

BLINDNESS AND LOW VISION IN A TERTIARY OPHTHALMOLOGIC CENTER IN THAILAND

The Importance of Cytomegalovirus Retinitis

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Purpose: To determine the causes of blindness and low vision in patients consulting a tertiary ophthalmologic center in northern Thailand.

Methods: The study population included 2,951 new consecutive patients from the Department of Ophthalmology at University Hospital in Chiang-Mai, Thailand. Main outcome measures were blindness and low vision, which were defined according to World Health Organization criteria.

Results: Of 2,951 patients, 369 (12.5%) had blindness and/or low vision (bilateral blindness in 73, unilateral blindness in 129, bilateral low vision in 77, and unilateral low vision in 90). Of the etiological causes of visual loss, age-related ocular disease was the most frequent (128 patients [35%]) followed by infections (66 patients [18%]) and trauma (43 patients [12%]). Although infections and trauma were the predominant causes of blindness, age-related disorders were frequently found in patients with low vision. Of anatomical sites, the lens (134 patients [36%]) was the main location of visual loss, closely followed by disorders of the retina and/or uvea (126 patients [34%]). Blindness and low vision were considered avoidable in 70% of cases. Of 73 patients with bilateral blindness, 14 had active cytomegalovirus retinitis, accounting for 19% of all patients with bilateral blindness.

Conclusion: The most common causes of blindness and low vision in a tertiary center in northern Thailand were age-related ocular disorders and infections, which were predominantly cases of cytomegalovirus retinitis in human immunodeficiency virus-infected patients.

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Visual impairment is one of the most common disabilities: an estimated 45 million people worldwide are blind, and 200 million people have low vision.^{1–3} Population-based studies have shown that

the main causes of blindness worldwide (in addition to refraction abnormalities) are age-related cataract and glaucoma.^{1,3} The prevalence of blindness and low vision due to infectious diseases, including human

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immunodeficiency virus (HIV)-related visual impairment, is not known. Cytomegalovirus (CMV) retinitis has not yet been recognized as an important cause of blindness, despite the huge burden of HIV infection in various areas of the world such as Southeast Asia and Africa. In Thailand during the last decades, ophthalmologic care has been aimed at the major causes of blindness (cataract and glaucoma surgery along with prevention of nutritional diseases), and the prevalence of bilateral blindness has decreased dramatically from 1.1% to 0.31%.^{4,5}

Nothing is known about the causes of blindness and low vision in patients consulting the tertiary centers in Southeast Asia, nor have the most frequent disorders and needs of patients consulting these centers been identified. In this study, we investigated the causes of blindness and low vision in a large university teaching hospital serving the whole of northern Thailand and paid specific attention to intraocular infections, specifically CMV retinitis.

Methods

Of 2,951 new consecutive patients consulting the Department of Ophthalmology at University Hospital in Chiang Mai, Thailand, from February 1 to June 31, 2005, 369 (12.5%) with bilateral or unilateral blindness and/or low vision were prospectively selected for the study.

The World Health Organization's definitions of blindness (corresponding to corrected visual acuity of <0.05 or 20/400) and low vision (corresponding to corrected visual acuity of ≤ 0.30 or 20/60) were used in this study.^{6,7} Patients were assessed according to anatomical location and etiology of the main cause of blindness. In addition, preventability and curability of blindness were also registered. These data were analyzed for both patients ($n = 369$) and affected eyes ($n = 519$). When a combination of diverse causes leading to blindness and/or low vision was noted, the most direct cause of visual loss was selected. If this selection was not possible, the cases were classified separately as combinations ($n = 12$). The refraction abnormalities were not represented among the causes of visual loss, except where there was still subnormal vision with optimal correction (e.g., amblyopia).

Anatomical location of the cause of blindness in glaucoma was classified as optic disk blindness. The etiology of primary open-angle glaucoma was classified as unknown, as was that of rhegmatogenous retinal detachment (with the exception of myopic and traumatic cases). Reversible blindness and low vision were considered in patients with cataract (possibility of surgery). The preventable category included trauma

Table 1. Blindness and Low Vision in 2,951 New Consecutive Patients Consulting the Department of Ophthalmology at University Hospital in Chiang Mai, Thailand

Finding	Blindness*	Low Vision†	Total
Bilateral loss of vision	73	77	150
Unilateral loss of vision	129	90	219
Total	202	167	369

*One or both eyes matching the World Health Organization's definition of blindness (corresponding to corrected visual acuity of <0.05 or 20/400).

