



## Occurrence of a Snail Borne Disease, Cercarial Dermatitis (Swimmer Itch) in Doon Valley (Uttarakhand), India

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### Abstract

**Background:** 'Cercarial dermatitis' also known as swimmers itch (Skin allergies) is caused by a trematode parasite, *Schistosoma* which has two hosts - an invertebrate (snail) and a vertebrate (livestock, human being). Although the availability of both vector snails and pathogens at the selected site the Doon Valley in northern India has already been confirmed but there was a hazy picture of the disease, whether it is due to entrance of cercariae or due to wild variety of grass (*Parthenium hysterophorus*). The present study is an attempt to provide a way forward towards the vector snails and snail borne diseases in the study area.

**Methods:** Snail sampling and identification was done by applying standard methods / using Keys & Catalogues. Associated parasites and cercariometry in snails has been worked out by cercarial shedding. Human involvement at zoonotic level has been performed in collaboration with Health centers and socio-economic aspect of inhabitants of study area.

**Results:** The snail diversity encountered 19 species including the vector species such as *Indoplanorbis exustus*, *Gyraulus convexiusculus*, *Melanooides tuberculata* and *Lymnaea acuminata*. The cercarial diversity comprised Furcocercous, Monostome, Amphistome and liver fluke / Xiphidiocercaria. During the study (2009-2010), 0.173% was found with cercarial dermatitis among human population in the selected area. The symptoms of disease recorded were red spots and swellings on effected parts of skin. Frequent visits of livestock to the water body and presence of vector snails provides a clue in completing the life cycle of the parasite of the family Schistosomatidae.

**Conclusion:** Cercarial dermatitis has been considered a potential risk at those places where warm blooded and snail's hosts share a link with aquatic bodies with particular emphasis to temperature and time of year.

**Keywords:** Snail borne, Cercarial dermatitis, India

### Introduction

Cercarial dermatitis is a parasitic disease with world-wide distribution, caused by the cercariae of animal schistosomes, if they enter in non-specific host for completion of life cycle. Though, the clinical cases of this disease have been reported from many countries in Europe and America, but scattered cases were recorded from southern end of South America (1). In India, the first report on dermatitis was from Mysore (Karnataka State)

among the people who used waste tank for domestic purpose but the cercariae involved were not identified (2). It was experimentally demonstrated that only repeated exposures to cercariae could produce dermatitis in man (3-5). As per views of Hoeffler (6), cercarial dermatitis is a parasitic disease affecting the skin. A case of schistosome cercarial dermatitis in man at Tiptur in Tumkur district in Karnataka (India) was observed

in which both *Indoplanorbis exustus* and *Lymnaea luteola* snails were involved in the transmission of disease in a pond (7).

Basic ideas about endemic form of cercarial dermatitis (Khujlee) were emerged in Bastar area of Madhya Pradesh (India) where many villages had only one pond which fulfills all their needs (8, 9). Thus the same pond was used by villagers for bathing, washing, even drinking (except in few where hand pumps are used) and also for washing and bathing of their domestic animals-mainly cattle. An outbreak of cercarial dermatitis occurred in a recreational-tourist lake in the Quebec City region (Canada) in the summer (10). Besides this, the contributions of some parasitologists (11-14) can be cited who reported that the disease swimmer itch is caused by free-swimming larvae of bird parasites of the family Schistosomatidae (Trematoda), which have penetrated through the skin.

Earlier in the Doon Valley, in northern India both the vector snails and pathogens have already been recorded (15-17) but there was no sign of occurrence of cercarial dermatitis. Henceforth, the present study is an attempt to provide a way forward towards malaco faunal diversity and distribution of snail borne parasitic diseases especially the cercarial dermatitis in the chosen area.

## Materials and Methods

Survey application on malaco-faunal diversity has been performed from the water bodies of the study areas [Sahaspur and Doiwala] in Doon Valley in district Dehradun in northern India having geographic co-ordinates of 30°18'56"N and 78°2'0" E at 652 msl. Snail sampling was done by applying standard methods (18) and the collected snails were identified using Keys and Catalogues (19, 20).

Associated parasites and cercariometry in snails has been worked out by cercarial shedding (21-23). The sampling of the diseases cases was based on simple random technique. A questionnaire having questions in concerned with socio-economic aspects of inhabitants were interviewed and the data was procured.

