



Research Article

Gongylonema sp. (Nematode: Gongylonematidae) from Indian Gerbil *Tatera indica* Hardwicke, 1807 (Rodentia: Muridae) of Hyderabad District, Sindh, Pakistan

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Abstract | Pathogenic nematodes were collected from the gastrointestinal tract of Indian Gerbil *Tatera indica* Hardwicke, 1807 in Hyderabad, Sindh, Pakistan. A total of 32 nematodes were collected from 09 hosts out of 22 hosts examined. These specimens were identified as the members of genus *Gongylonema* Molin, 1857 (Spirurida: Spiruroidea: Gongylonematidae) based on presence of various cuticular bosses on anterior portion of the specimens, a gubernaculum, unequal and dissimilar spicules. Previously, there is no record of genus *Gongylonema* from the host *Tatera indica*, therefore, it makes new host record from Sindh province of Pakistan.

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Keywords | *Gongylonema*, *Tatera indica*, Hyderabad, Sindh, Pakistan



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Introduction

Gongylonema Molin, 1857 is a genus of pathogenic nematodes. Currently it is only valid genus from family Gongylonematidae of order Spirurid. It settles in the anterior part of gastro-intestinal tract of various mammals and birds, transmitted through insect vectors mainly beetles (Anderson, 1992). Species of genus *Gongylonema* are identified by the presence of various cuticular bosses in anterior parts of body, a gubernaculum, and unequal and dissimilar spicules (Chabaud, 2009). Man has been reported as

an accidental host for the genus *Gongylonema* from the United States, France, China and New Zealand (Wilde *et al.*, 2001).

Rats can act as vectors for over forty different pathogens that can infect people (Singleton *et al.*, 2003). Research indicates that these diseases impair the host's physiology and immunity through tissue damage. Parasites reduce the host's blood volume, compete with it for nutrients, and cause various bodily floods (Hsu, 1980).

Since the discovery of the genus *Gongylonema*, over 100 human cases have been reported; the majority of these cases are caused by *G. pulchrum*, which infects the tongue, lips, palate, and oral cavity (Sato *et al.*, 2005). According to Sato *et al.* (2005), beetles and other insects serve as the parasites' intermediary hosts and are the means of transmission.

Materials and Methods

A total of 22 live specimens of Indian Gerbil *Tatera indica* Hardwicke, 1807 (Rodentia: Muridae) were collected from different habitats of Hyderabad district, Sindh, Pakistan. Among these, only 09 hosts were found positive with nematodes of genus *Gongylonema* Molin, 1857 (Spirurida: Spiruroidea: Gongylonematidae). Total of 32 nematode specimens were collected from upper gastro-intestinal tract and killed in hot 70% ethanol. Temporary mounts were prepared in alcohol-glycerol solution. Drawings were made with the help of Olympus BH2-DA Drawing Attachment. Photographs were taken with OMAX Digital Trinocular LED Microscope with 10MP Digital USB Microscope Camera. Measurements are given in micrometers (um). Specimens are deposited in the Department of Zoology, University of Sindh, Jamshoro, Pakistan.

Taxonomic summary

| | |
|--------------------------|--------------------------------|
| Family | Gongylonematidae Hall, 1916 |
| Genus | <i>Gongylonema</i> Molin, 1857 |
| No of hosts examined | 22 |
| No of hosts infected | 9 |
| No of specimen recovered | 32 |
| Site of infection | Upper gastro intestinal tract |
| Locality | Hyderabad, Sindh, Pakistan |

Results and Discussion

During current study (January–August, 2021) a total of 22 Indian Gerbil hosts were examined for the presence of nematode parasites. Only 09 out of the 22 hosts were positive to the presence of nematodes of genus *Gongylonema* which means a prevalence of 40.09%.

Description (Figure 1) (a total of 32 parasite specimens were isolated): Body whitish in color elongated 10200–13000 long; much wider at middle region, 130–140; cuticle bosses present at surface

of anterior mostly, oval, rounded or rectangular in shaped and poorly developed; mouth opening rectangular with lateral view; pharynx very short and thin, 40–50 long; esophagus 3500–3800 long, divided into two portions, short muscular esophagus 510–58 long, and long glandular esophagus 3150–4210 long; nerve ring located at posterior of muscular esophagus 60–70 long; spicules unequal, asymmetrical, right spicule thick, small and boat shaped 90–110 long, left spicule thin, long and pin shaped 510–720 long; gubernaculum cup-shaped in which right spicule rests 50–70 long; papillae asymmetrical with 6–8 pair in numbers, precloacal papillae 3–4 pair in numbers and post-cloacal papillae 2–4 pair in number; tip of the tail region coiled ventrally; lateral alae present though out the body expand at tail region.

