Amidostomiasis in Indigenous Ducks of Bangladesh: Prevalence and Pathology

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ABSTRACT

Amidostomiasis caused by Amidostomum anseris was investigated in 300 indigenous ducks reared in semi-scavenging system in the Mymensingh District, Bangladesh, from July, 2003-June, 2004. During this study, 14.67% ducks were found to be infected with A. anseris. Significantly (P<0.01) higher rate of infection was detected in young (<6 months) ducks (30.61%) than adult (> 6 months) ducks (6.93%). In young ducks, susceptibility to this infection was 2.27 times more than the adult. Male ducks were found to be more frequently infected (18.91%) than female (10.53%). Male ducks were 1.83 time more vulnerable to amidostomiasis than the female. The highest prevalence was observed in the monsoon (39.13%) followed by summer (14.28%) and the lowest in winter (7.38%) season. In the monsoon, ducks were 1.68 and 1.21 times more susceptible to A. anseris than in winter and summer seasons, respectively. But ducks were 1.38 times more likely to be infected with A. anseris in summer season than winter. On the other hand, parasitic load was relatively higher in summer (6.09±0.21) followed by monsoon (4.67±0.03) and winter (3.05±0.19) seasons. Parasitic burden was also higher in the male (7.41±0.28) than the female (4.12±0.35) ducks and younger ducks harbored more parasites (5.98±0.12) than the older ducks (3.21±0.15). Pathological lesions were found in 39 (13%) cases of which 23 (58.97%) cases were observed in younger ducks. Pathological lesions mostly were detected in the gizzard mucosa but in some cases 7 (17.95%) lesions were also found in the proventriculus. Grossly the lesions were characterized by the small necrotic areas with depressed center and the parasites were found embedded in to the submucosa. Histologically the lesions were characterized by the sloughing of superficial lining epithelium with underlying basement membrane. Marked infiltration of polynuclear reactive cells, predominantly eosinophils were observed in the mucosa and submucosa. The present study suggests that indigenous ducks are susceptible to A. anseris infection and this parasite was found associated with the production of some pathological conditions. So, proper control of this parasite is essential.

Key words: Amidostomum anseris, Ducks, Prevalence, Semi-scavenging, Pathology

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INTRODUCTION

Amidostomiasis is a parasitic disease of various waterfowls caused by different species belongs to the genus *Amidostomum* (Nematoda: Strongyloidea) of which *A. anseris* is the most common and cosmopolitan in distribution (Soulsby, 1982). *Amidostomum anseris* is very pathogenic in young geese, while the adult birds may act as carrier of the infection without showing symptoms (Lapage, 1962; Soulsby, 1982; Permin and Hensen, 1998). *A. anseris* has also been reported in ducks (Islam et al 1988) and in pigeon (Ruff and Norton, 1997). The adult parasites burrow into the mucosa and submucosa of the gizzard and proventriculus. They suck blood resulting anemia, weakness, loss of appetite and emaciation. The parasites give marked irritation resulting in severe inflammation, hemorrhage and necrosis. Extreme blood losses may occur in heavily infected birds (Permin and Hensen, 1998). Besides, Ullrich (1932) considered that the worms had a marked toxic effect on the host. The toxic effect is characterized by the cerebellar ataxia, inco-ordinated movements of the neck and head and by swaying gaits. Death may occur in affected geese (Lapage, 1962, Permin and Hensen, 1998 and Ruff and Norton, 1997). However, the occurrence and pathogenicity of *A. anseris* has not yet been extensively studied in indigenous ducks of Bangladesh. Islam et al (1988) reported only the prevalence of *A. anseris* in indigenous ducks of Bangladesh. Considering the paucity of information this research work was undertaken to study the prevalence of *A. anseris* in indigenous ducks of Bangladesh in relation to their age and sex including the seasonal dynamics of infection and pathological lesions in ducks caused by the parasite.

