Pattern of Uveitis in a Referral Ophthalmology Center in the Central District of Thailand

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ABSTRACT

Purpose: To report the pattern of uveitis in a major ophthalmology center in the central district of Thailand.

Methods: A retrospective study was performed in uveitis cases visiting the Department of Ophthalmology at Rajavithi Hospital, Thailand, from January 2007 to October 2012.

Results: Four hundred and forty-six patients (mean age 42 years, female 53.8%) were included in the study. Uveitis was unilateral in 51.1% of cases. Anterior uveitis was the most common (44.8%) case, closely followed by panuveitis (40%), posterior uveitis (14.3%), and intermediate uveitis (0.9%). Specific diagnosis was established in 51.6% of patients. The three most common specific diagnoses were Vogt-Koyanagi-Harada (VKH) disease (22.4%), followed by Behçet disease (6.7%) and herpetic anterior uveitis (5.8%).

Conclusions: The most common type of noninfectious uveitis group was VKH, while herpetic anterior uveitis was the most common type of infectious uveitis in the central district of Thailand.

Keywords: Behçet, epidemiology, Thailand, uveitis, Vogt-Koyanagi-Harada

Uveitis is the third most common cause of visual blindness in developing countries.¹ It encompasses an enormous group of diverse inflammatory disorders, which can be either primary or secondary. The classification for uveitis was defined by the Standardization of Uveitis Nomenclature for Reporting Clinical Data (SUN) group in 2005 and this has remained a popular pole for diagnosis². There are four major categories of uveitis: anterior, intermediate, posterior, and panuveitis, classified on an anatomical basis. Depending on the natural history of the disease, it can be classified as infectious or noninfectious, and granulomatous or nongranulomatous. Nevertheless, owing to some of the characteristics of these disease entities, such as their wide variety of presentation and their dynamic and changeable nature, lack of proper investigation has resulted in difficulties in making effective diagnosis.

There have been too few epidemiologic studies of uveitis in Thailand, especially in the central region. There have been only two studies, one from the northern and one from the southern region of Thailand, reporting patterns of uveitis.³⁴

We conducted this study to report the pattern of uveitis in the Department of Ophthalmology at Rajavithi Hospital, which is a major ophthalmology referral center in the central district of Thailand. In addition, we report other important information that has not previously been described, such as the percentage of universal health-care system coverage, referral sites based on geographic data, visual prognosis, and ocular sequelae.

MATERIALS AND METHODS

Study Design

The present research was designed as a retrospective descriptive study. The population for this study consisted of all patients with uveitis visiting the Department of Ophthalmology, Rajavithi Hospital,
Bangkok, Thailand from January 2007 to October 2012. The study followed the tenets of the Declaration of Helsinki and was approved by the Ethics Committee of Rajavithi Hospital. Initially, the database consisted of 29,540 patients selected by searching based on diagnostic codes used in the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM) relevant to uveitis (Supplement 1). Then we excluded patients diagnosed with episcleritis, scleritis without significant intraocular inflammation, cytomegalovirus retinitis (CMVR) in HIV, endophthalmitis, and visceral larva migrans, and those patients with direct trauma leading to inflammation. The remaining 2661 patients formed the population of this study.

The minimum number in the population sample was 384 patients, with 95% confidence interval and acceptable margin of error of 5%. Due to scarcity of population-based studies exploring the epidemiology of uveitis in Thailand and our setting, the probability of 0.5 was used. After sample size calculation was done, systematic sampling was randomly performed by selecting every 7th name from the list of patients in each year from 2007 to 2012.

All available medical records retrieved were rechecked for validity by at least 1 ophthalmologist. Other exclusion criteria were uveitis that occurred within 90 days after any intraocular surgery; had systemic conditions without ocular problems; accompanying follow-up time of less than 90 days; and lack of important clinical data, especially clear diagnosis.

