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Microbial keratitis in West and East Malaysia

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马来西亚东西部感染性角膜炎研究

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摘要

目的:评估马来西亚东西部三级医院感染性角膜炎流行病学及发病因素。

方法:收集来自马来西亚西部 Sungai Buloh 医院、吉隆坡综合医院和东部 Queen Elizabeth 医院、沙捞越州综合医院的感染性角膜炎患者 207 例。研究记录了危险因素。进行角膜刮片镜检和培养。

结果:马来西亚西部感染性角膜炎最普遍的风险因素是植物性损伤(28.5%)和非植物性损伤(18.3%)。27.7% 的创伤病例与工作有关,其中外籍男性工作者占 34.2%。马来西亚东部最普遍的风险因素是配戴隐形眼镜(32.9%)。马来西亚东西部绿脓假单胞菌是感染性角膜炎最常见的病菌。马来西亚西部最常见的真菌病原体是镰刀菌,占所有阳性真菌培养物的 60%。

结论:马来西亚东西部公立医院细菌性角膜炎检出率较高,而东部隐形眼镜配戴则是常见风险因素($P<0.05$),西部真菌性角膜炎检出率高。

关键词:镰刀菌素;地理学;感染性角膜炎;假单胞菌;社会经济学

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Abstract

• AIM: To evaluate the epidemiological and etiological factors of microbial keratitis seen in tertiary hospitals in West and East Malaysia.

• METHODS: A total of 207 patients were enrolled. Patients referred for microbial keratitis to Sungai Buloh Hospital and Kuala Lumpur Hospital in West Malaysia and Queen Elizabeth Hospital and Kuching General Hospital in East Malaysia were recruited. Risk factors were documented. Corneal scrapings for microscopy and culture were performed.

• RESULTS: The most common risk factor in West Malaysia was organic trauma (28.5%) followed by non organic trauma (18.3%); 27.7% of trauma cases was work related with 34.2% involving male foreign workers. The most common risk factor in East Malaysia was contact lens wear (32.9%). *Pseudomonas aeruginosa* was the most common organism isolated in both places. The most common fungal pathogen in West Malaysia was *Fusarium spp* representing 60% of all positive fungal cultures.

• CONCLUSION: In West Malaysia organic trauma was the most common risk factor seen in public hospitals here whereas, contact lens wear was the most common risk factor in East Malaysia ($P<0.05$). Fungal keratitis was more commonly seen in West Malaysia.

• KEYWORDS: *Fusarium*; geography; microbial keratitis; pseudomonas; socioeconomy
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INTRODUCTION

According to the WHO, of the 39 million people worldwide who are blind, 4% is due to corneal opacities[1]. The incidence of monocular blindness however, is less well reported, of which ocular trauma and corneal ulceration play a significant role and is believed to be responsible for 1.5-2 million new cases of monocular blindness yearly[2]. Malaysia, a developing country is not spared from this menace.

Malaysia is a multi-ethnic, multi-cultural and mega diverse country. It has a total landmass of 329750 km. However, the

country is divided into West and East Malaysia by the South China Sea. West Malaysia, consists of 11 states and Kuala Lumpur, the capital city of Malaysia. East Malaysia, is situated in Borneo and consists of two much larger states that is, Sabah and Sarawak. The local climate in both places is equatorial and the humidity is high.

Geographically, both West and East Malaysia are similar with coastal plains which rise to heavily forested hills and mountains. However, they have different socioeconomy. The population distribution is highly uneven with approximately 20 million of the 28 million residents living in West Malaysia.

The infrastructure in West Malaysia is also more advanced compared to East Malaysia. The road systems in the East are less developed and some areas are not assessable by land, which makes it harder for East Malaysians to seek medical treatment, often having to travel many hours to the nearest hospital[3-4].

