Causes of uveitis in a tertiary center in Western Saudi Arabia

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ABSTRACT

الأهداف: تحليل أسباب التهاب العنبة في المركز الطبي الجامعي في المنطقة الغربية في المملكة العربية السعودية ومقارنة النتائج بالدراسات المحلية و العالمية المنشورة.

الطريقة: أجريت دراسة استرجاعية ومراجعة سجلات المرضى الذين قصدوا عيادة العنبة في مستشفى المغربي للعيون في مدينة جدة، المملكة العربية السعودية خلال الفترة من يناير 1999م إلى ديسمبر 2011م.

النتائج: واجهنا 823 عين لعدد 587 مريض مصاب بالتهاب العنبة. شكل الذكور نسبة 319 (54%) مريض، بينما الإناث كانوا 268 (46%) مريضة. تصنيف المرضى حسب الجنسية كان كالتالي: شكل المواطنون السعوديون 52% من المرضى بينما كانت نسبة المرضى العرب من القاطنين في المملكة 23% و الأفارقة و الآسيويين أيضا 23%. تراوحت أعمار المرضى عند الحضور بين 5-70 عام بمتوسط (34.8±12.83). لوحظت الإصابة وحيدة الجانب (عين واحدة) في 351 مريض (60%) بينما الإصابة ثنائية الجانب (العينين) في 236 مريض (40%). إلتهاب العنبة الأمامي مجهول السبب كان الأشيع تشخيصاً 268 مريض (45.7%). كان إلتهاب العنبة الأمامي الأكثر شيوعاً تشريحياً 335 مريض (57.1%). يليه إلتهاب العنبة الشامل 151 مريض (25.7%)، ثم إلتهاب العنبة الخلفي 51 مريض (8.7%)، ثم إلتهاب العنبة المتوسط 50 مريض (8.5%). كان 50 مريضاً (8.5%) مصاباً بداء بهجت، و35 حالة (6%) بداء المقوسات و48 مريض (8.2%) مصابين بتناذر.

خاتمة: من الناحية التشريحية كان إلتهاب العنبة الأمامي الأكثر تشخيصاً. كان داء بهجت من أكثر الأسباب لإلتهاب العنبة، يليه التناذر. وكان أكثر الأسباب لإلتهاب العنبة الخمجي المقوسات بينما إلتهاب العنبة الأمامي مجهول السبب كان الأكثر وجوداً في الإلتهابات العنبية.

Objectives: To analyze the causes of uveitis and compare our results with national and international published studies.

Methods: This is a retrospective review of medical records of patients who attend the uveitic clinic of Magrabi Eye & Ear Hospital in Jeddah, Kingdom of Saudi Arabia from January 1999 to December 2011.

Results: We encountered 823 eyes of 587 uveitis patients (male: 319 [54%] and female: 268 [46%]). Native Saudi patients constituted 52% of our total population, expatriate Arabs 23%, and Afro-Asians 23%. Average age at presentation was 34.8±12.83 (range 5-70) years. Unilateral presentation was noted in 351 (60%) and bilateral in 236 (40%) patients. Idiopathic anterior uveitis was the most common diagnosis (n=268, 45.7%). Anterior uveitis was the most common anatomical diagnosis (n=335, 57.1%) followed by panuveitis (n=151, 25.7%), posterior uveitis (n=51, 8.7%) and intermediate uveitis (n=50, 8.5%). There were 50 patients (8.5%) of Behcet's disease, 48 patients (8.2%) of Vogt-Koyanagi-Harada disease (VKH) and 35 cases (6%) of toxoplasmosis.

Conclusion: The most common cause of anatomic diagnosis was anterior uveitis. Behcet's disease was the most common identifiable cause of uveitis followed by VKH. The most common cause of infectious uveitis was toxoplasmosis. Idiopathic anterior uveitis was the most common uveitic entity.

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Uvea, the middle vascular layer of eyeball consists of iris, ciliary body, and choroid, which nourish the visually important structures such as lens, retina, and optic nerve. Uveitis, the inflammation of these structures can lead to secondary complications such as cataract, glaucoma, macular scar, and optic atrophy; thereby, affecting the visual acuity.[1,2] The process of determining the causes of uveitis is as complicated as

its management. Determining the causes of uveitis in a particular community can help the clinicians in arriving at the proper diagnosis and management.[3] Ethnicity, environmental, cultural, dietary habits, and genetic factors play an important role in determining the pattern of uveitis in a particular community.[1-3] Kingdom of Saudi Arabia has its unique cultural, racial, and environmental characteristics. It is a desert country with 82% of its 27 million population live in cities.[4] The natives account for 18.7 million (69%). The proportion of Saudi nationals in cosmopolitan cities such as Jeddah (67% Saudi nationals) and Riyadh (70% Saudi nationals) differ from rural areas.[4] Ethnically, it is divided into Arabs (90%) and Afro-Asians (10%). As a part of ancient silk route, which extends from Turkey to Japan, Saudi Arabia has a high prevalence of Behcet's disease.[5-7] The studies from Saudi Arabia also reported a high prevalence of Vogt-Koyanagi Harada disease (VKH) and Toxoplasmosis.[5-7] Toxocariasis, Histoplasmosis, and human leukocyte antigen -B27 (HLA-B27) related uveitis appears to be less prevalent in this part of the world.