Patient information was gathered from clinical records, including age, gender, race, age at onset, age at presentation, patient’s health-care system coverage, referral sites based on geographic data, laterality, anatomic diagnosis, type of uveitis, etiological diagnosis, course of uveitis, activity of uveitis, medical and surgical treatment modalities, visual prognosis, and ocular complications. Patients were anatomically classified according to SUN criteria as having anterior uveitis, posterior uveitis, intermediate uveitis, or panuveitis. Regarding the nature of the disease, uveitis was divided into acute uveitis, defined as the sudden onset of intraocular inflammation lasting less than 3 months, and chronic uveitis, which referred to an inflammatory episode of insidious onset that lasted longer than 3 months.

All patients underwent careful history searches for specific ocular uveitis entities or systemic disease associations together with ocular examinations, including best-corrected visual acuity (BCVA), tonometry, slit-lamp biomicroscopy, and indirect ophthalmoscopy. Further laboratory investigations for uveitis were employed, depending on anatomic classification, uveitis frequency and severity, whether there were signs of granulomatous inflammation, and clinical clues for associated systemic illness. An array of laboratory investigations, including complete blood counts, erythrocyte sedimentation rate, urine analysis, anti-HIV antibody testing, hepatitis serological profiles, ELISA serum, fluorescent treponemal antibody absorption detection, anti-nuclear antibody (ANA), rheumatoid factor, and chest radiography, were performed in all cases except patients with first attack of anterior uveitis, who respond well to topical corticosteroids. Other augmented tests were carried out in selected cases where there was clinical suspicion. These tests included HLA-B27 for ankylosing spondylitis, Toxoplasma antibodies, Toxocara antibodies, tuberculin skin testing for suspected intraocular tuberculosis, C-reactive protein, serum angiotensin-converting enzyme, intraocular fluid analyses for polymerase chain reaction (PCR) or standard microbiological study and cytology, fluorescein and indocyanine green angiography, optical coherence tomography, computed tomography, and magnetic resonance imaging. PCR analyses are available in our institute only for the human herpes virus family (HSV-1, HSV-2, VZV, CMV) and were performed at the physician’s discretion.

The specific diagnosis was either confirmed or strongly suspected by the aforementioned meticulous examination of clinical history, extensive systematic reviews, ocular findings, and laboratory and ancillary tests. Medical consultation was done when indicated. Some uveitis entities, such as Vogt-Koyanagi-Harada (VKH) disease, Behcèt disease (BD), acute retinal necrosis (ARN) syndrome, and sarcoidosis, were unanimously diagnosed by the proposed diagnostic criteria.

The diagnosis of herpetic anterior uveitis was primarily based on suggestive clinical characteristics, for instance, positive history of herpetic infection, scarring in the corneal stroma, iris atrophy, decrement of corneal sensation, or elevated intraocular pressure. Intraocular fluid analysis was employed in cases that were equivocal.

The diagnosis of ocular toxoplasmosis was based on the distinctive retinal findings, that is, focal necrotizing retinitis or retinochoroiditis, which may be associated with pigmented retinochoroidal scar in either eye. Positive serology for toxoplasma was done only in certain cases. Unfortunately, neither PCR nor aqueous analysis by Goldmann-Witmer coefficient testing is available in our setting. The cases for which diagnosis could not be determined were classified as uveitis of idiopathic cause.

For the evaluation of visual impairment, low vision was defined as visual acuity of less than 6/18, but equal to or better than 3/60 in the better eye with best possible correction, while blindness was defined as visual acuity of less than 3/60 in the better eye with best possible correction. Monocular blindness was
defined as visual acuity of less than 3/60 in one eye but better than 3/60 in the other eye. The visual acuity level of each eye was classified into level 1 (better than low vision), level 2 (low vision), and level 3 (blindness).

**Statistical Analysis**

A descriptive statistical analysis for each one of the variables was performed. Data were analyzed using SPSS 16.0 (SPSS Inc., Chicago, IL, USA).

**RESULTS**

**Demographic Data**

The records of 446 patients (664 eyes) who fulfilled the aforementioned criteria were analyzed. Of these patients, 240 (53.8%) were female. Patients’ mean age was 42.1 ± 16.1 years (range, 3–86), and most cases (41.7%) were in the range of 40–59 years old. Thai was the most prevalent race (98.7%), followed by Burmese (0.9%). With regard to distribution of health-care system coverage, most of the patients were in the Universal Coverage Scheme (60.3%). In all, two-thirds of cases were officially referred from nearby clinics or remote hospitals. The hospitals in Bangkok and the vicinity accounted for the highest number (30.9%). Regarding referral regions, apart from the central one (72%), the northeastern (12.2%) and eastern (11.8%) regions were the main sources of referrals to our institute. Data of clinical illnesses associated with uveitis showed HIV infection as the most frequent disease (7.3%), followed by tuberculosis (2.7%). Table 1 displays the characteristics of all patients in detail.