†One or both eyes matching the World Health Organization's definition of low vision (corresponding to corrected visual acuity of ≤ 0.30 or 20/60 and ≥ 0.05 or 20/400).

and glaucoma (except congenital glaucoma) as well as CMV retinitis in HIV-infected patients (possibility of highly active antiretroviral therapy [HAART]). In intraocular inflammations, treatable loss of vision was considered in identified infectious causes, whereas the treatability of visual loss in uveitis of unknown cause was considered unknown. Blindness due to retinal vascular occlusions, age-related macular degeneration, and optic atrophy was considered not preventable and not reversible.

Data for patients were computerized and statistically analyzed by means of the χ^2 test and Fisher exact test. $P < 0.05$ was considered statistically significant.

Results

Our study included 369 patients with blindness or low vision, of whom 150 (41%) had bilateral loss and 219 (59%) had unilateral loss (519 affected eyes) (Table 1). The male-to-female ratio was 1:1, and the mean age of the patients was 52 years (median, 54 years; range, 4–87 years).

The main causes of visual impairment and blindness are listed in Table 2. The most common etiological causes were age-related ocular diseases (128 patients [35%], of whom 123 had cataract and the remainder had other age-related ocular disorders), followed by infections (66 patients [18%]) and trauma (43 patients [12%]). After age-related causes, infections were the second major cause of both blindness and low vision (21% and 14%, respectively). Although trauma was predominantly encountered in blindness ($P = 0.006$), age-related disorders were more frequently noted in low vision ($P < 0.001$).

The classification of patients according to severity and laterality of visual loss is listed in Table 3. For all 369 patients, the main anatomical location of visual loss was the lens with cataract (134 [36%]/369, in-

Table 2. Causes of Bilateral and Unilateral Blindness and Bilateral and Unilateral Low Vision

Cause	No. (%) of All Patients	No. (%) With Bilateral Blindness	No. (%) With Unilateral Blindness	<i>P</i> , Unilateral vs. Bilateral Blindness	No. (%) With Bilateral Low Vision	No. (%) With Unilateral Low Vision	<i>P</i> , Unilateral vs. Bilateral Low Vision
Age related	128 (35)	32 (44)	23 (18)	<0.001	36 (47)	37 (41)	NS
Infections*	66 (18)	17 (23)	25 (19)	NS	10 (13)	14 (16)	NS
Trauma†	43 (11.7)	1 (1)	31 (24)	<0.001	0	11 (12)	<0.002
Hereditary and developmental ocular diseases‡	30 (8.1)	5 (7)	7 (5)	NS	11 (14)	7 (8)	NS
Diabetes mellitus	12 (3.3)	3 (4)	3 (2)	NS	5 (6.5)	1 (1)	NS
Ocular vascular occlusions	5 (1.4)	1 (1)	2 (2)	NS	0	2 (2)	NS
Retinopathy of prematurity	2 (0.5)	1 (1)	0	NS	1 (1)	0	NS
Nonmalignant tumors	1 (0.3)	1 (1)	0	NS	0	0	NS
Malignancy	0	0	0	NS	0	0	NS
Nutritional	0	0	0	NS	0	0	NS
Other	6 (1.6)	0	3 (2)	NS	2 (3)	1 (1)	NS
Unknown‡	64 (17.3)	7 (10)	35 (27)	<0.004	5 (6.5)	17 (19)	<0.018
Combinations of causes	12 (3.3)	5 (7)	0	NA	7 (9)	0	NA
Total	369 (100)	73 (100)	129 (100)		77 (100)	90 (100)	

*Includes 45 patients with human immunodeficiency virus–related visual loss (42 with active cytomegalovirus retinitis, 2 with retinal detachment due to cytomegalovirus retinitis, and 1 with herpetic retinopathy).

†Includes also surgical trauma (3 patients with bullous keratopathy after cataract surgery).

