

RETINOPATHY OF PREMATURITY AS A CAUSE OF BLINDNESS IN CROATIA

Tigrena Csik, Tanja Šimek, Jasna Pavičić-Astaloš, Ivana Merc, Ivan Slugan and Branka Jambreč

Department of Ophthalmology, Dr. Tomislav Bardek General Hospital, Koprivnica, Croatia

SUMMARY – The aim of our study was to assess the rate of retinopathy of prematurity (ROP) as a cause of blindness in Croatia. Data were collected from the registers of the associations of the blind. In our study, we analyzed 25% of the blind population in Croatia (N=1699) including the City of Zagreb, Koprivnica-Križevci County and Međimurje County Associations of the Blind. Data were analyzed according to sex, age and cause of blindness. According to prevalence, ROP ranked tenth as the cause of blindness in the blind population and was the main cause of blindness by age 16. The rate of ROP as a cause of blindness was on a continuous increase over the past two decades (1985-2007). The number of newly registered blind children during the past two-year period (2005-2007) indicated that every 26th day one child in Croatia goes blind because of ROP. Better prevention and treatment of ROP should be developed within the Croatian health care system.

Key words: *Retinopathy of prematurity; Blindness; Association of the Blind*

Introduction

Retinopathy of prematurity (ROP), previously known as retrolental fibroplasia, was first diagnosed in 1942. It is a serious vasoproliferative disorder of immature retinal blood vessels affecting extremely premature infants. The main risk factor is premature birth. ROP primarily affects preterm infants weighing about 1500 grams or less that are born before 32nd week of gestation. It is the major cause of blindness in childhood in developed countries. ROP is a two-stage disease, beginning with delayed retinal vascular growth after premature birth (stage I). Stage II follows when stage I-induced hypoxia releases factors to stimulate new blood vessel growth. Both oxygen-regulated and non-oxygen-regulated factors contribute to normal vascular development and retinal neovascularization. Vascular endothelial growth factor (VEGF) is an important oxygen-regulated factor. A critical non-oxygen-regulated growth factor is insulin-like growth factor-I (IGF-I). In knockout mice, the lack of

IGF-I prevents normal retinal vascular growth despite the presence of VEGF, important to vessel development. *In vitro*, low IGF-I levels prevent VEGF-induced activation of Akt, a kinase critical for vascular endothelial cell survival. It is known that premature infants who develop ROP have low levels of serum IGF-I compared to age-matched infants without the disease. IGF-I is critical to normal vascular development. Low IGF-I predicts ROP in premature infants, and restoration of IGF-I to normal levels may prevent ROP¹. According to data of the World Health Organization, the number of blind children is estimated to 1.4 million. ROP as a potentially avoidable cause of blindness and lesions of the central nervous system are very important causes of blindness in high-income and middle-income countries. The control of blindness in children is a priority within the World Health Organization's VISION 2020 program². Financial help for one blind child in Croatia is around 83,540.00 HRK annually, including free schooling at Vinko Bek School for the Blind and Visually Impaired Children. During the period of primary schooling, a blind child receives equipment necessary for education (Braille's aids) that cost around 100,000.00 HRK. Despite constant increase in the number of blind children

Correspondence to: *Tigrena Csik, MD*, Department of Ophthalmology, Dr. Tomislav Bardek General Hospital, Ul. Željka Selinger bb, HR-48000 Koprivnica, Croatia

E-mail: ocna-ambulanta@ob.koprivnica.hr

in Croatia, protection of eyesight and prevention of ROP have not been recognized as a cost-effective investment in the Croatian health care system.

Material and Methods

The Croatian Association of the Blind was founded in 1946. In March 2007, there were 6796 blind people registered. The prevalence of blindness in Croatia is 0.15%. We analyzed data on 25% of the blind population in Croatia (N=1699). In our retrospective analysis we included associations of the blind in the City of Zagreb, Koprivnica-Križevci County and Međimurje County. Members of the Croatian Association of the Blind are blind people who have visual acuity on the better eye less than 0.05 or visual field 5 degrees from the point of fixation. Data collected from records of the associations of the blind were analyzed according to sex, age and cause of blindness. These records are written by ophthalmologists on signing up in the associations of the blind. At that time, the associations of the blind had 1239 registered members in the City of Zagreb, 228 members in Koprivnica-Križevci County and 232 members in Međimurje County. According to these data, we could assess the rate of ROP causing blindness in Croatia. Since we had a statistically representative sample of blindness in the Croatian population as whole, we could make conclusions on the causes of blindness at the national level.