Up to now, many studies have reported the epidemiology and etiology of corneal ulcers[5-6]. Further studies have also shown that the etiology of corneal ulcers tend to vary depending on geographical and socioeconomic factors[7-9]. The epidemiology and etiology may also differ from neighboring countries and within countries. This study aims to evaluate the epidemiological and etiological factors of suppurative keratitis in tertiary hospitals in West and East Malaysia in order to provide valuable data towards the management of this disease.

SUBJECTS AND METHODS

This was a prospective, multicenter, observational study involving patients presenting with suppurative keratitis over a 12mo period. The research adhered to the tenets of the Declaration of Helsinki and received approval from the Institutional Review Board of the National Committee for Clinical Research, Malaysia.

In West Malaysia, patients who presented to either one of the 2 corneal centers in West Malaysia, Sungai Buloh Hospital or Kuala Lumpur General Hospital were recruited. As there are no corneal centers in East Malaysia, patients presenting to Queen Elizabeth Hospital in Sabah or Sarawak General Hospital in Sarawak.

Corneal ulceration was defined as corneal infiltration with loss of overlying epithelium associated with signs of inflammation with or without hypopyon. Typical viral ulcers, sterile neurotropic ulcers, Mooren ulcers, marginal ulcers and ulcers associated with autoimmune conditions were excluded.

Patients who consented to participation in the study were examined on a slit lamp and findings recorded. Risk factors were documented. In each case, a corneal scrape was carried out with a 21G needle and a smear prepared for Gram stain. Corneal material was also inoculated onto blood agar, chocolate agar, Sabouraud dextrose agar and Mc Conkey medium. Results were documented and statistical analysis was carried out by using Pearson Chi-Square.

Table 1 Risk factors for corneal ulcers in West versus East Malaysia

Risk factors	West Malaysia		East Malaysia		*P*
	n	%	*n*	%	
Organic trauma	39	28.5	16	22.9	> 0.05
Non organic trauma	25	18.3	9	12.9	> 0.05
Contact lens use	23	16.8	23	32.9	0.009
Bullous keratopathy	9	6.6	10	14.3	> 0.05
Severe dry eyes	4	2.9	2	2.9	> 0.05
Ocular surface disease	5	3.6	2	2.9	> 0.05
Exposure keratopathy	5	3.6	2	2.9	> 0.05
Peripheral ulcerative keratitis	2	1.5	1	1.4	> 0.05
Chronic steroid use	5	3.6	0	0	> 0.05
Chemical injury	3	2.2	1	1.4	> 0.05
Suture related	1	0.7	1	1.4	> 0.05
Nil noted	16	11.7	3	4.3	>0.05
Total	137	100	70	100	

RESULTS

A total of 207 patients were enrolled in the study. There were 103 from Sungai Buloh, 34 from Kuala Lumpur General Hospital, 26 from Queen Elizabeth Hospital in Sabah and 44 from Sarawak General Hospital. The mean age of patients in West Malaysia was 45.46y which was similar to that in East Malaysia (44.31y). The ratio of male to female patients was 2.6∶1 in West Malaysia and 1.5∶1 in East Malaysia (P = 0.073).

With regards to risk factors, in West Malaysia, the most common risk factor was organic trauma (28.5%). Non organic trauma accounted for 18.3% of patients and contact lens related keratitis was 16.8%. In East Malaysia, the most common risk factor was contact lens wear (32.9%). The percentage of patients presenting with contact lens related keratitis was significantly higher than that seen in West Malaysia (P = 0.009). This was followed by organic trauma (22.9%) and nonorganic trauma (12.9%) (Table 1).

In West Malaysia, 27.7% of trauma cases were work related with the majority of workers being male (97.4%). Of this, 39.5% of injuries occurred at palm oil plantations and 13.1% at rubber plantations. There were 31.6% laborers at construction sites or doing odd jobs when the injury occurred while 13.2% sustained a corneal foreign body while welding or grinding metal. In East Malaysia a similar number (27.2%), of trauma was work related; 78.9% of those involved were males. The majority of these patients were farmers (36.8%) followed by laborers doing odd jobs (26.3%). Only 3 incidents occurred at rubber plantations. One patient was working at a construction site and 2 patients sustained a corneal foreign body while cutting grass.