**Clinical Data and Diagnosis**

Uveitis was unilateral in 228 patients (51.1%) and bilateral in 218 patients (48.9%). All patients were classified as anterior uveitis, intermediate uveitis, posterior uveitis, or panuveitis at 44.8, 0.9, 14.3, and 40%, respectively. The chronic form (61.2%) was found more frequently than the acute form (38.8%), and cases with nongranulomatous presentations were predominant (77.8%). Definite diagnosis was established in 51.6% (230/446) of cases, and these were categorized as having either an infectious (59/230, 25.7%) or a noninfectious cause (177/230, 74.3%). Among the group with known specific diagnosis, VKH, BD, and herpetic anterior uveitis formed the majority at 22.4, 6.7, and 5.8%, respectively. Of the 446 patients, 91.9% were diagnosed primarily by clinical manifestation.

Table 2 shows definite causes of uveitis among all patients.

**Subgroup Analysis: Different Classifications of Diagnosis**

Among the 4 groups of anatomical classification, the anterior uveitis and intermediate uveitis groups each contained a majority of idiopathic cases (>70%), while the posterior uveitis and panuveitis groups had more than 60% of cases with specific diagnosis. In the case of anterior uveitis, the most common disease was herpetic anterior uveitis (13%), including varicella zoster and herpes simplex infection (Table 3). VKH and BD were the 2 most common diseases found in both posterior uveitis and panuveitis, at 23.4 and 7.7%, respectively, in posterior uveitis, and at 47.8 and 12.9%, respectively, in panuveitis (Table 4).

With regard to infectious etiologic causes, herpetic cause (5.8%) was found to be the most frequent etiology. For noninfectious etiologies, VKH was the most frequent diagnosis. There were 8 AIDS patients, of which 2 were cases of ocular toxoplasmosis, 2 had herpetic anterior uveitis, 1 was a case of syphilitic panuveitis, and 3 were idiopathic cases.

**Subgroup Analysis: Different Age Groups**

The age group of 40- to 59-year-olds was the most predominant (at 41.7% of cases), and anterior uveitis (90/186, 48.4%) and panuveitis (73/186, 39.2%) were the two most frequent types among the subjects in this age range. This was similar to the second most frequent age group, the 20- to 39-year-old range (34.3%). VKH was the most common disease in every age group.

**Therapeutic Approaches**

**Medical Approach**

Of the total of 446 patients, 262 patients (58.7%) received systemic corticosteroids and/or immunosuppressants. Apart from those with intermediate uveitis, patients with panuveitis and posterior uveitis received the greatest amount of treatment by systemic corticosteroids and/or immunosuppressive drugs. Immunosuppressive drugs were employed in 18.6% of cases and were administered mainly in the group with panuveitis.

**Surgical Approach**

Surgical approaches were performed in 38.3% of cases. Vitrectomy and cataract surgery were the top two surgical interventions in panuveitis and posterior uveitis. In addition, glaucoma surgery was performed in roughly equal proportion among 3 of the 4 groups, the intermediate uveitis group of patients being the exception.
TABLE 1. The selected characteristics of all uveitis patients classified by anatomical classification.

