



## Short Communication

# Follow-on to Eradication of Dracunculiasis in District Dera Ismail Khan, Khyber Pakhtunkhwa, Pakistan

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## ABSTRACT

Dracunculiasis or guinea worm disease causes severe morbidity and disability among effected populations. Pakistan was declared dracunculiasis-free in 1996. The present study is a follow-on to the declared eradication of dracunculiasis in Dera Ismail Khan district of Khyber Pakhtunkhwa (KP) Province, Pakistan through investigating disease recurrences and *Cyclops* species in drinking water sources. A cross-sectional household survey was carried out using in-person questionnaire evaluation along with microscopic assessment of water samples for *Cyclops* species. Based on previous clinical records of dracunculiasis, five villages of Dera Ismail Khan including Kath Garh, Wanda Dost Ali, Chah Mundar Wala, Ketch and Gara Baloch were surveyed for a total of 206 randomly selected households, where the household heads (106 males and 100 females) were interviewed for any previous dracunculiasis lesion scars or active infections among household members. No active cases of dracunculiasis were observed in the present study. However, 11 individuals, had history of affliction by the disease during 1972-1992. All the water samples from drinking water sources tested negative for the presence of *Cyclops* species. No recurrence of dracunculiasis to an extent corroborates the proclaimed eradication by Guinea Worm Eradication Program (GWEP) from Dera Ismail Khan District in Khyber Pakhtunkhwa (KP) province.

## Article Information

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## Authors' Contributions

AS conceived and designed the study. I and QJ carried out the survey, lab work and data analysis. SW and NHK wrote the article.

## Key words

Dracunculiasis, *Cyclops*, Dera Ismail Khan, Khyber Pakhtunkhwa.

Dracunculiasis is a helminth parasitosis caused by a nematode worm, *Dracunculus medinensis* commonly called Guinea Worm or Medina Worm. It inhabits the subcutaneous tissues (usually of lower extremities) where it produces debilitating and painful blisters. Eruption of the blisters is usually accompanied by itching, swelling, burning sensation, fever, pruritus and eosinophilia. Secondary bacterial infection of the lesion may aggravate the condition (Ogunniyi *et al.*, 2000; Roberts and Jannovy, 2005).

After ulceration of papule, the female worm extrudes its rear part through the lesion, especially when it is stimulated by contact with water, and releases thousands of 1<sup>st</sup> stage larvae in drinking water sources (streams, ponds, step wells *etc.*). The larvae are ingested by cyclopoid copepods (water fleas) that act as intermediate hosts of the parasite. Eight species and two subspecies of these copepods have been so far recognized to transmit the parasite that include: *Thermocyclops neglectusdecipiens*, *T. crassusconsimilis*, *T. incisus*, *T. inopinus*, *T. emini*, *Mesocyclops major*, *M. ogonnus*, *M. kieferi*, *Cryptocyclops linjanticus* and *Cyclops vernalis* (Muller, 1991). Humans are infected when they

ingest these infected microcrustaceans in contaminated water (Peries and Cairncross, 1997; Cairncross *et al.*, 2002).

Guinea worm infection is mainly prevalent in poverty-stricken lots, preferably in areas where the poor sanitary conditions prevail and no regularized treatments of drinking water sources are practiced. It is now prevalent in a few West African countries. In 1980 global prevalence was estimated at 5-10 million cases. An eradication programme was initiated in 1920s (Guinea Worm Eradication Program, GWEP) but it was seriously endorsed in 1980 and then in 1991 in the forty fourth World Health Assembly to finally eradicate the infection by the end of 1995. The estimated prevalence was reduced from 3.5-4 millions in 1986 to 25,000 in 2006 and 2,000 cases in 2010 due to effective eradication strategies (Hopkins and Ruiz-Tiben, 1991; Ogunniyi *et al.*, 2000; Hopkins *et al.*, 2000, 2005; Barry, 2006; Awofeso, 2013).

Dracunculiasis has now been eradicated successfully within Asia. Overall, 168 countries have been certified dracunculiasis-free by WHO including India (2000), Pakistan (1996), Senegal and Yemen (2004) (Ruiz-Tiben and Hopkins, 2006). In 2007, 97% cases were reported from Ghana and Sudan alone. Currently, Sudan has the highest prevalence of guinea worm infection, as among 542 of the globally reported cases in 2012, 521 were from Sudan (Awofeso, 2013). The claim to eradicate the

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disease from Sudan by 2015-2020 seems realistic as the disease has been tremendously controlled due to effective multipronged eradication programmes by WHO on global level. Some control strategies employed by eradication programmes included community-level health education, setting up national surveillance programs, giving away cloth filters, use of temephos (cyclopsicide), early case detection and case containment (Hopkins *et al.*, 1995; Visser, 2012).