Genus *Gongylonema* Molin, 1857 contains thread like nematodes belonging to family Gongylonematidae and order Spirurid. Currently it is only valid genus in family Gongylonematidae. Species of *Gongylonema* are identified by the presence of various cuticular bosses in anterior parts of body, a gubernaculum, unequal and dissimilar spicules. But when comparing species morphometrically, based on data obtained in the original descriptions, a great deal of overlap was noted. Therefore, for interspecific identification of parasites of rodents, it is necessary to rely on structures such as shape of the caudal alae, presence or absence of lateral alae and number of pairs of caudal papillae (Chabaud, 2009).

Initially, only two species *Gongylonema musculi* and *G. ursi* were described by Rudolphi in 1819. Upto now, more than 50 species are recorded from mammals and aves around the world in which 13 species were recorded from rodents. Some of its species are poorly characterized, need more specimens to understand their character in better fashion. Species of *Gongylonema* are mostly found in rodents of various regions of world. Although variations are found in total body length and other characters which are compared with current study mentioned in Table 1.

Present specimens are compared with 13 species of genus *Gongylonema* which were recovered from different rodent hosts. Present specimens differ from *G. neoplasticum* in length of body, size of right spicule but resembles in having eight pairs of papillae, size of left spicule, lateral alae continuous and bosses present at anterior of body. It also differs from *G. musculi* in

body size, 14 pairs of papillae but resembles in having bosses at anterior part of body. Present specimens differ from *G. longispiculum* in body size, length of both spicules and 11 pairs papillae. It also differs from *G. dipodomys* in size of body and left spicule, 11 pairs of papillae but resembles in size of right spicule, lateral alae continuous and bosses at anterior end of body surface. Present specimens differ from *G. peromysci* in size of body, 10 pairs of papillae and size of both spicules but resembles in presence of lateral alae and bosses at anterior end of body surface. It also differs from *G. mysciphila* in having 11 pairs of papillae, size of both spicules, but resembles in size of body, presence of lateral alae and bosses at anterior end of body surface. Present specimens differ from *G. fotedari* in size of both spicules, 12 pairs of papillae and absence of lateral alae, whereas, resembles in body size and bosses present at anterior end of body surface. It also differs from *G. aegypti* in having 10 pairs of

papillae, size of left spicule, absence of bosses but resembles in size of body and size of right spicule, presence of lateral alae. Present specimens differ from *G. dupuisi* in size of both spicules, 10 pairs of papillae but resembles in size of body, lateral alae continuous and presence of bosses. It also differs from *G. madalinensis* in size of body and left spicule, 11 pairs of papillae but resembles in size of right spicule, lateral alae continuous and presence of bosses. Present specimens differ from *G. pythiusensis* in size of body and spicules, 12 pairs of papillae but resembles in bosses present at anterior part of body surface. It also differs from *G. berveridgei* in having larger size of left spicule but resembles in 8 pairs of papillae, lateral alae continuous and presence of bosses. Present specimens differ from *G. archboldi* in size of body, length of left spicule, 11-12 pairs of papillae and resembles in size of right spicule, lateral alae continuous and presence of bosses.

Table 1: Comparison of various species of genus *Gongylonema* of rodents with present specimens.

| Species | Present study | <i>G. musculi</i> | <i>G. longispiculum</i> | <i>G. dipodomys</i> | <i>G. peromysci</i> | <i>G. mysciphila</i> | <i>G. fotedari</i> | <i>G. aegypti</i> | <i>G. dupuisi</i> | <i>G. pythiusensis</i> | <i>G. archboldi</i> |
|---------------------------|---------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Reference | -- | Cordeiro <i>et al.</i> , 2018 | Cordeiro <i>et al.</i> , 2018 | Cordeiro <i>et al.</i> , 2018 | Cordeiro <i>et al.</i> , 2018 | Cordeiro <i>et al.</i> , 2018 | Cordeiro <i>et al.</i> , 2018 | Cordeiro <i>et al.</i> , 2018 | Cordeiro <i>et al.</i> , 2018 | Cordeiro <i>et al.</i> , 2018 | Cordeiro <i>et al.</i> , 2018 |
| Total body length of male | 10.02-13.0 | 8.8 | 19.3 | 7.6-9.7 | 5.9-9.0 | 10.5 | 9.54-15.05 | 9.5-12 | 11.6 | 2.79-4.95 | 13-19 |
| Buccal capsule | - | - | - | 0.03-0.04 | 0.02-0.03 | - | 0.05 | 0.02 | - | 0.02 | 0.03-0.04 |
| Right spicule | 90-110 | - | 0.17 | 0.09-0.11 | 0.09-0.10 | 0.07 | 0.07-0.08 | 0.08-0.10 | 0.17 | 0.04-0.07 | 0.10-0.11 |
| Left spicule | 510-720 | - | 9.54 | 0.62-0.73 | 0.34-0.42 | 1.13 | 0.55-0.65 | 0.32-0.42 | 2.75 | 0.62-0.86 | 1.40-1.74 |
| Gubernaculum | 50-70 | - | 0.09 | 0.04 | 0.02-0.03 | 0.08 | 0.05-0.07 (v-shaped) | 0.02 | 0.16 | 0.03-0.05 | 0.07-0.09 |
| Papillae pairs | 6-8 | 14 | 11 | 11 | 10 | 11 | 12 | 10 | 10 | 12 | 11-12 |
| Pre-cloacal | 3-4 | 10 | 7 | 6-7 | 5-6 | 6 | 5 | 4-6 | 4 | 5-6 | 5-6 |
| Post-cloacal | 2-4 | 4 | 4 | 4-6 | 3-6 | 5 | 7 | 5-6 | 6 | 5-7 | 5-6 |
| Caudal wings | - | - | Asymmetrical | Asymmetrical | - | Asymmetrical | Symmetrical | Asymmetrical | Asymmetrical | - | Asymmetrical |
| Lateral alae | Continuous | - | - | Present | With constrictions | With constrictions | Absent | With constrictions | Present | - | Present |
| Bosses | Present | Present | - | Present | Present | Present | Present | Present | - | Present | Present |
| Host | Tatera indica | Mus musculus | Citellus mus-planicola | D. merriami | P. maniculatus | Peromyscus maniculatus | B. bengalensis | M. musculus, gerbillus | Mastomys sp. | Eliomys quercinus ophiusae | Sigmodon hispidus |
| Country/region | Pakistan | Australia | China | Indonesia | USA | USA | India | Egypt | Central African Republic | USA | USA |