MATERIALS AND METHODS

The study was conducted in the Laboratory of Parasitology, Bangladesh Agricultural University, Mymensingh, from July 2003 to June 2004. A total of 300 indigenous ducks were purchased from the farmer’s households and local markets of different areas of Mymensingh district. Before slaughtering, the vent area of the ducks was carefully examined to detect any soiling or other symptoms of diarrhoea. The slaughtered ducks were subjected to routine post-mortem examination following the procedure described by Fowler (1990). The gizzard and proventriculus were opened to collect parasites and to detect pathological lesions produced by them. The collected parasites were preserved and detail morphological study was conducted by preparing temporary slides with lactophenol (Cable, 1957). The gross pathological lesions were recorded and the affected organs were collected and preserved in 10% buffered neutral formalin. For histopathological study, slides were prepared in the Pathology Laboratory, Bangladesh Agricultural University, Mymensingh, following the methods as described by Luna (1968). The parasites were identified according to the keys given by Yamaguti (1961) and Soulsby (1982). To study the seasonal dynamics the year was divided in to three seasons such as monsoon (July to October), winter (November to February) and
summer (March to June) seasons. The ducks were divided into two age categories such as ducks of <6 months old and ducks of > 6 months old. In ducklings, sexes were identified by the digital palpation of penis according to the procedure as described by Parkhurst and Mounteney (1988).

**Statistical analysis**

The data were analyzed by using SPSS package program using “t-test”. Odds ratio and confidence interval were obtained by the formula according to the Schlesselman (1982).

**RESULTS**

During this study, out of 300 ducks examined 44 (14.67%) were infected with *A. anseris*. Significantly higher (P<0.01) infection rate was observed in younger ducks of <6 months old (30.61%) than the adult ducks of >6 months old (6.93%). In fact, younger ducks were found significantly (P<0.05) 2.27 times more susceptible to this infection. We also found that younger ducks (5.98±0.13) harbored more parasites than the adult (3.21±0.54) ducks. The infection rate was higher in male (18.91%) than that of the female (10.53%) ducks. The calculated odds ratio implied that male ducks were 1.83 time more susceptible to *A. anseris* infection than the female ducks. Parasitic burden was also higher in the male (7.41±0.87) than in female (4.12±0.55) ducks (Table 1). A marked seasonal variation was observed in the prevalence of *A. anseris* infection. The infection rate varied significantly (P<0.01) in monsoon with other seasons of the year. The highest prevalence was recorded in the monsoon (39.13%) followed by summer (14.28%) and the lowest in winter (7.38%). In monsoon, ducks were 1.68 and 1.21 times more affected by *A. anseris* than winter and summer respectively. Whereas in summer season ducks were 1.38 time more vulnerable to amidostomiasis than winter. The average density of parasites was relatively higher in summer (6.09±0.13) followed by monsoon (4.67±0.05) and the lowest in winter (3.05±0.19) season (Table 2). During post-mortem examination, out of 44 infected ducks 39 (13%) cases showed marked gross pathological lesions. Of this 39 cases, 23 (58.97%) were in young ducks of <6 months old. Pathological lesions mostly were observed on the mucosa of the infected gizzards. Brown colored fragile masses were found to be deposited on the necrotic areas. Lesions in the proventriculus were observed only in 7 cases which were characterized by pale red to brown coloured small necrotic areas with depressed center. Parasites were found embedded into the submucosa (Figure 1). Histopahologically, the lesions were characterized by loss of superficial lining epithelium with its underlying basement membranes. Marked infiltration of reactive cells, predominantly eosinophils were observed in the mucosa and submucosa of the affected proventriculus (Figure 2).
Amidostomiasis in ducks

Table 1. Age and sex related prevalence and density of *A. anseris* infection in indigenous ducks