The epidemiological studies from different geographic locations in a country as big as Saudi Arabia are needed to understand the referral pattern and thereby planning the management strategies both on individual and community level.[6] Surprisingly, all studies reported from Saudi Arabia originated from Riyadh, Najd (central) region.[5-7] Herein, we report this study to analyze the causes of uveitis in a tertiary referral center in western region of Saudi Arabia and to compare our results with national and international studies.

Methods. This retrospective study was carried out from the data of consecutive patients who were seen in the tertiary referral uveitis clinic in Magrabi Eye & Ear Hospital, Jeddah, Saudi Arabia from 1999 to 2011. The Ethical Commiitte of Magrabi Hospitals approved this study. The information regarding age, race was recorded. The details on the ocular and systemic examination, investigations and ocular and systemic disease were recorded for all patients. Patients with post-traumatic (including post operative) uveitis, eale's disease and infectious bacterial endophthalmitis were excluded. All other uveitis cases were included.

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Our study was in accordance with the guidelines of the Declaration of Helsinki.

The specific ocular uveitis diagnosis or systemic disease association was based on a detailed clinical history, ophthalmological examination, general and physical examination, and laboratory tests. Ocular examination included external examination, slit lamp biomicroscopy, Applanation tonometry, fundus examination with 90/78 D Lens slitlamp fundus biomicroscopy and with indirect ophthalmoscopy. Ultrasonography and fundus fluorescein angiography were carried out when needed. Anatomical classification of uveitis was carried out based on The Standardization of Uveitis Nomenclature (SUN) Working Group classification.[8] The laboratory tests included were complete blood counts, erythrocyte sedimentation rate, Treponema pallidum hemagglutination test (TPHA), serum angiotensin converting enzyme (ACE) levels, enzyme linked immunosorbent assay (ELISA) for Toxoplasma, toxocara and human immunodeficiency virus (HIV), and human leukocyte antigen (HLA) typing. Radiological investigations included x-rays of the chest and sacro-iliac joints. The diagnosis of presumed ocular herpes was considered when there was a clinical evidence of unilateral anterior iritis with sectoral iris atrophy, healed stromal keratitis, and decreased corneal sensation.[9] Tuberculin skin testing was carried out for all patients. Ocular tuberculosis was presumed in patients with positive tuberculin test (>15mm), exclusion of other causes of uveitis and clinical response with multi drug anti-tuberculosis treatment without steroids.[10] If the reading is indeterminate,[10-15] QuantiFERON gold test was ordered. Rheumatologist and internist were consulted whenever required for the diagnosis. The diagnosis was declared 'idiopathic' whenever the uveitis could not be attributed to specific ocular or any underlying systemic disease.

We used the Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA) Version 16 program to analyze the data. The chi-square test was used to calculate the statistical significance between the groups. A p value of less than 0.05 indicated statistical significance.

Results. We encountered 823 eyes of 587 uveitis patients. Average age at presentation was 34.8±12.83 (range 5-70) years. Unilateral affliction was observed in 351 (60%) patients and bilateral in 236 (40%) patients. The male patients constituted 54% (n=319) and female patients 46% (n=268) (**Table 1**). In our study, native Saudi patients predominated 308 (52%) followed by expatriate Arabs 135 (23%) (Egyptians, Yemenis, north Africans, Syrians, Palestinians, Jordanians and Sudanese).