‡Hereditary and developmental causes also include amblyopia and myopia. For unknown causes and further details, see Methods. NS, not significant; NA, not applicable.

cluding age-related cataract and cataract from other causes such as traumatic, juvenile, or others), which was followed by disorders of the retina and/or uvea (126 [35%]/369). Active CMV retinitis was the cause of visual loss in 11% (42) of 369 patients, while age-related macular degeneration was the cause only in 0.8% (3) of 369 patients. Of 369 patients, 45 (12% [42 with active CMV retinitis, 2 with retinal detachment due to CMV retinitis, and 1 with herpetic retinopathy]) had loss of visual acuity due to HIV infection. Visual loss was caused by glaucoma in 11 (3%), non-HIV uveitis in 19 (5%), and retinal detachment in 18 (5%) of 369 patients. Bilateral blindness and/or low vision was more frequently caused by cataract than was unilateral blindness and/or low vision (69 [46%]/150 vs. 65 [30%]/219 patients, respectively; $P < 0.001$). In contrast, the most frequent cause of unilateral visual loss was retinal and/or uveal disorders (81 [37%]/219 patients). Disorders affecting the cornea and whole globe were more frequently noted in unilateral visual loss than in bilateral visual loss (25/219 vs. 6/150 patients, respectively [$P = 0.012$]; and 19/219 vs. 0/150 patients, respectively [$P < 0.001$]). The prevalence of retinal diseases, and specifically of CMV retinitis, did not differ between unilaterally and bilaterally affected patients (20 [9.1%]/219 vs. 22

[14.7%]/150, respectively; $P = 0.1$). Age-related ocular disorders were more frequent in bilateral blindness and low vision than in unilateral blindness and low vision (68 [45.3%]/150 vs. 60 [27.4%]/219 patients, respectively; $P < 0.001$), while trauma-induced blindness and low vision were more frequent in unilateral visual loss than in bilateral visual loss (1 [0.7%]/150 vs. 42 [19.2%]/219 patients, respectively; $P < 0.001$). Of 150 patients with bilateral blindness and/or low vision, 23 (22 with CMV retinitis and 1 with progressive herpetic outer retinal necrosis) had HIV-related visual loss, thus accounting for 15% of all patients with bilateral blindness or low vision.

Patients with blindness and low vision were further subdivided according to four separate categories (bilateral blindness, unilateral blindness, bilateral low vision, and unilateral low vision; Table 4). Retinal and/or uveal disorders were a major cause of blindness (76 [38%]/202 patients), whereas cataract was the main cause of low vision (76 [46%]/167 patients). The association of unilateral blindness with trauma and a marginally higher prevalence of bilateral blindness with CMV retinitis were also observed. When 150 patients with bilateral visual loss were subdivided into blindness ($n = 73$) and low vision ($n = 77$) groups

Table 3. Anatomical Location of Ocular Disorders Causing Loss of Visual Acuity Classified According to Laterality and Severity of Visual Loss