After comparison of present specimen with species of genus *Gongylonema* (Table 1), the present specimens are identified upto generic level due to resembles of characters with different species of genus *Gongylonema*. These specimens will be identified up to species level after recovery of more specimens from the same host or other rodent hosts. Previously there is no record of genus *Gongylonema* from the host *Tatera indica*, therefore, it makes new host record from Hyderabad, Sindh, Pakistan.

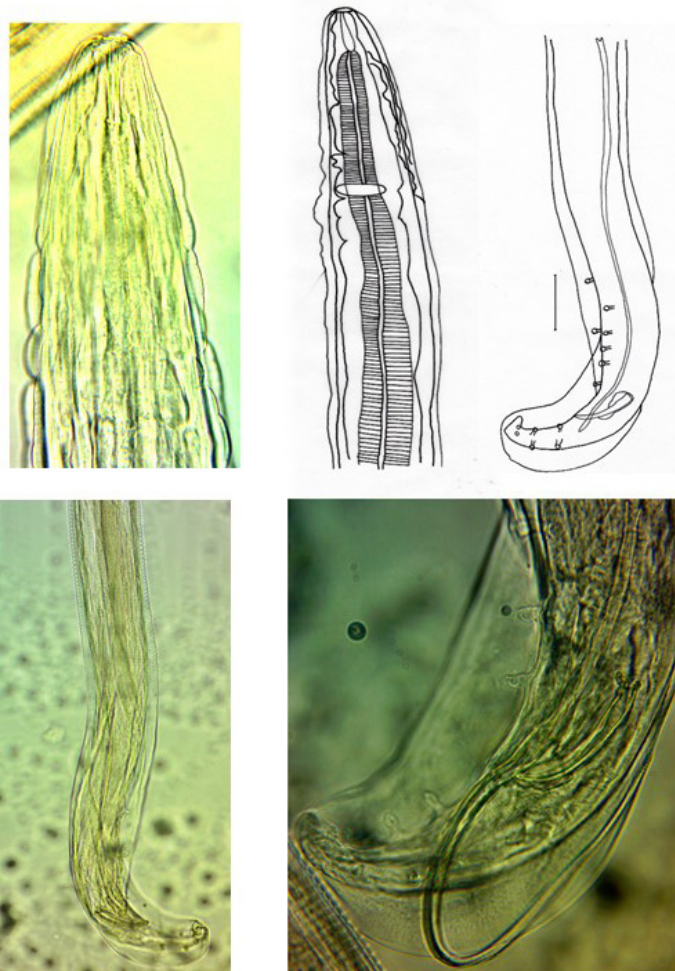


Figure 1: *Gongylonema* sp. A & B: anterior portion showing mouth opening, pharynx, esophagus and nerve ring; C, D & E: posterior portion showing spicules, papillae and lateral Alae.

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sion, Sindh, Pakistan. This research paper is the part of that research project.

Author's Contribution

Nadir Ali Birmani: Designed, performed experiment and finalized research paper.

Ramesh: Performed experiments, wrote research paper.

Shakeel Ahmed Memon: Analyzed data and wrote research paper.

Raheela Noor Memon: Experimental work and microscopy.

Badar Alam Samejo: Sample preparation and review literature.

Mehtab Ali Mahar: Photography and diagrams.

Conflict of interest

The authors have declared no conflict of interest.

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