|                        | Anterior uveitis (n = 200) | Intermediate uveitis (n = 4) | Posterior uveitis (n = 64) | Panuveitis (n = 178) | Total (n = 446) |
|------------------------|----------------------------|------------------------------|---------------------------|----------------------|-----------------|
| Age at presentation    | 45.6 ± 16                  | 29 ± 19.7                    | 37.2 ± 15.7               | 40.3 ± 15.6          | 42.1 ± 16.1     |
| Age group              |                            |                              |                           |                      |                 |
| 0–19 years             | 10 (5.0%)                  | 2 (50%)                      | 11 (17.2%)                | 20 (11.2%)           | 43 (9.6%)       |
| 20–39 years            | 63 (31.5%)                 | 1 (25%)                      | 23 (35.9%)                | 66 (37.1%)           | 153 (34.3%)     |
| 40–59 years            | 89 (44.5%)                 | 1 (25%)                      | 24 (37.5%)                | 72 (40.4%)           | 186 (41.7%)     |
| ≥60 years              | 38 (19%)                   | 0                            | 6 (9.4%)                  | 20 (11.2%)           | 64 (14.3%)      |
| Sex                    |                            |                              |                           |                      |                 |
| Male                   | 86 (43%)                   | 0                            | 30 (46.9%)                | 90 (50.6%)           | 206 (46.2%)     |
| Female                 | 114 (57%)                  | 4 (100%)                     | 34 (53.1%)                | 88 (49.4%)           | 240 (53.8%)     |
| Health-care system     |                            |                              |                           |                      |                 |
| UCS                    | 96 (48%)                   | 3 (75%)                      | 43 (67.2%)                | 127 (71.3%)          | 269 (60.3%)     |
| SSS                    | 34 (17%)                   | 0                            | 14 (21.9%)                | 29 (16.3%)           | 77 (17.3%)      |
| CSMBS                  | 43 (21.5%)                 | 0                            | 3 (4.7%)                  | 11 (6.2%)            | 57 (12.8%)      |
| SPPI                   | 27 (13.5%)                 | 1 (25%)                      | 4 (6.2%)                  | 11 (6.2%)            | 43 (9.6%)       |
| Visiting method        |                            |                              |                           |                      |                 |
| Self                   | 110 (55%)                  | 2 (50%)                      | 6 (9.4%)                  | 32 (18%)             | 150 (33.6%)     |
| Refer                  | 90 (45%)                   | 2 (50%)                      | 58 (90.6%)                | 146 (82%)            | 296 (66.4%)     |
| Follow-up period       |                            |                              |                           |                      |                 |
| (mean ± SD) in month   | 3–180 (33.7 ± 33.9)        | 20–25 (22.5 ± 3.5)           | 3–115 (23.9 ± 23.4)       | 3–155 (34.5 ± 30)    | 3–180 (32.6 ± 31.1) |
| Follow-up status       |                            |                              |                           |                      |                 |
| Still follow-up        | 76 (38%)                   | 0                            | 25 (39.1%)                | 69 (38.8%)           | 170 (38.1%)     |
| Lost to follow-up      | 102 (51%)                  | 4 (100%)                     | 33 (51.6%)                | 91 (51.1%)           | 230 (51.6%)     |
| Referred back          | 22 (11%)                   | 0                            | 6 (9.4%)                  | 18 (10.1%)           | 46 (10.3%)      |
| Laterality             |                            |                              |                           |                      |                 |
| Unilateral             | 146 (73%)                  | 1 (25%)                      | 33 (51.6%)                | 48 (27%)             | 228 (51.1%)     |
| Bilateral              | 54 (27%)                   | 3 (75%)                      | 31 (48.4%)                | 130 (73%)            | 218 (48.9%)     |
| Course                 |                            |                              |                           |                      |                 |
| Acute                  | 131 (64.9%)                | 0                            | 16 (25.8%)                | 26 (14.4%)           | 173 (38.8%)     |
| Chronic                | 71 (35.3%)                 | 2 (100%)                     | 46 (74.2%)                | 154 (85.6%)          | 273 (61.2%)     |
| Inflammation type      |                            |                              |                           |                      |                 |
| Granulomatous          | 16 (8%)                    | 0                            | 12 (18.8%)                | 71 (39.9%)           | 99 (22.2%)      |
| Nongranulomatous       | 184 (92%)                  | 4 (100%)                     | 52 (81.2%)                | 107 (60.1%)          | 347 (77.8%)     |
| Specific diagnosis     |                            |                              |                           |                      |                 |
| Yes                    | 53 (26.5%)                 | 0                            | 41 (64.1%)                | 136 (76.4%)          | 230 (51.6%)     |
| No (idiopathic)        | 147 (73.5%)                | 4 (100%)                     | 23 (35.9%)                | 42 (23.6%)           | 216 (48.4%)     |
| Uveitis cause (n = 230) |                            |                              |                           |                      |                 |
| Infectious             | 32 (60.4%)                 | 0                            | 13 (31.7%)                | 14 (10.3%)           | 59/230 (25.7%)  |
| Noninfectious          | 21 (39.6%)                 | 0                            | 28 (68.3%)                | 122 (89.7%)          | 171/230 (74.3%) |
| Medical treatment      |                            |                              |                           |                      |                 |
| Systemic steroids      |                            |                              |                           |                      |                 |
| Yes                    | 51 (25.5%)                 | 4 (100%)                     | 42 (65.6%)                | 163 (91.6%)          | 260 (58.3%)     |
| No                     | 149 (74.5%)                | 0                            | 22 (34.4%)                | 15 (8.4%)            | 186 (41.7%)     |
| Immunosuppressants     |                            |                              |                           |                      |                 |
| Yes                    | 11 (5.5%)                  | 0                            | 6 (9.4%)                  | 66 (37.1%)           | 83 (18.6%)      |
| No                     | 189 (94.5%)                | 4 (100%)                     | 58 (90.6%)                | 112 (62.9%)          | 363 (81.4%)     |
| Surgical treatment     |                            |                              |                           |                      |                 |
| undergone during 2007–2012 |                        |                              |                           |                      |                 |
| Yes                    | 48 (24%)                   | 1 (25%)                      | 23 (35.9%)                | 99 (55.6%)           | 171 (38.3%)     |
| No                     | 152 (76%)                  | 3 (75%)                      | 41 (64.1%)                | 79 (44.4%)           | 275 (61.7%)     |
| Cataract surgery       |                            |                              |                           |                      |                 |
| Yes                    | 31 (15.5%)                 | 0                            | 11 (17.2%)                | 78 (43.8%)           | 120 (26.9%)     |
| No                     | 169 (84.5%)                | 4 (100%)                     | 53 (82.8%)                | 100 (56.2%)          | 326 (73.1%)     |
| Glaucoma surgery       |                            |                              |                           |                      |                 |
| Yes                    | 18 (9%)                    | 0                            | 5 (7.8%)                  | 16 (9%)              | 39 (8.7%)       |
| No                     | 182 (91%)                  | 4 (100%)                     | 59 (92.2%)                | 162 (91%)            | 407 (91.3%)     |
| Vitrectomy             |                            |                              |                           |                      |                 |
| Yes                    | 7 (3.5%)                   | 1 (25%)                      | 12 (18.8%)                | 38 (21.3%)           | 58 (13.0%)      |
| No                     | 193 (96.5%)                | 3 (75%)                      | 52 (81.2%)                | 140 (78.7%)          | 388 (87.0%)     |