Human involvement at zoonotic level has been worked out in the selected villages in collaboration with Health centers and socio-economic aspect of inhabitants of study area. Frequent visits to respective PHCs was made for procuring information on skin diseases and confirmation of present results. Simultaneously, a close look to frequently visiting livestock of the study area provided a clue of their potent role in completing the life cycle of the parasites.

## Results

The snail diversity revealed the occurrence of 19 species belonging to 8 different families (Table 1). The collection sites from Sahaspur shared all the species while from Doiwala, the two species *Segmentina calatha* (Benson, 1850) and *M. nevillei* (Brot, 1874) were not reported.

For cercariometry, the snails like *I. exustus*, *M. tuberculata*, *G. convexiusculus* and *L. acuminata* were found infected with larval trematodes (Fig. 1a,b,c,d). The cercarial diversity comprised four different types viz., Furcocercous, Monostome, Amphistome and Liverfluke / Xiphidio cercariae. Among the collected snails, *M. tuberculata* have harbored with furcocercous, monostome and amphistome cercariae whereas *L. acuminata* and *I. exustus* released xiphidio and furcocercous cercariae. The infection was found more in winter than post monsoon, summer and monsoon seasons.



Fig.1: a) *I. exustus* b) *M. tuberculata* c) *G. convexiusculus* d) *L. acuminata*

**Table 1:** Malaco-faunal diversity of the study area in Doon Valley (Uttarakhand), India during 2009 to 2010

Sl.No.	Family	Molluscan species	Collection sites	
			Sahaspur	Doiwala
1	Viviparidae	<i>Bellamya bengalensis</i> (Lamarck, 1822)	+	+
2		<i>B. dissimilis</i> (Mueller, 1774)	+	+
3		<i>B. crassa</i> (Benson, 1836)	+	+
4	Lymnaeidae	<i>Lymnaea (Pseudosuccinea) acuminata</i> f. <i>bians</i> Sowerby 1873	+	+
5		<i>L. luteola (Pseudosuccinea)</i> f. <i>ovalis</i> Gray, 1822	+	+
6		<i>L. acuminata (Pseudosuccinea)</i> f. <i>patula</i> (Troschel, 1837)	+	+
7		<i>Radix auricularia</i> (Linnaeus, 1758)	+	+
8	Pilidae	<i>Pila globosa</i> (Swainson 1822)	+	+
9	Buliinidae	<i>Indoplanorbis exustus</i> (Deshayes, 1834)	+	+
10	Planorbidae	<i>Gyraulus convexiusculus</i> (Hutton, 1849)	+	+
11		<i>G. barrackporensis</i> (Clessin, 1886)	+	+
12		<i>Planorbis planorbis</i> var. <i>tangitarenis</i> Germain 1918	+	+
13		<i>Segmentina (Polypylis) calatha</i> (Benson, 1850)	+	-
14	Bithyniidae	<i>Bithynia (Digonostoma) pulchella</i> (Benson, 1836)	+	+
15	Thiaridae	<i>Melanoides tuberculata</i> (Mueller 1774)	+	+
16		<i>M. nevillei</i> (Brot, 1874)	+	-
17		<i>Thiara (Thiara) scabra</i> (Mueller, 1774)	+	+
18		<i>Brotia (Antimelania) costula</i> (Rafinesque, 1833)	+	+
19	Physidae	<i>Physa acuta</i> (Draparnaud, 1805)	+	+

A survey work on the spread of cercarial dermatitis has been made and some cases of dermatitis have been found. As many as, 24 villages under 7 blocks were surveyed for social status, occupation and skin infection among the inhabitants during January, 2009 to December, 2010. Among the persons examined, 0.173% was found with cercarial dermatitis (Table 2 and Fig. 2). Considering the cases of cercarial dermatitis and parasite infection found, the localities like Khushalpur, Dhali-pur, Jamanpur and Dudhlee in Doon Valley exhibited a positive correlation. But in the localities like Dhaki, Jhajhara, Lakhanwala, Rampur and Nahgal Bulandawala the pathogen was existed but no case of dermatitis was recorded. It has also been observed that in almost all the selected vil-lages the farming was one of the occupations of the residing people. There were red spots and swellings on the effected parts of the skin.

Frequent visits to respective PHCs was made for procuring information on skin disease and con-firmation of present studies. It is noted that the physicians at PHC's were in the doubtful position whether the skin infection is due to entrance of

cercariae or due to allergic reaction of wild variety of grass (*Parthenium hysterophorus*).