Africans (south Africans) 86 (15 %) followed by Asians (Indian subcontinent and eastern countries) 49(8 %) and others (Canadians, Americans, Turks) constituted 9 (1.5%) (**Table 2**). We divided the patients into 3 age groups ≤18 years, 18-40 years, and ≥40 years. The patients in 18-40 years group predominated 354 (60%) followed by >40 group 180 (31%) and <18 group 53 (9%). Anterior uveitis was the most common (335/587, 57.1%) followed by panuveitis (n=151, 25.7%), Posterior uveitis (n=51, 8.7%) and Intermediate uveitis (n=50, 8.5%). Idiopathic anterior uveitis was the most common uveitic entity 268 (45.7%) (**Figure 1**). Behcet's disease was the most common identifiable disease entity followed by VKH, toxoplasmosis, fuch's heterochromic uveitis, ankylosing spondylitis, herpes, sarcoidosis, and tuberculosis (**Figure 1**). We could not find underlying disease in (371/587) 63.2% of our patients. Among these idiopathic cases, anterior uveitis was the predominant one (n=268, 72%) followed by intermediate uveitis 48 (13%), panuveitis 39 (11%) and posterior uveitis 16 (4%). The male patients slightly predominated over female patients with respect to anterior uveitis and panuveitis (not statistically significant) (**Table 1**). The unilateral disease was significantly (p=0.04) more common in anterior uveitis. The bilateral disease was significantly (p=0.001) more common in intermediate uveitis (**Table 1**). The patients in 18-40 years age group were predominant in all anatomic uveitis entities followed by >40 years age group. Posterior uveitis was significantly (p=0.001) less common in patients <18 years age.

The prevalence of anatomic uveitic entities appeared to be fairly uniform among ethnic groups. Anterior uveitis was the most common. It was followed by panuveitis, posterior uveitis, and intermediate uveitis except in expatriate Arabs. In Arabs, the posterior uveitis was significantly (p=0.005) less common (**Table 2**).
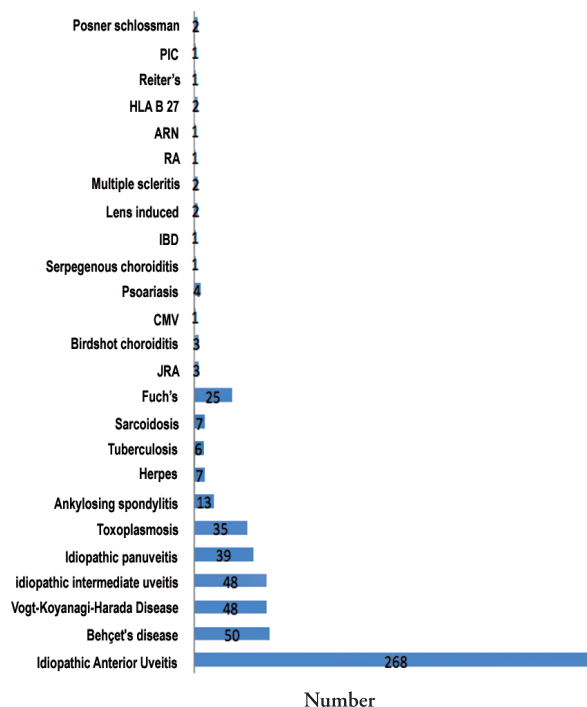

Figure 1 - Most common uveitic entities in 587 patients.

Table 1 - Gender distribution and laterality among the anatomic diagnoses.

Variables	Male	Female	*P*-value	Unilateral	Bilateral	*P*-value
Anterior uveitis	197	145	0.069	257	85	0.04
Intermediate uveitis	24	25	0.63	22	27	0.001
Posterior uveitis	22	28	0.13	40	10	0.2
Pan uveitis	76	70	0.46	32	113	0.75
There are some missing data regarding gender and laterality with respect to anatomic entities.						

Table 2 - Distribution of anatomic diagnosis among the ethnic groups.

Ethnic groups	Anterior uveitis N=335		Intermediate uveitis N=50		Posterior uveitis N=51	Panuveitis N=151		*P*-value
Saudi	176	(52.5)	31	(62)	26 (50.9)	75	(49.6)	0.49
Arab	83	(24.7)	11	(22)	5 (9.8)	36	(23.8)	0.005[*]
African	52	(15.5)	4	(8)	10 (19.6)	20	(13.2)	0.36
Asian	22	(6.5)	3	(6)	9 (17.6)	15	(9.9)	0.007[*]
Others	2	(0.6)	1	(2)	1 (1.9)	5	(3.3)	Not valid

*Chi-square statistical significance between the groups. For Saudi, the reference is non-Saudi namely Arabs, Africans, Asians, and Others. For Arab - the reference were Saudi, Africans, Asians, Others. Same for Africans.
P-value is not valid for Others because of the small number of cases.

Table 3 - Specific uveitic cases with respect to ethnic groups.