UCS, Universal Coverage Scheme; SSS, Social Security Scheme; CSMBS, Civil Servant Medical Benefit Scheme; SPPI, self-payment or private insurance.
Follow-up Data and Disease Sequelae

The mean overall follow-up period was 32.6 ± 31.1 months. Of the 446 patients, approximately one-half (51.6%) were lost to follow-up within the study period, whereas roughly one-third (38.1%) of the patients were in regular follow-up (Table 1).

Ocular complications bringing about visual deterioration were found in 72% of patients. Cataracts were found to be the most frequent complication, accounting for 37.2% of cases, followed by glaucoma (22.9%), retinal ischemia (9.9%), and optic atrophy (9.9%).

Visual Assessment

A total of 664 eyes from 446 patients were included. The visual acuity at last follow-up time was categorized into levels 1, 2, and 3, accounting for 55.1% (366/664), 22.6% (150/664), and 22.3% (148/664), respectively. Of the total of 446 patients, the rate of blindness was 7.2% and that of monocular blindness was 9.4%.

DISCUSSION

We conducted a retrospective descriptive study of 446 uveitis patients by systematic sampling of 2661 patients from 2007 to 2012. To the best of our knowledge, this is the first epidemiologic study of uveitis in the central region of Thailand, providing the largest number of patients with a wide variety of valuable outcomes.