**Fig. 2:** Cases of cercarial dermatitis (Original)

Simultaneously, a close look to frequently visiting livestock of the study area provides a clue of their potent role in completing the life cycle of the parasites. In view of lack of information on skin infection, this needs a comprehensive study on the role of livestock/ birds in the zoonotic transmission of the parasites.

**Table 2:** Showing suspected cases of Cercarial dermatitis (C.D.) in selected areas of Doon valley

Block/ Area	Village	Persons Examined			Itching / Skin infection			Main Occupation	Cases of C.D.	
		M	F	C	M	F	C			
Sahaspur	Dhaki	87	38	70	27.7	13.1	52.8	Business/Farming		
	Redapur	25	20	30	12	30	10	Farming		
	Khushalpur	64	46	118	50	15.2	37.2	Business/Farming	02	
	Charba	45	25	41	6.6	20	34.1	Business/Farming		
	Indripur	30	31	43	26.6	19.3	20.9	Farming		
Prem Nagar	Terri Gaon	29	29	33	27.5	31	12.1	Business/Farming		
Teri Gaon	Kolu Pani	27	17	30	18.5	17.6	13.3	Business/Farming		
Suddhowala	Suddhowala	12	10	18	8.3	10	22.2	Business/Farming		
	Jhajhara	31	32	29	16.1	25	-	Farming		
	Jassowala	23	19	43	21.7	15.7	6.9	Business/Farming		
	Dhalipur	19	17	29	15.7	25.5	13.7	Business/Farming	01	
	Jamnipur	32	32	40	15.6	34.3	15	Business/Farming		
Herbertpur	Lakhanwala	29	22	57	17.2	-	10.5	Business/Farming		
	Bairagiwala	24	25	39	25	12	7.6	Business/Farming		
	Fatehpur	23	15	13	13.0	6.6	23.0	Business/Farming		
	Rampur	52	32	67	17.3	21.8	10.4	Farming		
	Shonlearpur	32	27	41	15.6	22.2	17.0	Business/Farming		
Selaqui	Muh. Nagar	16	15	31	37.5	20	16.1	Business/Farming		
	Jamanpur	30	22	55	36.6	22.7	9.0	Farming	01	
	Chota Rampur	22	16	48	18.1	18.7	8.3	Business/Farming		
	Doiwala	Nangal Jwalapur	20	19	28	5.0	15.7	-	Business/Farming /Labour	
		Simlash	22	19	29	-	5.2	6.8	Farming/Labour /Service	
Doiwala	Dudhlee	22	26	41	4.5	11.5	9.7	Business/Farming /Labour	02	
	Nahgal Bulanda-wala	20	19	23	10.0	15.7	-	Business/Farming /Labour		

## Discussion

According to Hoeffler (6), the cercarial dermatitis is a parasitic disease affecting the skin. It may be encountered in fresh or salt water and is global in its distribution. It is a potential economic hazard to persons who work in aquatic environments and to the tourist industry. With regard to occurrence of cercarial dermatitis the present findings resemble with the contributions of a number of workers (7, 8, 24-28) but slightly differ in considering the role of species of snail. In our studies there is a major role of *I. exustus* and *M. tuberculata*.

Cercariae of several species of mammalian and avian schistosomes are responsible for causing dermatitis in man, during the act of skin penetra-

tion. These cercariae are unable to propagate and eventually perish. Known also as swimmer's itch or paddy field dermatitis, it could be an occupational hazard for agricultural labourers, washer men and fishermen. This condition is rampant in rural India, where villagers are largely dependent on water ponds for their domestic and animal needs.

On a personal discussion with the village people there was a case of a young man who collected fresh water fish with bare hands from an irrigation pond. Minutes after collecting the fish, the person experienced itching and erythema on the dorsum of the hands. Soon, a few macules appeared on the hands and 6-7 h later these macules developed into papules. Routine anti-allergic treatment re-

lieved the irritation and purities. But, later on appearance of cyst was noticed. This shows that the cercarial dermatitis exists in the Doon Valley.

## Conclusion

Cercarial dermatitis should be considered a potential risk whenever warm-blooded and molluscan hosts share a water resource with man as it is a self-limited, severely itching rash that lasts about one week and may be easily mistaken for insect bites. More emphasis has been given on (a) the temporal occurrence of cercarial dermatitis in humans and (ii) the prevalence of animal schistosome infection in vector snails and the level of cercarial shedding in relation to time of year and water temperature.

## Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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