Ethnic groups	Saudi n=308		Arab n=135		African n=86		Asian n=49		Others n=9	*P*-value
Idiopathic uveitis	188	(61.0)	87	(64.4)	58	(67.4)	31	(63.3)	7 (77.8)	0.71
Behcet's disease	33	(10.7)	15	(11.1)	1	(1.2)	1	(1.2)	0	0.009
VKH	30	(9.7)	12	(8.9)	3	(3.5)	3	(6.1)	0	0.62
Toxoplasmosis	15	(4.9)	3	(2.2)	9	(10.5)	8	(16.3)	0	0.006
Fuch's	14	(4.5)	8	(5.9)	2	(2.3)	1	(2.0)	0	0.21

VKH - Vogt-Koyanagi Harada disease.
Chi-square statistical significance between the groups. For Saudi, the reference is non-Saudi namely Arabs, Africans, Asians, and Others. For Arab - the reference were Saudi, Africans, Asians, Others. Same for Africans. For ideopathic uveitis the reference groups were Behcets and other uveitic entities. Ankylosing spondylitis, herpes , and tuberculosis were not mentioned due to small number.

Table 4 - Specific uveitic cases with respect to gender and laterality.

Cases	Male n=319		Female n=268		P value	Unilateral n=351		Bilateral n=236		*P*-value*
Idiopathic uveitis	196	(61.4)	175	(65.3)	0.39	250	(71.2)	121	(51.5)	<0.001
Behcet's disease	38	(11.9)	12	(4.5)	0.001	2	(0.6)	47	(20)	<0.001
Vogt-Koyanagi Harada disease	19	(6.0)	29	(10.8)	0.021	1	(0.3)	47	(20)	<0.001
Toxoplasmosis	15	(4.7)	20	(7.5)	0.19	33	(9.4)	2	(0.9)	<0.001
Fuch's	17	(5.3)	8	(3.0)	0.16	23	(6.6)	2	(0.9)	<0.001

*Chi-square statistical significance between the groups. Rest (Ankylosing spondylitis, herpes, Tuberculosis) were not mentioned in the table because of their small number.

Idiopathic uveitis was common in all ethnic groups. But the prevalence of Behcet's disease was significantly (*p*=0.009) higher in Saudi and Arab groups (**Table 3**). Toxoplasmosis was significantly (*p*=0.006) more common in Saudi group.

The male and female patients were equivalent with respect to idiopathic uveitis (**Table 4**) Behcet's disease was more common among males. Most of the idiopathic cases were significantly (*p*<0.001) unilateral. Toxoplasmosis and Fuch's heterochromic cyclitis were significantly unilateral. The patients of Behcet's disease and VKH were significantly bilateral (**Table 4**). The patients in 18-40 years age group predominate in all uveitic entities followed by >40 years age group. Vogt-Koyanagi Harada disease was the second common diagnosis following idiopathic uveitis in patients less than 18 years age.

Table 5 shows the frequency of various uveitic entities with respect to anatomic classification. Most of the cases of anterior, intermediate and posterior uveitis were idiopathic. Behcet's disease was the most common cause of panuveitis.

Discussion. Epidemiological studies of a particular community help the clinician in arriving at a suitable differential diagnosis, modifying work up and ultimately aid in rendering the appropriate therapy.[3] The epidemiological studies related to the causes of uveitis in the Kingdom of Saudi Arabia are limited, and mostly originated from central region of Saudi Arabia.[5-7] This study was partially presented in the American Academy of Ophthalmology conference in 2009.[11] We also published a study regarding the referral pattern of uveitis in Saudi female population in western region of Saudi Arabia.[12] Most of the epidemiological studies from Saudi Arabia came from Riyadh, which is predominant in Saudi population (70%).[5-7] In contrast, Jeddah (Makkah region) is the most cosmopolitan region of Saudi Arabia(33.2% expatriates Versus 29.2% in Riyadh).[4] It is reflected in our study, as we have 52% Saudi nationals, 23% expatriate Arabs, and Afro-Asians 23%. In Hamade et al study from Riyadh, there were 75% Saudi nationals, 19% expatriate Arabs.[6] Islam et al[5] study reported 76.5% Saudi nationals, 15% expatriate Arabs, and 7% Afro-Asians. In our study, the male to female ratio was 1.1:1, which more likely similar to the world literature. In our study, the mean age at presentation was 34.8 years. Approximately 60% of our patients were in between 18-40 years. Most published studies reported the similar pattern.[5-7,13-20] Previous study[3] stated that the pattern of uveitic cases were affected by many factors such as data collected

from a tertiary center or community based primary centers. The Retina Center reported a higher frequency of posterior uveitis cases.[13]

We enrolled all our patients from Magrabi Eye & Ear Hospital, Jeddah, and a tertiary eye private hospital with satellite eye centers in Jeddah, Makkah and Medina. Our population included the patients of all nationalities unlike the tertiary university hospitals in Saudi Arabia wherein expatriates have difficult access to the hospital services. Our hospital can be considered as mixed (community and referral) eye care center where most of the uveitic cases (simple and complicated) are referred.