Our report revealed that sex and age among the affected cases were consistent with many previous studies.3,4,11–16 Some studies from referral centers involved younger age groups.17–20 However, the majority of our patients were over 16 years of age because the children’s hospital adjacent to this setting is responsible for the referrals of patients younger than 16 years of age. The present outcome unveiled a major affliction for those aged 20–59 years, as in a previous review.21 Being a major referral center in the central region of the Thai public health system, it was predictable that most of our patients would be in the Universal Coverage Scheme, and also in the contributory Social Security Scheme. This aspect was crucial to the outcome due to the way it reflected on the coverage of available uveitis investigations and treatment modalities, to which patients who paid for treatment or were in the Civil Servant Medical Benefit Scheme or had private insurance have better access.

To lessen epidemiologic bias, the study enrolled all uveitis cases visiting the ophthalmology clinic in Rajavithi Hospital. These comprised cases such as anterior uveitis, Posner Schlossman syndrome, systemic lupus erythematosus-associated retinopathy, and toxoplasmosis, which are often treated by general ophthalmologists or other subspecialty ophthalmologists. Because CMVR related to AIDS patients has occupied a large proportion of the etiology of posterior uveitis, and as it was treated in a separate specialty

TABLE 2. Definite causes of uveitis (a total of 446 patients).

| Causes                                      | Number of patients | %   |
|---------------------------------------------|--------------------|-----|
| Infectious cause                            |                    |     |
| Herpetic anterior uveitis                   | 26                 | 5.8 |
| Tuberculous uveitis                        | 10                 | 2.2 |
| Toxoplasmosis                               | 7                  | 1.6 |
| Toxocariasis                                | 7                  | 1.6 |
| Syphilis                                    | 4                  | 1.0 |
| Acute retinal necrosis                      | 2                  | 0.5 |
| Diffuse unilateral subacute neuroretinitis  | 1                  | 0.2 |
| Cat-scratch disease                         | 1                  | 0.2 |
| Cytomegalovirus anterior uveitis            | 1                  | 0.2 |
| Total                                       | 59                 | 13.3|
| Associated systemic condition               |                    |     |
| Vogt-Koyanagi-Harada                        | 100                | 22.4|
| Behç¸et disease                             | 30                 | 6.7 |
| Nonspecific arthropathy (HLA-B27-positive)  | 9                  | 2   |
| Systemic lupus erythematosus                | 4                  | 1.0 |
| Rheumatoid arthritis                        | 3                  | 0.7 |
| Ankylosing spondylitis                      | 2                  | 0.4 |
| Psoriasis                                   | 2                  | 0.4 |
| Primary intraocular lymphoma                | 1                  | 0.2 |
| Total                                       | 151                | 33.8|
| Specific ocular condition                   |                    |     |
| Sympathetic ophthalmia                      | 6                  | 1.4 |
| Posner Schlossman syndrome                  | 5                  | 1.1 |
| Multifocal choroiditis with panuveitis       | 5                  | 1.1 |
| Eales disease                               | 3                  | 0.7 |
| Multiple evanescent white dot syndrome      | 1                  | 0.2 |
| Total                                       | 20                 | 4.5 |
| Idiopathic                                  | 216                | 48.4|
| Final total                                  | 466                | 100 |

TABLE 3. Causes of anterior uveitis.

| Causes                                      | Number of patients | %   |
|---------------------------------------------|--------------------|-----|
| Herpetic anterior uveitis                   | 26                 | 13  |
| Nonspecific arthropathy (HLA-B27-positive)  | 9                  | 4.5 |
| Posner Schlossman syndrome                  | 5                  | 2.5 |
| Tuberculous uveitis                        | 3                  | 1.5 |
| Syphilis                                    | 2                  | 1   |
| Behç¸et disease                             | 2                  | 1   |
| Rheumatoid arthritis                        | 2                  | 1   |
| Ankylosing spondylitis                      | 2                  | 1   |
| Cytomegalovirus anterior uveitis            | 1                  | 0.5 |
| Psoriasis                                   | 1                  | 0.5 |
| Idiopathic                                  | 147                | 73.5|
| Total                                       | 200                | 100 |

Ocular Immunology & Inflammation
TABLE 4. Causes of panuveitis.