Results

The Croatian Association of the Blind has 6796 blind people registered (3420 female and 3376 male members). More than 50 percent of the blind people are in the age group of 60 years and more (Table 1). This can be explained by the occurrence of a disease that can impair vision, e.g., diabetes mellitus, in older individuals. Table 1 shows that 268 blind children are registered in associations of the blind. The main causes of blindness in Croatia are myopia (myopic maculopathy)

Table 1. Age distribution

Age (yrs)	n	Percentage
0-16	268	3.94%
17-60	3.060	45.03%
>60	3.468	51.03%

Table 2. Main causes of blindness

No.	Cause of blindness	n	Percentage
1	Myopia	960	14.13%
2	Diabetic retinopathy	892	13.13%
3	Glaucoma	812	11.95%
4	Optic nerve atrophy	688	10.12%
5	Macular degeneration	640	9.42%
6	Retinitis pigmentosa	532	7.83%
7	Trauma	524	7.71%
8	Congenital disorders	480	7.06%
9	Uveitis	264	3.88%
10	Retinopathy of prematurity	260	3.83%
11	Retinal detachment	212	3.12%
12	Congenital cataract	192	2.83%
13	Opacities of cornea	180	2.65%
14	Others	160	2.35%

(n=960), diabetic retinopathy (n=892) and glaucoma (n=812) causing 39.21% of blindness cases (n=2664). Macular degeneration, including myopic- (n=960) and age related disorder (n=640), is the most common cause of blindness in Croatia (25.33%). Myopia on the first place is followed by diabetic retinopathy and glaucoma, which can be prevented. ROP as the cause of blindness is on tenth place (n=260; 3.83%), after uveitis and prior to congenital cataract (Table 2)³. Total number of blind children in Croatia is 268. ROP is the main cause of blindness by age 16, including 104 blind children (38.80%). The formerly most common cause of blindness (congenital cataract) is now on the last, sixth place (Table 3). ROP as a cause of blindness was recognized a long time ago; the oldest member of the Association was born in 1924 and registered in 1946, when the Association was founded. There was constant increase in the ROP causing blindness in the last eighty years (1924–2005). In the first thirty years of our study, ROP was a rare but recognized disease. Every ten years, from 1965

Table 3. Main causes of blindness according to diagnosis: age 0-16

No.	Cause of blindness	n	Percentage
1	Retinopathy of prematurity	104	38.80%
2	Congenital disorders	88	32.84%
3	Optic nerve atrophy	32	11.94%
4	Retinitis pigmentosa	32	11.93%
5	Congenital glaucoma	8	2.99%
6	Congenital cataract	4	1.49%
	Total	268	

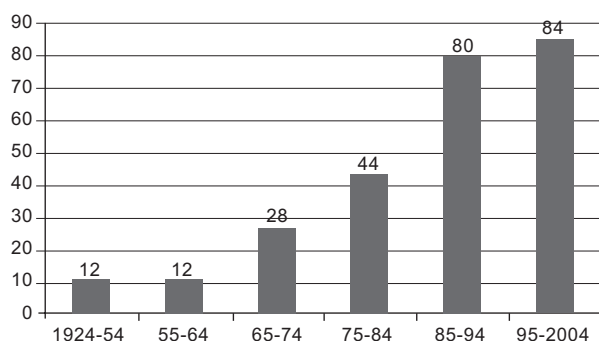


Fig. 1. Retinopathy of prematurity: cause of blindness in the last 80 years

till 1984, the rate of blindness caused by ROP rose twice. In the period from 1985 till 1994, the number of newly registered blind persons because of ROP was 80, and in the period from 1995 till 2004 it was 84, suggesting some hope for the problem of ROP causing blindness to stagnate. In the last two years (2005-2007), seven ROP induced blind children were newly registered, yielding a figure of 28 for the whole country. If this trend continues, we can expect 140 newly recorded blind children due to ROP by the year 2014 (Fig. 1).