Anatomical Location	No. (%) of All Patients	No. (%) With Bilateral Blindness and Low Vision	No. (%) With Unilateral Blindness and Low Vision	<i>P</i> , Unilateral vs. Bilateral Blindness and Low Vision	No. (%) With Blindness (Unilateral and Bilateral)	No. (%) With Low Vision (Unilateral and Bilateral)	<i>P</i> , Blindness vs. Low Vision
Cornea	31 (8.4)	6 (4)	25 (11.4)	0.012	19 (9.4)	12 (7.2)	0.44
Bullous keratopathy	3 (0.8)	1 (0.7)	2 (0.9)		3 (1.5)	0	
Corneal scar	13 (3.5)	2 (1.3)	11 (5)		9 (4.5)	4 (2.4)	
Corneal ulcer	9 (2.4)	2 (1.3)	7 (3.2)		7 (3.5)	2 (1.2)	
Miscellaneous	6 (1.6)	1 (0.7)	5 (2.3)		0	6 (3.6)	
Lens	134 (36.3)	69 (46)	65 (29.7)	<0.001	58 (28.7)	76 (45.5)	<0.001
Retina/uvea	126 (34.6)	45 (30)	81 (37)	0.17	76 (37.6)	50 (29.9)	0.12
CMV retinitis	42 (11.4)	22 (14.7)	20 (9.1)		24 (11.9)	18 (10.8)	
Uveitis (non-CMV)	19 (5.1)	4 (2.7)	15 (6.9)		14 (6.9)	5 (3)	
Retinal detachment*	18 (4.9)	3 (2)	15 (6.9)		14 (6.9)	4 (2.4)	
Vascular occlusions	4 (1.1)	0	4 (1.8)		2 (1)	2 (1.2)	
Diabetic retinopathy	9 (2.4)	6 (4)	3 (1.4)		5 (2.5)	4 (2.4)	
AMD	3 (0.8)	2 (1.3)	1 (0.5)		3 (1.5)	0	
Tapetoretinal degenerations	4 (1.1)	4 (2.7)	0		2 (1)	2 (1.2)	
Miscellaneous	27 (7.9)	4 (2.7)	23 (10.5)		12 (5.9)	15 (9)	
Optic disk	28 (7.6)	9 (6)	19 (8.7)	0.34	20 (10)	8 (4.8)	0.07
Glaucoma	11 (3)	4 (2.7)	7 (3.2)		8 (4.0)	3 (1.8)	
Atrophy	13 (3.5)	4 (2.7)	9 (4.1)		10 (5)	3 (1.8)	
Neuritis	4 (1.1)	1 (0.7)	3 (1.4)		2 (1)	2 (1.2)	
Whole globe	19 (5.1)	0	19 (8.7)	<0.001	19 (9.4)	0	0.001
Endophthalmitis	5 (1.4)		5 (2.3)		5 (2.5)		
Phthisis	5 (1.4)		5 (2.3)		5 (2.5)		
Rupture	5 (1.4)		5 (2.3)		5 (2.5)		
Contusion	2 (0.5)		2 (0.9)		2 (1)		
Microphthalmos	2 (0.5)		2 (0.9)		2 (1)		
Amblyopia	19 (5.1)	9 (6)	10 (4.6)	0.54	5 (2.5)	14 (8.4)	0.01
Myopic amblyopia†	10 (2.7)	5 (3.3)	5 (2.3)		4 (2)	6 (3.6)	
Nonmyopic amblyopia	9 (2.4)	4 (2.7)	5 (2.3)		1 (0.5)	8 (4.8)	
Combinations of diverse disorders	12 (3.2)	12 (8)	NA	NA	5 (2.5)	7 (4.2)	0.36
Total	369 (100)	150 (100)	219 (100)		202 (100)	167 (100)	

*Included patients with bilateral retinal detachment due to CMV retinitis ($n = 2$), diabetic retinopathy ($n = 3$), myopia ($n = 1$), trauma ($n = 1$), and non-human immunodeficiency virus uveitis ($n = 1$) and 10 patients with idiopathic bilateral retinal detachment.

†In the group with myopic amblyopia, some patients with a combination of amblyopia and myopic retinal changes might have been included. The exact distinction between pure myopic amblyopia and myopic retinal degenerations and combinations was not feasible in this study.

CMV, cytomegalovirus; AMD, age-related macular degeneration; NA, not applicable.

and compared, no differences emerged in terms of location or etiological cause of visual loss (all locations and causes, $P = 0.1$).

When the data were evaluated for affected eyes ($n = 519$), a higher percentage of blindness and low vision due to bilateral diseases was noted (e.g., cataract). No other differences were observed. Blindness and low vision were considered preventable ($n = 126$) and/or reversible ($n = 134$) in 260 (70%) of 369 cases. Of 73 patients with bilateral blindness, 30 (42%) had cataract and 26 (36%) had retinal/uveal disorders, of whom 14 (19%) had active CMV retinitis.

Discussion

The leading causes of blindness and low vision at a large tertiary center in northern Thailand were age-related diseases and ocular infections, which were predominantly cases of CMV retinitis in HIV-infected patients. Bilateral active CMV retinitis was present in 19% of all patients with bilateral blindness. Loss of vision was considered preventable and/or reversible in most patients.

The very high percentage of CMV retinitis among blind patients at a tertiary center is striking. Immuno-

Table 4. Anatomical Location of Ocular Disorders Causing Bilateral and Unilateral Blindness and Low Vision

Anatomical Location	No. (%) of All Patients	No. (%) With Bilateral Blindness	No. (%) With Unilateral Blindness	<i>P</i> , Unilateral vs. Bilateral Blindness	No. (%) With Low Vision	No. (%) With Low Vision	<i>P</i> , Unilateral vs. Bilateral Blindness
Cornea	31 (8.4)	4 (6)	15 (12)	NS	2 (3)	10 (11)	NS
Lens	134 (36.3)	30 (41)	28 (22)	0.003	39 (51)	37 (41)	NS
Retina/uvea	126 (34.6)	27 (37)	50 (39)	NS	18 (23)	31 (34.5)	NS
CMV retinitis	42 (11.4)	14 (19)	12 (9)	0.044	9 (11.5)	10 (11)	NS
Optic disk	28 (7.6)	6 (8)	14 (11)	NS	3 (4)	5 (5.5)	NS
Glaucoma	11 (3)	2 (3)	6 (5)	NS	2 (3)	1 (1)	NS
Whole globe	19 (5.1)	0	18 (14)	<0.001	0	1 (1)	NS
Combinations of diverse disorders	12 (3.2)	5 (7)	NA		7 (10)	NA	
Nonocular	19 (5.1)	1 (1)	0	NS	8 (10)	6 (7)	NS
Total	369 (100)	73 (100)	129 (100)		77 (100)	90 (100)	