The introduction of the anatomical classification of uveitis as recommended by the International Uveitis Study Group in 1987, has led to a greater uniformity in describing and classifying the uveitic entities and more importantly it helped in comparing the pattern of uveitis cases in different studies across the globe.[4,8] Chang et al[4] from Australia studied and compared the pattern of uveitis in various geographic locations using this classification. Accordingly, we tried to compare our results with other national and international studies based on anatomical diagnosis classification. In our study, anterior uveitis (57.1%) was the most common anatomical form of uveitis (**Table 6**). The pattern of

uveitis is affected by inclusion bias: the study population drawn from OPD (outpatient department) or from admitted patients. It was reflected in Al Mezaine et al study from Riyadh where panuveitis was the most common type of uveitis, possibly because they studied the prevalence of uveitis in admitted patients who might be having more serious diseases.[7]

Panuveitis (25.7%) was the second most common in our study. It was similar to the studies published in Riyadh[5,6] and China.[14] It was in contrast to the studies

Table 6 - Comparison of our study with the various national and international studies based on anatomical classification.

Studies	Year	n	Anterior uveitis (%)	Posterior uveitis (%)	Intermediate uveitis (%)	Panuveitis (%)
Our study	2012	587	57.1	8.7	8.5	25.7
Central KSA[7]	2010	351	12.7	12.7	6.0	68.6
Central KSA[6]	2009	488	60.0	11.0	6.0	24.0
Central KSA[5]	2002	200	59.5	13.5	6.5	20.5
North India[15]	2004	1233	49.3	20.0	16.0	14.6
China[14]	2005	1752	45.6	6.8	6.1	41.5
NE USA[17]	1996	1237	51.6	19.4	13.0	16.0
SE USA[18]	1997	385	25.0	24.0	12.0	38.0
Rome, Italy[20]	1996	1417	49.0	22.0	12.0	16.0

KSA - Kingdom of Saudi Arabia, NE - North East USA,
SE - South East USA

Table 5 - Anatomical classification of our cases.

Etiology	Anterior uveitis n=335 (57.1)		Intermediate uveitis n=50 (8.5)	Posterior uveitis n=51 (8.7)		Panuveitis n=151(25.7)	
Idiopathic	268	(45.7)	48 (8.1)	16	(2.7)	39	(6.6)
Ankylosing spondylitis	13	(2.2)					
Behcet's disease						50	(8.5)
Birdshot retinochoroiditis				3	(0.5)		
CMV				1	(0.2)		
Fuchs heterochromic cyclitis	25	(4.2)					
Inflammatory bowel disease	1	(0.2)					
Herpes simplex virus	4	(0.7)					
Herpes zoster virus	3	(0.5)					
HLA B 27	2	(0.3)					
JRA	3	(0.5)					
PIC				1	(0.2)		
RA	1	(0.2)					
ARN				1	(0.2)		
Lens induced	2	(0.3)					
Multiple sclerosis			2 (0.3)				
Psoriasis	4	(0.7)					
Posner schlossman syndrome	2	(0.3)					
Sarcoidosis	3	(0.5)		1(	(0.2)	3	(0.5)
Reiter's syndrome	1	(0.2)					
Serpigenous choroidopathy				1	(0.2)		
Toxoplasmosis				23	(3.9)	12	(2.0)
Tuberculosis	3	(0.5)		1	(0.2)	2	(0.3)
Vogt-Koyanagi Harada disease				3	(0.5)	45	(7.7)

Data are expressed as number and percentage (%).
CMV - cytomegalovirus, HLA B27 - human luekocyte antigen B27, JRA - juvenile rhematoid arthritis,
PIC - punctate inner choroidopathy, RA - rheumatoid arthritis, ARN - acute retinal necrosis

published from India,[15,16] Northeast America, and other western countries (Australia and Europe) where the posterior uveitis was the second most common.[3,17]

Behcet's disease and VKH shows a preponderance in our study.

