HUMAN GNATHOSTOMIASIS IN MYANMAR: A REVIEW OF LOCAL LITERATURE

Aung Phyo Wai[1], Win Win Maw[2], Aye Chan Moe[3], Thidarut Boonmars[1] and Yukifumi Nawa[4]

[1]Department of Parasitology, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand; [2]Department of Microbiology, University of Medicine 2, Yangon; [3]Department of Pharmacology, University of Medicine 1, Yangon, Myanmar; [4]Tropical Diseases Research Centre, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand

Abstract. Gnathostomiasis is a fish-borne nematodiasis endemic mainly in Asia and Latin America. Although the disease is still highly prevalent in some countries of Southeast Asia, such as Thailand and Lao PDR, the status of gnathostomiasis in Myanmar remains hitherto unknown. We have made an extensive literature review on gnathostomiasis cases in Myanmar. Although case reports on gnthostomiasis in Myanmar are very few in international journals, we have found over 10 indigenous gnathostomiais cases in Myanmar published in local medical journals, the majority of which are ocular gnathostomiasis cases. Thus, more hidden cases of cutaneous and visceral gnathostomiasis should exist in Myanmar.

Keywords: *Gnathostoma*, gnathostomiasis, hidden case, Myanmar

INTRODUCTION

Nematode parasites in the genus *Gnathostoma* are found in wild animals in various parts of America, Asia, Europe, and Oceania (Miyazaki, 1960). Among 13 valid species in this genus, seven species are found in the Americas and six in Asia (Nawa *et al*, 2015). Among them, five species in Asia, namely, *G. doloresi, G. hispidum, G. malaysiae*, *G. nipponicum* and *G. spinigerum,* and one species, *G. binucleatum*, in the Americas, are identified as pathogens causing food-borne parasitic zoonosis in humans (Nawa *et al*, 2015).

In Asia, Japan, the People's Republic of China and Thailand have been known as the major endemic areas of human gnathostomiasis (Miyazaki, 1960). In addition, several Southeast Asian countries, such as Lao PDR (Vonghachack *et al*, 2010) and Vietnam (Xuan *et al*, 2004) are recently identified as gnathostomiasis endemic areas. Myanmar has long been supposed as a gnathostomiasis-endemic country.

However, apart from the report of an outbreak of gnathostomiasis among Korean residents in Yangong (Chai *et al*, 2003), only two sporadic cases of ocular gnathostomiasis were reported in international journals (Gyi, 1960; Khin, 1968). Korean parasitologists conducted a series of epidemiological surveys for intermediate/paratenic hosts of *Gnathostoma* spp in

Correspondence: Yukifumi Nawa, Tropical Diseases Research Centre, Faculty of Medicine, Khon Kaen University, 123 Mitrapap Highway, Khon Kaen 40002, Thailand.
Tel: +66 (0) 89 0196632
E-mail: yukinawa@kku.ac.th

Myanmar and demonstrated advanced 3rd stage larvae (infective stage) of *G. spinigerum* in several intermediate and/or paratenic fish hosts in Myanmar, *eg*, catfish, *Parasilurus* sp (Chai *et al*, 2003), snakehead fish, *Channa striatus* (Jung *et al*, 2008) and Asian swamp eel, *Monopterus albus* (Chai *et al*, 2015). However, epidemiological survey for gnathostomiasis in humans has never been systematically conducted in this country.

Hence, we performed a thorough and extensive literature search in Myanmar local journals to identify reports on human gnathostomiasis. Eventually we found more than 10 gnathostomiasis cases mentioned in local medical journals in Myanmar up to 2016, which reported the high predominance of ocular gnathostomiasis cases. The epidemiological and clinical features of human gnathostomiasis in Myanmer are summarized herein.

MATERIALS AND METHODS

For the literature search, we used the following search strings: "gnathostoma" and "Myanmar", "gnathostomiasis" and "Myanmar", "ocular" or "eye" and "gnathostomosis" and "Myanmar", "cutaneous" or "skin" and "gnathostomiasis" and "Myanmar". In the first step, we searched through PubMed, Google Scholar and China Academic Journals Full-text Database (CJFD) (www://cnki.net) during March 2017. Then, additional searches were performed to discover case reports and commentaries appearing in local medical journals in Myanmar, which were obtained from the Library of Myanmar Medical Research, lower region, Yangon; University of Medicine 2, Yangon; and the Library of the University of Medicine 1, Yangon. Although we found few gnathostomiasis cases among travelers returning from Myanmar, they are not included in this study as we included only indigenous gnathostomiasis cases in Myanmar. Each case was reviewed for relevance by the authors and the references listed in those papers were checked further to seek for hidden cases.