| Causes                                         | Number of patients | %    |
|------------------------------------------------|--------------------|------|
| Vogt-Koyanagi-Harada                           | 85                 | 47.8 |
| Behçet disease                                 | 23                 | 12.9 |
| Sympathetic ophthalmia                         | 6                  | 3.4  |
| Toxoplasmnosis                                 | 5                  | 2.8  |
| Multifocal choroiditis with panuveitis          | 4                  | 2.2  |
| Toxocariasis                                   | 3                  | 1.6  |
| Tuberculous uveitis                            | 3                  | 1.6  |
| Syphilis                                       | 2                  | 1.1  |
| Diffuse unilateral subacute neuroretinitis      | 1                  | 0.6  |
| Eales disease                                  | 1                  | 0.6  |
| Rheumatoid arthritis                           | 1                  | 0.6  |
| Psoriasis                                      | 1                  | 0.6  |
| Primary intraocular lymphoma                   | 1                  | 0.6  |
| Idiopathic                                     | 42                 | 23.6 |
| Total                                          | 178                | 100  |

Frequent data are European ones.16,20 In contrast to the only studies on this entity that have unveiled frequent data are European ones.16,20 In contrast to Asia, posterior uveitis was found to be the second most common subtype in studies done in the United States22 and Tunisia.11 Beside geographic status differences and genetic and socioeconomic ones, there are many possible reasons for the variation among epidemiologic data from different centers, such as different exclusion criteria and uveitis grouping methods. In addition, heterogeneity in the diagnostic criteria and definitions together with availability of various investigation techniques would be vital factors influencing comparison of uveitis epidemiology. Another fundamental cause is the nature of uveitis as an extensive, delicate, and dynamic disease.

With reference to specific etiology, our data reported 48.4% of cases as idiopathic, which is significantly higher than in two previous studies in Thailand4,14 (which found about approximately 29% to be idiopathic). This was due to the disparity in the health-care system coverage in Thailand: the two prior studies were performed in university-based settings in contrast to our public health-based setting. Most of the patients visiting our hospital were literally prevented from accessing adequate investigation and treatment because of their health-care system coverage (60% for Universal Coverage Scheme). Examples of investigations that were denied include HLA-B27 typing, polymerase chain reaction (PCR) testing, and newly imported interferon-gamma release assays (IGRAs). Another reason for the high rate of idiopathic cases reported was that half of our subjects were lost to follow-up during the course of dynamic entities like uveitis because of financial problems and ignorance. However, the percentage of idiopathic cases in our present study was comparable to the data from major referral centers in Asia,12–14,16–17,18 Columbia,19 and Germany.20 Among anatomical classification, the significant majority of idiopathic cases were revealed in anterior uveitis, reiterating the proportion outlined in previous studies.25,28

The percentage of noninfectious etiology (70–87%) almost unanimously outnumbered infectious types in most other reports,3,4,11,14,16,18,20,22,27 except in one community-based review,24 a study from Sierra Leone,29 and another from Columbia.19 One report in the American literature that reported a majority of infectious cases may have done so because it included infectious endophthalmitis and CMVR.15 The present study reported 0.02% of HIV-associated uveitis compared with 31% of those reported by Pathanapithoon et al., but the prior study included CMVR, which turned out to be significant majority of such entity. Only minority of HIV-associated uveitis without CMVR, accounting for 5%, was found.3

Regarding the group with specific etiology in the present study, the three most common entities were VKH, BD, and herpetic anterior uveitis. VKH and BD together accounted for more than a quarter of all cases. Though recent reports of epidemiology from the United States and Australia are scarce, a worldwide comparison of frequently found problems was meticulously performed, as shown in Table 5.

VKH is regarded as a common identifiable disease in pigmented races among most parts of Asia, North Africa, and some natives of South America.25,26 The previous studies found prevalence of VKH greater or equal to 10% from the studies performed in East Asia12,13,17 and Southeast Asia,3,4 while presentation
was less frequent in Middle East, South Asia, and North Africa (Table 5). Overall in the Asian continent, VKH was in the top three most common noninfectious entities. In addition, the present study reported the most preponderant data (22.4%) among others from Asia, bringing about a high proportion of panuveitis. In contrast, this affliction was rarely reported in Columbia, Europe, the United States, or Australia.