Table 7 summarized the anterior uveitis cases in various national and international studies. Study from West Africa reported (88%).[21] This may be due to decreased prevalence of other anterior uveitic entities. Fuch's uveitis was the second most common cause in our study; similar to the study published from Riyadh by Al Mezaine et al.[7] A study from Italy also showed similar results.[20] Ankylosing spondylitis was the third common cause of anterior uveitis in our study. The studies from North India[15] and China[14] found it to be second most common cause after idiopathic anterior uveitis. We found 2% of anterior uveitis cases ascribed to be Herpes where as other studies from Riyadh found it to be much more common cause of anterior uveitis (25%,12%, 6.6%).[5-7] We have very low incidence of HLA-B27 positive uveitic cases compared to western literature. It was also reflected by other studies from Saudi Arabia and also from studies from eastern

countries. Most of our cases of intermediate uveitis were idiopathic in etiology (Table 8). It is in accordance with the published reports. Multiple scleritis was the second common cause of intermediate uveitis similar to the reports from national and international studies. Islam et al found tuberculosis as the second common cause of intermediate uveitis in their study from Riyadh.[5]

In our study, toxoplasmosis was the most common cause of posterior uveitis. It is similar to the studies (Table 9) from western countries where Toxoplasmosis was very common.[3] The high number of cats in Saudi Arabia and eating habits in western countries could be the reason for this high prevalence of toxoplasmosis. In Saudi Arabia, cats are the most common stray animals seen ubiquitously, where as the dogs are seen rarely. The cultural tolerance for cats rather than dogs can explain the relative rarity of toxocara and high prevalence of toxoplasma uveitis in Saudi population. The extremely low level of humidity could also be another factor against toxocariasis in Saudi arabia.[5] The study from Riyadh by Al Mezaine et al[5] found out Tuberculous choroiditis was the most common cause of posterior uveitis.[7] Islam et

Table 7 - Comparison of the present study of anterior uveitis cases (in percentages) with similar data from national and international studies.

Countries	Year	N	Idiopathic anterior uveitis	Ankylosing spondylitis	Fuch's uveitis	Herpes	HLA-B 27	Sarcoidosis	Psoriasis	IBD	JRA	Reiter's syndrome	TB	Others
Present study	2012	335	80.0	3.8	7.46	2.0	0.6	0.8	1.1	0.3	0.9	0.2	-	2.8
Central KSA[7]	2010	76*	67.1	-	14.5	6.6	1.3	3.9	-	-	6.6	-	-	0
Central KSA[5]	2002	119	48.7	2.5	5.9	25.2	2.5	-	1.7	-	-	-	7.6	5.8
North India[15]	2004	607	61.3	13.2	5.1	1.8	-	3.8	-	-	3.3	0.2	7.9	3.4
China[14]	2005	800	59.0	17.0	12.5	3.25	-	0.1	0.6	1.6	4.4	0.5	-	1.0
NE USA[17]	1996	637	31.0	7.0	5.0	10.0	6.0	6.0	1.0	2.0	11.0	4.0	-	17.0
SE USA[18]	1997	97	49.0	9.0	7.0	3.0	19.0	3.0	-	1.0	2.0	3.0	-	4.0
Rome[20]	1996	696	42.0	1.0	17.0	11.0	7.0	0	1.0	1.0	5.0	1.0	-	12.0
West Africa[21]	1996	17	88.0	-	-	-	1.0	-	-	-	-	-	-	-

*number of eyes, IBD - inflammatory bowel disease, HLA B27 - human leukocyte antigen B27, JRA - juvenile rhuematoid arthritis, NE-North East, SE-South East

Table 8 - Comparison of our data of intermediate uveitis cases with similar data from national and international studies.

Countries	Year	N	Idiopathic intermediate uveitis	Multiple scleritis	Sarcoidosis	Tuberculosis	Toxo-plasmosis	HTLV-1 uveitis	Masquerade syndrome	Post vaccination
Present study	2012	50	96.0	4.0	-	-	-	-	-	-
Central KSA[7]	2010	36*	94.4	5.6	-	-	-	-	-	-
Central KSA[5]	2002	13	69.2	7.7	-	15.4	-	-	-	7.7
North India[15]	2004	198	91.4	-	4.0	4.0	0.5	-	-	-
China[14]	2005	?	100.0	-	-	-	-	-	-	-
NE USA[17]	1996	162	70.0	8.0	22.0	-	-	-	-	-
SE USA[18]	1997	47	98.0	-	2.0	-	-	-	-	-
Rome[20]	1996	176	97.0	1.0	2.0	-	-	-	-	-
West Africa[21]	1996	17	100.0	-	-	-	-	-	-	-

*number of eyes, HTLV 1 - human t lymphotropic virus 1

al also found it to be the second most common cause of posterior uveitis after toxoplasmosis. We had only one case of Serpigenous choroidopathy whereas, it was the most common cause of posterior uveitis in north Indian study.[15]

Table 10 shows the comparison of our panuveitis cases with the other studies. In our study, Behcet's disease was the most common cause of panuveitis similar to the study from China.[14] It is in accordance with the observation that Behcet's disease is more prevalent along Ancient Silk Road countries.[3,5-7] In these countries, males predominate and have much more severe disease. In our study 76% of Behcet's disease patients were males.

