methods

47 children (9 to 14 years old) from the elementary school »Drago Gervais« in Brešca, Croatia participated in this study. Along with patient's history, following ophthalmic tests were performed: external eye examination, anterior eye segment examination with biomicroscopy, intraocular pressure measurement, visual field testing and in few cases optical coherence tomography (OCT). Children were divided into three groups according to the origin of their parents: domestic, foreign and mixed group. The children who gravitate to this school and who are subjects of this study come from smaller regional geographic toponyms: Brgud, Mune, Brešca, Žejane, Zvoneće, Pasjak, Šapjane and Zaluki (Figure 1). Measurements of ultraviolet UV-A and UV-B radiation were previously performed over a longer period of time. The obtained values are far below those that we have encountered on the island of Rab and partly below those obtained in Novi Vinodolski and Delnice.

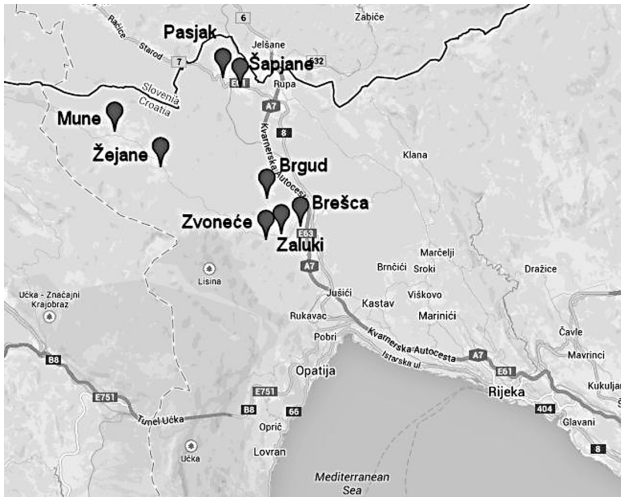

Fig. 1. Regional geographic toponyms of the karst area of Opatija.

Results

Tables 1 and 2 show the results of our earlier studies which were conducted using the same methodology as on the island of Rab, Novi Vinodolski and Delnice. Table 3 shows the results of the testing made in previously mentioned toponyms in the karst area of Opatija. It is evident that the occurrence of glaucoma in this area, especially in Mune-Brgud area, is far greater than in locations mentioned in Tables 1 and 2. The occurrence of AMD is practically non-existent in children in the karst area of Opatija, as opposed to results on the island of Rab. It should particularly be noted that the occurrence of glaucoma is present only among the indigenous population. Refractive anomalies occur among children of mixed marriages or whose parents originate from outside of the karst area of Opatija.

TABLE 1
ANALYSIS AND DETECTION OF REFRACTIVE ERRORS, MACULAR DEGENERATION AND GLAUCOMA IN CHILDREN IN PRIMORSKO-GORANSKA COUNTY

Location	Number of children	Refractive errors (%)	AMD (%)	Glaucoma (%)
The island of Rab	62	17	15	8
Delnice	86	9	4	3
Novi Vinodolski	41	40	11	4

AMD – age-related macular degeneration

TABLE 2
REFRACTIVE ERRORS OF THE EYE IN CHILDREN IN PRIMORSKO-GORANSKA COUNTY

Location	Refractive errors				
	Myopia (%)	Hyperopia (%)	Astigmatism		
			With-the-rule (%)	Against-the-rule (%)	Oblique
The island of Rab	5.0	9.5	2.0	0.5	–
Delnice	2.5	4.5	1.0	0.5	0.5
Novi Vinodolski	6.0	21.5	6.0	4.0	2.5

TABLE 3
ANALYSIS AND DETECTION OF REFRACTIVE ERRORS, MACULAR DEGENERATION AND GLAUCOMA IN CHILDREN IN THE KARST AREA OF OPATIJA

Origin	Number of children	Refractive errors (%)	AMD (%)	Glaucoma (%)
Domestic population	30	17%	0%	27% suspected 7% diagnosed
Mixed population	7	57%	0%	0%
Foreign population	10	30%	0%	0%

AMD – age-related macular degeneration

Discussion and Conclusion

As the area that was tested showed mixture of population, we have separated indigenous population from mixed and foreign population. Within the indigenous population (especially Mune and Brgud), the incidence of glaucoma is very high: 27% of children had suspected glaucoma and 7% were proven to have glaucoma. The children of other two population groups had no glaucoma. In his earlier

studies, Vojniković[4] singled out this form of »Mune-Brgud« glaucoma as a separate clinical entity in genetic terms of »Random Drift«. It is interesting to point out that the highest occurrence of AMD was found in children in the island of Rab where it occurs in 15% of cases compared to children in the karst area of Opatija where none of them showed signs of AMD. Why is that so? If we analyze the intensity of ultraviolet radiation in the field of UV-A and UV-B we will see that the radiation is far lower in the karst area of Opatija and it is related to the non-appearance of AMD in children.

It is important to emphasize that it is necessary to constantly examine the population of the karst area of Opatija because of early diagnosis of glaucoma and prevention of its progression.

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B. Vojniković

»Dr. B. Vojniković« Eye Polyclinic, Antuna Barca 3b, 51 000 Rijeka, Croatia
e-mail: decv@decv.com

EPIDEMIOLOŠKA STUDIJA VIDNIH FUNKCIJA – REFRAKTIVNIH GREŠAKA, MAKULARNE DEGENERACIJE I GLAUKOMA U DJECE NA PODRUČJU OPATIJSKOG KRASA

SAŽETAK

Autori su u ranijim studijama ispitivali epidemiološke karakteristike pojedinih očnih bolesti: dobno-povezane makularne degeneracije (AMD), refrakcijskih grešaka oka i glaukoma na području Primorsko-goranske županije – otok Rab, Novi Vinodolski i Delnice. Konstatirano je da je pojava AMD najučestalija na otoku Rabu, zatim u Novom Vinodolskom i najmanje u Gorskom Kotaru, što se povezuje sa jačinom sunčeva zračenja u području UV-A i UV-B. Također je i pojava glaukoma utvrđena u najvećem postotku na otoku Rabu. U usporedbi sa ovom studijom, ustanovljeno je da na području opatijskog krasa (Mune, Brgud, Žejane, Brešca, Zvoneća, Pasjak, Šapjane i Zaluki) postoji vrlo visoka incidencija glaukoma (27% suspektan glaukom i 7% dijagnosticiran) u autohtonog stanovništva. Glaukom se kod djece čiji roditelji potječu izvan područja opatijskog krasa praktički ne pojavljuje. Refrakcijske greške su daleko manje zastupljene kod djece čiji su roditelji autohtoni stanovnici nego u djece čiji roditelji potječu izvan tog područja. Pojava AMD nije konstatirana ni kod jednog djeteta koje je rođeno i živi na tom području, bez obzira iz kojeg kraja njihovi roditelji potječu. Ova konstatacija je vrlo bitna jer potvrđuje raniju konstataciju autora da kod niske solarne izloženosti UV-A i UV-B, nema pojave AMD zbog izostanka nužnog triger faktora.