In Pakistan, the disease was certified dracunculiasis-free in 1996 under the Pakistan's National Guinea Worm Eradication Programme that was a joint venture of NIH Pakistan, Global 2000 Project of the Carter Center and Center for Disease Control (CDC). Dera Ismail Khan was one of the regions where these control strategies were implemented (Hopkins *et al.*, 1995). The present work was a follow-up study aimed to detect any new infections and thus to corroborate the claimed eradication of dracunculiasis in the study area.

#### Methods

To assess the present status of dracunculiasis in Dera Ismail Khan Khyber Pakhtunkhwa (KP), Pakistan after its declared eradication in 1996, five villages were selected for a cross-sectional household survey based on previous clinical records of dracunculiasis. These villages included Kath Garh, Wanda Dost Ali, Chah Mundar Wala, Ketch and Gara Baloch.

**Table I.- Dracunculiasis and its vectors in surveyed villages of Dera Ismail Khan.**

Village	House-holds surveyed	No. of lesion scars	No. of active lesions	<i>Cyclops</i> species detected
Kath Garh	105	1	0	0
Wanda Dost Ali	60	0	0	0
Ketch	10	1	0	0
Chah Mundar Wala	21	7	0	0
Gara Baloch	10	2	0	0
Total	206	11	0	0

The survey was carried out by random house-to-house visits where household heads were interviewed for any active or past infections of dracunculiasis (preferably backed by clinical examination or in-person examination) among members of their household. Ethics approval for the study was acquired from Ethics committee, Department of Pharmacy, University of Peshawar and informed consent was obtained from participants prior to inclusion.

Additionally, water samples from main drinking water sources including tubewells, Persian wells and hand pumps were also examined for *Cyclops vernalis*, the vector for parasite, through light microscopy. Water samples were collected from all the reservoirs of drinking water using rectangular dip nets (0.5mm mesh) kindly provided by UNICEF teams doing routine work for water quality assessment in the study area. Each water reservoir was surface sampled three times a day: morning (8 am), afternoon (2 pm) and evening (8 pm). The samples were preserved in sorbex vials containing 30% glycerin, 20% distilled water and 50% to 70% alcohol. The samples were observed under 4X-40X objectives of the microscope for the presence of the *Cyclops* species.

#### Results and discussion

Table I shows the number of household surveyed and the number of lesion scars in five villages.

No active lesions in the household or *Cyclops* sp. was detected in the water samples.

The present study to greater extent validated the elimination of dracunculiasis in the studied areas of Dera Ismail Khan District.

Successful eradication of dracunculiasis in Pakistan was possible due to multipronged strategies and involvement of multiple stakeholders. Immediate and committed response of the government, attention by the WHO, various NGOs, proper village-to-village surveillance, mass education by volunteers, provision of safe drinking water and control of the intermediate host proved effective in the prevention and ultimate eradication of the disease from Pakistan. For each calendar year from 1988-1994, the number of villages in Pakistan endemic for dracunculiasis were 156, 146, 56, 35, 07, 01 and 0, respectively, while the number of cases were 1110, 534, 160, 106, 23, 02 and 0, respectively (Azam, 2000). Global success of the control program is apparent since as of June 2014 WHO reported 27 cases compared to 92 cases for previous year in 2013. These cases originated from African countries including Chad, Ethiopia and South Sudan (WHO, 2014).

So far recurrence of any sort has not been observed in any of the Asian countries that eradicated the disease. The present survey also confirmed no recurrence in the study area; however, sporadic cases of recurrence were reported in Chad even a decade after its transmission was arrested (Tayeh and Cairncross, 2007). Resurgence of any sort is a source of concern to people involved in eradication projects since it is usually not possible to determine whether the resurgence is due to a recent import or low levels of the disease burden that remained undetected during the eradication process, since each of these means

would accordingly require particular interventions (Visser, 2012).

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#### Ethical approval

Ethics committee, Department of Pharmacy, University of Peshawar.

#### Statement of conflict of interest

Authors have declared no conflict of interest.

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