RESULTS

Up to 2016, we found 11 or more cases of human gnathostomiasis described in local medical journals (Table 1). Two ocular gnathostomiasis cases reported in the British Journal of Ophthalmology (Gyi, 1960; Khin, 1968) were also included. Apart from those two cases, no other cases of gnathostomiasis were reported in Myanmar until 2005.

In 2004, three brief reviews related to food-borne parasitic zoonoses (first one on paragonimiasis, second on invasion of *Gnathostoma* and *Angiostrongylus* in cerebrospinal system and the third on eosinophilic meningitis due to *Gnathostoma* in Thailand) were published in the section "From Other Publications" of the Myanmar Journal of Clinical Medical Practice (MJCMP) with Editorial comment alerting the possible occurrence of such cases in Myanmar (Anonymous, 2004). In response to this Editorial comment, several "Letter to the Editor" from parasitologists and clinicians appeared in MJCMP 2005 (Aung Than *et al*, 2005; Khin Muang Aye, 2005; Ye Htut, 2005). For example, Khin Muang Aye (2005) mentioned in his "Letter to the Editor" about his personal experience in 1980 of treating ocular gnathostomiasis in the left eye of a female worker, and also mentioned that one of his colleagues has observed a living parasite swimming in the anterior ocular chamber of another patient. Unfortunately, the species of the worm was

Table 1
Indigenous cases of gnathostomiasis in Myanmar.

No.	Age (years)	Gender	Affected site	Year of infection	Reference
1	28	Male	Left eye	1958	Gyi (1960)
2	48	Male	Left eye	1964	Khin (1968)
3	N/A	Female	Left eye	1980?	Aye Htun (referred by Khin Maung Aye, 2005)
4	3-4 ocular cases and several cutaneous cases during last 20 years			last 20 years	Ye Htut (2005)
5	A cutaneous case in Yangon Hospital			2004	Khin Maung Win (2004) (referred by Aung Than *et al* (2005)
6	Ocular cases in National Health Laboratory			2005	Thin Nyunt (referred by Aung Than *et al* (2005)
7	2 ocular cases (one worm each)			2007	Thuzar Han and Kyi Kyi Thin (2007)
8	N/A	Male	Right eye	2001	Khin Ommar Khine (2011)
9	10	Male	Right eye	2013	Myint Thazin Aung *et al* (2014)

N/A, not available.

not reported, and so we did not include this personal communication in Table 1. In the same MJCMP issue, Ye Htut (2005), a senior parasitologist at the Department of Medical Research, Lower Myanmar, also wrote a "Letter to the Editor", in which he described his own experience of identification of *G. spinigerum* worms from various parts of the human body including 3-4 cases of the recovery of worms from the anterior chamber of the eyes during the past 20 years. He also reported of *G. spinigerum* worms from the skin, but did not indicate the number of cases. In addition, Aung Than *et al* (2005) wrote in the "Letter to the Editor" of a case of cutaneous gnathostomiasis identified by Khin Maung Win in Yangon Hospital and ocular cases due to *G. spinigerum* infection detected by Tin Nyunt, a pathologist at the National Health Laboratory, Yangon.

In 2007, Thuzar Han and Kyi Kyi Thin (2007) identified two worms, one worm each from the eye of two patients, as advanced L3 stages of *G. spinigerum*, which were sent to the Laboratory of the Yangon Eye Hospital. Khin Ommar Khine (2011) reviewed a total of 13 cases of intraocular parasitosis found in the Yangon Eye Hospital from 2001 to 2010. Among these ocular parasitosis cases, parasites were found in the anterior segment and in the posterior segment in nine and four cases, respectively, with three latter cases presenting with infection with cysticercus and one with *Gnathostoma* larva. In the review, the author described adult worms of *Loa* and *Gnathostoma* larvae were commonly found in the anterior segment, some of which might be *G. spinigerum* worms as described by Thuzar Han and Kyi Kyi Thin (2007). More recently, a 10-year-old boy from North Dagon Township came to the out-patient department of the North Okkalapa General Hospital on 15 October, 2013 with complaints of

headache on the right side, loss of visual acuity and blurred vision during the previous week; worm was morphologically identified as *G. spinigerum* (Myint Thazin Aung *et al*, 2014).