The presumed tuberculous uveitis was reported to be highly prevalent in Saudi Arabia,[5-7] but we had only 6 (1%) cases of uveitis (3 anterior uveitis, one posterior uveitis and 2 panuveitis) secondary to tuberculosis. It was also the most common cause of panuveitis in the study published from north India.[15] Due to the difficulty in obtaining microbiologic evidence from ocular fluids, in nearly all reported cases, the diagnosis of intraocular TB was only presumptive.[10] The high incidence of presumed tuberculous uveitis in these series might be due to high index of suspicion in patients with unexplained chronic uveitis, selection bias inherent in tertiary centers. Al Mezaine et al[7] study had

Table 9 - Comparison of the present of posterior uveitis cases with similar data from national and international studies.

Countries	Present study	Central KSA[7]	Central KSA[5]	North India[15]	China[14]	NE USA[17]	SE USA[18]	Rome[20]	West Africa[21]
N	50	76*	23	247	119	240	93	313	21
Year	2012	2010	2002	2001	2005	1996	1997	1996	1996
IPU (%)	31.3	18.4		24.7	82.3	13.0	9.0	30.0	36.0
Toxo-plasmosis (%)	45.0	13.3	52.2	8.1	1.7	25.0	42.0	38.0	43.0
CMV retinitis (%)	1.9	0	-	1.2	2.5	12.0	-	1.0	-
Sarcoidosis (%)	1.9	0	-	0.8	-	8.0	0	-	-
Behcet's disease (%)	0	3.9	-	0.4	-	2.0	3.0	6.0	-
BSRC	5.9	0	-	0	-	8.0	3.0	6.0	-
Toxocarasis (%)	0	0	-	0	-	3.0	14.0	3.0	-
ARN (%)	1.9	3.9	-	3.2	1.7	6.0	9.0	3.0	-
POHS (%)	0	0	-	0	-	1.0	4.0	2.0	-
Tuberculosis (%)	1.9	42.1	34.8	8.9	-	-	-	-	-
PIC (%)	1.9	0	-	0	-	-	-	-	-
VKH (%)	5.9	18.4	-	0	-	-	-	-	-
SC (%)	1.9	-	-	25.1	-	-	-	-	-
MFC (%)	-	-	-	20.7	-	-	-	-	-
APPMPE (%)	-	-	-	1.6	-	-	-	-	-
GHPC (%)	-	-	-	5.3	-	-	-	-	-
Others (%)	2.4	-	13.0	5.3	11.8	22.0	16.0	11.0	21.0

*number of eyes, IPU - idiopathic posterior uveitis, BSRC - bird shot retino-choroiditis, VKH - Vogt-Koyanagi Harada disease, POHS - primary ocular histoplasmosis, SC - serpiginous choroidopathy, MFC - multifocal choroiditis, GHPC - geographic helicoid peripapillary choroiditis, APPMPE - acute posterior multifocal placoid pigmentary choroidopathy, CMV - cytomegalovirus, ARN - acute retinal necrosis, PIC - punctate inner choroidopathy

Table 10 - Comparison of our data of panuveitis uveitis cases with similar data from national and international studies.

Countries	Year	N	Ideopathic panuveitis	Behcet's disease	Sarcoidosis	TB	VKH	Sympathetic ophthalmia	MFC+ PU	Toxo-plasmosis	Multiple scleritis	Phacogenic	Others
Present study	2012	151	25.8	33.1	2.0	1.32	29.8	0	0	7.9	-	0	-
Central KSA[7]	2010	412*	4.9	20.1	2.7	31.3	29.4	4.0	-	5.8	2.4	-	-
Central KSA[5]	2002	45	28.9	28.9	13.3	4.4	11.1	-	-	-	-	-	13.3
North India[15]	2004	181	9.4	12.2	9.4	26.0	24.3	14.4	-	-	-	-	4.3
China[14]	2005	727	14.8	39.7	0.2	1.2	38.2	3.9	-	-	-	-	0.7
NE USA[17]	1996	198	22.0	12.0	14.0	-	6.0	4.0	12	0	-	-	30.0
SE USA[18]	1997	148	43.0	4.0	27.0	-	2.0	2.0	16	0	-	1	-
Rome[20]	1996	232	38.0	6.0	1.0	-	13.0	6.0	-	-	-	-	36.0
West Africa[21]	1996	51	36.0	-	-	-	-	-	-	43.0	-	-	-

*number of eyes, TB - tuberculosis, VKH - Vogt-Koyanagi Harada disease, MFC + PU - multifocal choroiditis + panuveitis

tuberculosis as the most common uveitic entity (28.2% of their total uveitic cases and 31.3% of their panuveitis cases) enrolled the cases from their admitted patients with advanced disease. Other studies from tuberculosis endemic areas such as south India and west Africa did not have ocular tuberculosis cases.[16,21] It could be due to Mycobacterium might not involve the eye as frequently as previously reported.[13] Vogt-Koyanagi Harada disease was the second most common cause of panuveitis in our study. Vogt-Koyanagi Harada disease is common in pigmented races and practically rare in studies involved in western countries with Caucasian population.[5] Accordingly, it was common in the studies reported from Riyadh,[5-7] India,[15,16] and China.[14] In Table 11, we compared our results with the national and international published studies with respect to the most common etiological diagnoses.