The culture positive rate was 40.1% in West Malaysia and 28.6% in East Malaysia (P=0.10). In both West and East Malaysia, the majority of organisms identified were bacteria

Table 2 Organisms isolated from corneal tissue in West and East Malaysia

Organism isolated	West Malaysia		East Malaysia	
	n	(%)	*n*	(%)
Pseudomonas species	21	38.2	15	75.0
Klebsiella	0	0	2	10.0
Staph aureus	4	7.3	0	0
Staph epidermidis	3	5.5	0	0
Strep species	3	5.5	1	5.0
Corynebacterium	1	1.8	0	0
E. coli	1	1.8	0	0
Enterobacter	1	1.8	0	0
Acinitobacter	1	1.8	0	0
Micrococcus	0	0	1	5.0
Burkholderia	0	0	1	5.0
Fusarium	12	21.8	0	0
Aspergillus	1	1.8	0	0
Candida	1	1.8	0	0
Arthrographis kalrae	1	1.8	0	0
Curvularia	1	1.8	0	0
Non sporulating mold	4	7.3	0	0
Total	55	100	20	100

with *Pseudomonas spp* being the most common organism cultured (38.2% and 75.0%). There was a significantly higher number of fungal keratitis identified in West Malaysia compared to East Malaysia ($P=0.001$), with *Fusarium* being the species most commonly isolated in the West. In East Malaysia, there were no positive cultures for fungus although fungal elements were identified with KOH stain in 2 cases (Table 2).

DISCUSSION

Prompt and accurate identification of the causative organism is important in the management of microbial keratitis[10]. However, as this can take days, the initial management is empirical, with broad-spectrum topical antimicrobials. The drug of choice should therefore aim to treat the most likely cause based on local experience.

In this study, the most common risk factor for infective keratitis was organic trauma in West Malaysia and contact lens wear in East Malaysia. Further analysis showed, of the work related injuries in West Malaysia, 34.2% involved male foreign workers. These men from neighboring countries come to West Malaysia to seek employment in order to provide financially for their families back home. Many work in rubber and palm oil plantations. In East Malaysia, only 2 of the 19 (10%) work related injuries involved foreigners. In this study, we noted 15 of the 38 male workers (39.5%) in West Malaysia who's ulcers were work related, sustained the injury at palm oil plantations. This calls for more awareness to be instilled in this area along with increased enforcement.

In East Malaysia, the most common risk factor was contact lens wear. A large number of the middle class in these 2 states live close to the city and seek treatment at public hospitals. Patients living in remote villages, find it difficult to travel to tertiary centers. They often present late and frequently default follow up.

In both places, *Pseudomonas spp* was the most common organism cultured. A significantly higher number of fungal organisms were seen in West Malaysia with *Fusarium* species being the most common. These etiological findings are similar with that seen by our neighbors in Thailand and Singapore[11-14]. Further analysis also showed that a large number of these ulcers were a result of injuries sustained at palm oil plantations. This is in keeping with prior studies in temperate climates that have shown trauma from organic matter to be a significant risk factor for fungal keratitis[15-17].

In conclusion, the epidemiology and etiology of microbial keratitis may not just vary from region to region but also between hospitals in a single region. Therefore, determining the "regional" etiology is insufficient and one treatment protocol should not be used across the board. Instead, each center should conduct an audit of their cases to ascertain the most common risk factor and causative organism for microbial keratitis. The use of broad spectrum antibiotics, has also been shown to cause a shifting trend in the etiological organism[18-20]. Globalization with increasing travel and migration may also play a role. Repeat audits should therefore be conducted on a regular basis to aid in the management of this disease.

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