Due to insufficient descriptions in those reports, we were not able to enumerate the exact number of gnathostomiasis cases in Myanmar. Nevertheless, at least 11 (or more) cases of ocular gnathostomiasis and a significant number of cutaneous cases have been found in Myanmar. Among the ocular cases, four patients were males and only one female patient, and the gender of the other patients were not disclosed. The ages of the patients were available for only 3 cases, 10, 28 and 48 years old. The ratio of affected side of the eye was left:right = 3:2. With the limitation of the available number of clinical features, all patients complained of visual disturbance, redness of the eye, pain, and visual loss.

DISCUSSION

In the present study, we successfully gathered reports of more than 10 gnathostomiasis cases reported in Myanmar, most of which were ocular cases and a few cutaneous cases. The two classical ocular cases in the review of ocular gnathostomiasis by Nawa *et al* (2010; *ibid*, 2017) are included. Although not included in Table 1, a case of ocular gnathostomiasis of a Chinese Burmese patient was reported in Taiwan (Yu *et al*, 1984). In addition, several cases of gnathostomiasis among travelers who were assumed to be infected in Myanmar have been reported. For example, a cutaneous gnathostomiasis case of a French traveller was assumed to be infected in Myanmar (Develoux *et al*, 2006). Two healthy Japanese businessmen, 45- and 51-years-old, were reported to be infected with *G. malasiae* in Myanmar (Nomura *et al*, 2000), although the species identification remains uncertain and the distribution of this species in Myanmar has not yet been described, However, although the precise number is uncertain, gnathostomiasis cases of Burmese and Laotian immigrants in Thailand have recently been reported (Maek-a-nantawat *et al*, 2014). Thus, more hidden cases of gnathostomiasis should exist in Myanmar.

In terms of clinical manifestation of gnathostomiasis, cutaneous lesions, which can present as migratory edema or serpigenous creeping eruptions, are the most common symptoms (Nawa *et al*, 2015). Cutaneous gnathostomiasis is also known as nodular migratory eosinophilic paniculitis (Crowley and Kim, 1995). Although the frequency of ocular cases is far lower than that of cutaneous gnathostomiasis, *Gnathostoma* larvae can migrate into various visceral organs, such as the lungs, genitourinary system, gastrointestinal tract, auditory and vital organs, *eg*, central nervous systems (Schmutzhard *et al*, 1988; Rusnak and Lucey, 1993; Katchanov *et al*, 2011) and eyes (Nawa *et al*, 2010; *ibid*, 2017). In exceptional cases, a patient can present with both cutaneous and ocular involvement at the same time (Gutierrez, 2000). As for ocular gnathostomiasis, high prevalence was only observed in India, Japan, Mexico, and Thailand (Nawa *et al*, 2010; *ibid*, 2017). Except for India, the other three countries are known as being highly endemic areas of gnathostomiasis. Although the precise reason for the predominance of ocular cases in India remains uncertain (Nawa *et al*, 2010; *ibid*, 2017), it might be merely an ignorance of cutaneous cases. In fact, cutaneous cases are recently emerging in India (Mukherjee *et al*, 2012).

The current situation of gnathostomiasis in Myanmar might be the same as that in India, and Myanmar should be considered as one of the highly gnathostomiasis endemic countries. Assistance from dermatologists is necessary if we are to elucidate an accurate situation of gnathostomiasis in Myanmar. As eating raw fish and meat is not a traditional food habit in Myanmar (Khin Maung Win, 2004), acquisition of this disease among Myanmar people would be happening only recent years with the introduction of such eating habits. Extensive epidemiological survey not only of humans but also of intermediate/paratenic host animals is required to clarify the route of infection and the maintenance of the parasite lifecycle.

ACKNOWLEDGEMENTS

This work was supported by a grant from Thailand Research Fund (RTA5580004) and from the Research Affairs, Faculty of Medicine (grant no. IN60245), Khon Kaen University.

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