Like VKH, BD, another entity found in many Asian countries (including Thailand) and North Africa, is a leading cause of panuveitis, accounting for 4–16.5% of total cases (Table 5) while the least common occurrence was reported from India (1.9%). The rarity of this entity, unlike VKH, was also revealed in studies from Columbia, Europe, the United States, and Australia. Nonetheless, some worldwide studies, including one each from Saudi Arabia, Tunisia, Germany, and Italy, reported a strikingly high frequency of herpetic anterior uveitis. These studies throughout distant global areas found herpetic anterior uveitis to be the most common identifiable infection, in keeping with the findings of our study. However, reducing discrimination in access to health care, especially in investigations requiring access to tests such as PCR testing, would have helped us to identify a higher number of cases of herpetic anterior uveitis in our study.

Based on a WHO global tuberculosis report 2013, Thailand ranked 18th in the order of high-burden countries, with 61,208 new TB cases in 2012. In Thailand, the proportion of tuberculous uveitis cases in our series was consistent with other former studies by Pathanapithoon et al. and Sittivarakul et al. The most prominent data of such cases was acquired from India, the country with the highest incidence of tuberculosis.

HLA-B27-positive anterior uveitis, though regarded as the 3rd most frequent entity among associated systemic conditions, was found in only 2% of subjects in our setting. This is another ocular problem with no significant difference among geographical distribution (Table 5). However, 2 recent studies performed in Thailand and Germany found that such entities accounted for 22 and 16% of anterior uveitis cases, respectively. The latest Australian data collected about acute anterior uveitis found 28% of cases. In addition to genetic and geographical propensity, the crucial influencing factor affecting the disease’s prevalence is probably the availability of HLA-B27 typing, which has not been permissible for more than two-thirds of our cases based on patient’s
health-care system coverage. This circumstance was witnessed by its unavailability in Columbia as well.19

Regarding less common entities, the present study revealed a lower frequency of toxoplasmosis (1.6%) compared with two previous studies in Thailand (5–6%).3,4 Unfortunately, the authors lacked in sufficient information of toxoplasmosis serologic testing. Nevertheless, the diagnosis of ocular toxoplasmosis was unlikely to be biased by the result of serologic evidence due to the diagnosis principally based on the characteristic retinal findings. Our results were analogous with reports from Asia.12,13,17,18 Two previous studies from Iran14 and Columbia19 reported a prominent proportion of such disease, at 10 and 39.8%, respectively. White dot syndrome, inflammatory chorioretinopathies of unknown etiology, which are common uveitis entities frequently affecting Caucasians, were found in only 6 cases: 5 cases of multifocal choroiditis with panuveitis and 1 case of multiple evanescent white dot syndrome. The rarity of ocular sarcoidosis in our study was contrast to most studies in Western and Japan series.12,13,21,22,25

However, this finding would be underestimated not only by the unavailability of serum angiotensin converting enzyme (ACE), lysozyme, but also by negligence of the examiner for careful attention of simple tests like skin test, chest x-ray, and liver enzyme tests. The prevalence of sarcoidosis in Thailand has recently been approved by Pathanapittoo et al. for 4 sarcoidosis patients from 209 consecutive new patients in Thailand.33

The limitations of the present study derive from referral bias and underestimation of some entities like CMVR, HLA-B27-positive anterior uveitis, and tuberculous uveitis. However, the advantages of our study include the fact that it is the largest uveitis epidemiologic study ever done in Thailand, has less bias regarding anatomical classification, and provides a variety of data, such as proportion of health-care system coverage and visual prognosis.

In conclusion, our study presented anterior uveitis and panuveitis as the top two most common patterns. The majority of specific diagnostic entities consisted of VKH, BD, and herpetic anterior uveitis. Hopefully, our initiative will be not only another efficient addition to uveitis data in Thailand, but will also help to trigger many more subsequent studies in countries among the Association of Southeast Asian Nations (ASEAN), as we enter the era of the ASEAN Economic Community (AEC), where relevant data up to now have been insufficient.

**DECLARATION OF INTEREST**

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.
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Supplementary material available online

Supplementary 1