Analyzing data on the cost of this type of disability we found that in Croatia a blind child receives annual support of 83,540.00 HRK (Table 4). During the period of primary schooling a blind child receives equipment necessary for education (Braille's aids), the cost of which is around 100,000.00 HRK.

Table 4. Financial help to blind children

Social care center (monthly)	1,000.00 HRK
Single payment (once a year)	3,500.00 HRK
Pension fund, child benefit (monthly)	870.00 HRK
Free schooling, boarding at Vinko Bek School for Blind and Visually Impaired Children (monthly)	4,800.00 HRK
Annual contribution	83,540.00 HRK

Discussion and Conclusion

The major causes of blindness in children vary widely from region to region, being largely determined by socio-economic development, and the availability of primary health care and eye care services². ROP is one of the few largely preventable causes of childhood vision impairment. The most effective prevention of ROP is the prevention of premature birth. The survival of prema-

ture babies with extremely low birth weight is constantly increasing. This improved survival is associated with an increased incidence of ROP. ROP causes blindness in 38.80 percent of cases by the age of 16 and 3.83 percent of cases in the blind population in Croatia. According to our analysis, twice more blind children due to ROP were registered in the last two decades than in previous periods. During a two-year period (March 2005-2007), seven new children became members of the Association of the Blind because of ROP (25% of the blind population), yielding a figure of 28 for Croatia as a whole. Vision 2020 warns of the following: "Every 5 seconds an adult goes blind; every minute a child becomes blind, too"⁴. Our analysis showed that in Croatia every 26th day one child goes blind because of ROP. Restoration of sight is one of the most cost-effective interventions in health care. Analyzing data on the cost of this type disability we found that in Croatia, a blind child receives annual support of 83,540.00 HRK. It has been proven that blindness can be prevented with early detection, monitoring and early surgical treatment of ROP. Efficient and inexpensive screening performed with indirect ophthalmoscopy (cost 15,000.00 HRK) is necessary to detect ROP and initiate appropriate treatment on time. Diode laser (cost 170,000.00 HRK) photocoagulation is used in the treatment of affected eye. Significant aid for better prevention of ROP would be the supply of appropriate equipment (20 diode lasers and 4 indirect ophthalmoscopes). The amount needed for this equipment (1,000,000.00 HRK) is equal to 12-year financial help for one blind child (12 'blind years'). The Croatian Ministry of Health and Social Welfare should recognize this kind of investment for prevention of blindness as the most cost-effective investment in the Croatian health care system^{3,5}.

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Sažetak

PREMATURNA RETINOPATIJA KAO UZROK SLJEPOĆE U HRVATSKOJ

T. Csik, T. Šimek, J. Pavičić-Astaloš, I. Merc, I. Služan i B. Jambreč

Cilj rada bio je istražiti koliko je često prematurna retinopatija (PR) uzrok sljepoće u Hrvatskoj. Upotrebjeni su podaci Saveza slijepih Hrvatske. Obrađeni su podaci Udruge slijepih grada Zagreba, Udruge slijepih Koprivničko-križevačke županije i Udruge slijepih Međimurske županije, što čini 25% članstva Hrvatske udruge slijepih. Uzroci sljepoće obrađeni su prema dobi, spolu i razlogu sljepoće. PR je bio uzrok sljepoće u 260 osoba u Hrvatskoj. U cijeloj populaciji slijepih u Hrvatskoj PR je na desetom mjestu po učestalosti te vodeći uzrok sljepoće u dobi do 16 godina. Broj slijepih zbog PR od 1985. g. je u stalnom porastu. U obrađenim udrugama slijepih u razdoblju od 2005. do 2007. godine zbog PR je učlanjeno 7 slijepih djece. S obzirom na velik istražen uzorak možemo zaključiti da u Hrvatskoj svakog 26. dana jedno dijete oslijepi zbog PR. Preventivi i liječenju PR nužno je pridati veće značenje, od županijskih bolnica do klinika i Ministarstva zdravstva.

Ključne riječi: *Prematurna retinopatija; Sljepoća; Udruga slijepih*