CMV cytomegalovirus; NS, not significant; NA, not applicable.

suppression due to acquired immunodeficiency syndrome is a serious public health problem in Southeast Asia. Recent data indicate that the prevalence of HIV infection among the whole population of Thailand is 1.5%.^{8,9} Before the era of HAART, $\approx 30\%$ of patients with acquired immunodeficiency syndrome in industrialized countries developed CMV retinitis.^{10,11} The combination of HAART and effective anti-CMV drugs has improved the visual prognosis for patients with CMV retinitis and has dramatically reduced the risk of developing bilateral blinding disease in the industrialized world. The rates of vision loss among eyes with CMV retinitis observed in the era of HAART are approximately eightfold less than the rates reported in pre-HAART studies.^{12,13} In Thailand, the prevalence of CMV retinitis was reported to be 21% (42/200 patients) in a cross-sectional study in 1996¹⁴ and 33% in a prospective study of newly diagnosed HIV-positive patients in 2003.¹⁵ Therefore, 33% of HIV-infected persons in Thailand can expect to develop CMV retinitis at some point during the course of their illness. Thailand's national program for access to antiretroviral treatment began in 2002, in which cheaper generic antiretroviral drugs are locally produced and distributed in all government hospitals through the Universal Coverage Project. Unfortunately, so far, not all HIV-positive patients receive HAART.¹⁶ It is expected that locally produced HAART will be increasingly used and that the life expectancy of HIV-infected persons will increase. Hopefully, after implementation of HAART for HIV-infected persons, CMV as a cause of blindness (with yet undefined magnitude in Southeast Asia) will decrease. However, some investigators have warned that the initial increase of CMV-induced blindness (related to a longer life for those who already have CMV retinitis) might be tremendous.¹⁷

Our study illustrates that the causes of blindness encountered in a tertiary center differ from those reported for the whole population, which is not surprising. Our study did not attempt to replace an epidemiologic survey on blindness but aimed to analyze the specific disorders that the tertiary ophthalmologic centers are confronted with and, consequently, to determine which specific demands these centers should anticipate. We attempted to reveal the answers to questions entirely different from those of epidemiologic studies. The pattern of diseases encountered in a tertiary center undoubtedly reflects the local diagnostic and therapeutic possibilities; in addition, the referral patterns might also be influenced by age, availability of the center, and socioeconomic position of the patients. The patients attending tertiary centers are in part (self-selected) from a local area and referred from a much larger area. Although the basic medical coverage in Thailand also includes the elderly and the very poor, it is possible that these groups of patients might be underrepresented. The referral bias in the number of patients with acquired immunodeficiency syndrome and CMV retinitis is very high because tertiary centers are the only centers for treatment of CMV retinitis. In our population, the roles of glaucoma and age-related macular degeneration in blindness and low vision were negligible. The recent availability of therapeutic and surgical options for glaucoma might also have influenced the low number of cases of glaucoma-induced blindness in this university hospital. Future population studies will allow further analyses of visual impairment and blindness according to age and further distinctions, topics out of the scope of the present study.

The expertise of treating CMV retinitis in Southeast Asia is localized in tertiary centers. Our results indicate that precise data on the prevalence and incidence

of blinding complications of HIV infection in South-east Asia are urgently needed. Our study emphasizes the very important role of tertiary ophthalmologic centers in caring for HIV-infected persons with ocular disease in Thailand and probably all of Southeast Asia. Our results point out that retinal disorders, especially infections, play a major role in the cause of blindness encountered in tertiary centers in Thailand. Clearly, such institutions should anticipate the expected needs of their patient populations and prepare for taking care of large numbers of HIV-infected patients.

Key words: blindness and visual impairment, cytomegalovirus retinitis, Thailand.

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