Our study suffers from the limitations of a retrospective study. However, it may represent the gross referral pattern of uveitis in general population in our part of the world. It is, in view of the fact that our patient population was drawn from both primary and tertiary referral systems. The demographic characteristics of the study population in particular the racial composition were not adequately detailed in many of the local and international studies.[3] We tried to analyze the data with respect to the ethnic composition in our study. We found out that panuveitis was more common in Saudi and Arab population than African and Asians. Behcet's disease was more common in Saudi and Arab population than the Afro Asian populations. In our study, we encountered 'new' uveitic entities like Acute Retinal Necrosis (ARN), Birdshot Choroiditis and Punctuate Inner Choroidopathy (PIC).[3] We did not encounter Toxocariasis and Histoplasmosis and HIV related uveitis. Our series has less number of tuberculosis and herpes cases compared to the studies from Saudi Arabia.[5-7] Multicenter epidemiological studies from different regions of Saudi Arabia are warranted which can help in understanding the pattern of uveitis from this part of the world.

In conclusion, we have studied a distinct cosmopolitan population in a tertiary center in western part of Saudi Arabia. We showed that anterior uveitis was the most common type of uveitis in our study, according to anatomic classification. Behcet's disease was the most common identifiable uveitis entity and also the most common cause of panuveitis. Toxoplasmosis was the most common infectious uveitis. Idiopathic anterior uveitis was the most common uveitic entity.

Table 11 - The most common causes of uveitis according to etiological classification among various national and international studies

Etiological classification	Most common causes of uveitis						
	Jeddah, KSA (Present study) (n=587) Year: 2012	Riyadh, KSA[5] (Islam & Tabbara) n=200 Year: 2009	Riyadh, KSA[6] (Hamade et al) n =224 Year: 2002	Riyadh, KSA[7] (Al –Mezaine et al) n=351 Year: 2010	China[14] (Yang et al) n=1752 Year: 2005	India[15] (Singh et al) n=1233 Year: 2004	USA [17] (Rodriguez et al) n=1237 Year: 1996
1	AAU (45.7%)	AAU (29%)	AAU (32%)	Tuberculosis (28.2%)	AAU (27%)	AAU (30%)	AAU (19.4%)
2	Behcet's disease (8.5%)	Herpes (16%)	Herpes (12%)	VKH (19.4%)	Behcet's disease (16.5%)	Tuberculosis (10%)	Sarcoidosis (9.6%)
3	VKH (8.2%)	Tuberculosis (10.5%)	VKH (8%)	AAU (14.5%)	VKH (15.9%)	Ankylosing spondylitis (7.1%)	Idiopathic intermediate uveitis (9%)
4	Idiopathic intermediate uveitis (8.1%)	Behcet's disease/ Toxoplasmosis (6.5%)	Tuberculosis (7%)	Behcet's disease (12.5%)	Idio panuveitis (6.2%)	Serpigenous choroiditis (5%)	JRA (5.6%)
5	Idiopathic panuveitis (6.6%)	Fuchs' uveitis (3%)	Behcet's disease/ Toxoplasma (6%)	Toxoplasmosis (8.2%)	Fuch's 5.7%	VKH (3.5%)	Herpes (5.0%)
6	Toxoplasmosis (6%)	Sarcoidosis (3%)	Fuchs' uveitis (4%)	Fuch's/sarcoidosis/ MS (2.0%)	Ankylosing spondylitis (3.3%)	Fuchs' uveitis (2.5%)	Toxoplasmosis (4.8%)
7	Fuchs' uveitis (4.3%)	VKH (2.5%)	Sarcoidosis (2%)	Herpes (1.7%)	JRA (2.0%)	Behcet's disease (1.8%)	Ankylosing Spondylitis (3.8%)

VKH - Vogt-Koyanagi Harada disease, AAU - acute anterior uveitis of unknown origin (idiopathic anterior uveitis),
JRA - juvenile rheumatoid arthritis, MS - multiple sclerosis

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