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Categories</th>
<th>No. of ducks examined</th>
<th>No. of ducks infected (%)</th>
<th>Parasitic load</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mean±SD (Range)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>&lt;6months</td>
<td>98</td>
<td>30 (30.61)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.98±02.13 (3-12)</td>
<td>2.27&lt;sup&gt;*&lt;/sup&gt;</td>
<td>1018-4.37</td>
</tr>
<tr>
<td></td>
<td>&gt;6months</td>
<td>202</td>
<td>14 (06.93)&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.21±01.54 (2-6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Male</td>
<td>148</td>
<td>28 (18.91)</td>
<td>7.41±02.87 (2-12)</td>
<td>1.83</td>
<td>0.97-3.45</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>152</td>
<td>16 (10.53)</td>
<td>4.12±03.55 (2-8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>300</td>
<td>44 (14.67)</td>
<td>2-12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>a,b</sup> Values with different superscript letters within the same group differ (P<0.01)

* Statistically Significant (P < .05)

Table 2. Seasonal prevalence and density of *A. anseris* infection in indigenous ducks

<table>
<thead>
<tr>
<th>Seasons</th>
<th>No. of ducks examined</th>
<th>No. of ducks infected</th>
<th>Percentage of ducks infected</th>
<th>Parasitic load</th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mean±SD Range</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monsoon</td>
<td>46</td>
<td>18</td>
<td>39.13&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.67±03.05 2-12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(July to October)</td>
<td></td>
<td></td>
<td></td>
<td>Monsoon vs Winter</td>
<td>1.68</td>
<td>0.78-3.62</td>
</tr>
<tr>
<td>Winter</td>
<td>149</td>
<td>11</td>
<td>7.38&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.05±01.94 2-6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Nov to Feb)</td>
<td></td>
<td></td>
<td></td>
<td>Summer vs Winter</td>
<td>1.38</td>
<td>0.62-3.06</td>
</tr>
<tr>
<td>Summer</td>
<td>105</td>
<td>15</td>
<td>14.28&lt;sup&gt;b&lt;/sup&gt;</td>
<td>6.09±02.13 6-12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Mar to Jun)</td>
<td></td>
<td></td>
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</tbody>
</table>

<sup>a,b</sup> Values with different superscript letters within the same group differ (P<0.01)
DISCUSSION

The prevalence of *A. anseris* infection in indigenous ducks (14.67%) revealed in this investigation conforms to the earlier report of Islam et al. (1988) who reported amidostomiasis caused by *A. anseris* in 15% of indigenous ducks in Bangladesh. Gokcen et al (2002) reported 15.09% infection in geese in Turkey. However, in geese, *A. anseris* infection was recorded 73.90% in Iran (Hosseini, et al 2001) and 98% in USA (Nowicki et al 1995). Besides, Nakamura and Asakawa (2001) reported *A. anseris* as one of the most common parasites occurring among the anatids in Hokkaido. This contrast with the earlier findings can be explained by the differences of the species of the birds examined, the geographical location of the experimental areas, topography and composition of soil, variation in the climatic conditions and differences in the method of study.

The marked seasonal variation in the infection rate with the highest in the monsoon (39.13%) observed in the present study is almost similar with the findings of the earlier workers (Birova et al. 1990; Guclu, 1994). Birova et al (1990) recorded highest infection rate (40.18%) with *A. anseris* in domestic ducks in the fall. Guclu (1994) reported higher infection rate of *A. anseris* in geese in fall in Turkey. In this study, the monsoon consisted of July-October whereas in other countries fall consists of September-November. So, monsoon in Bangladesh almost covers the fall in other countries. The highest rate of infection of *A. anseris* in indigenous ducks of Bangladesh in the monsoon (39.13%) might be due to the favorable climatic conditions such as temperature and humidity for the development of eggs and infective stage of the parasites. Eggs of *A. anseris* reached to infective stage within 23 days at 20°C (Enigk and Dey-Hazra, 1970). *Trichostrongylus*
Amidostomiasis in ducks

tenuis eggs develop by 4 to 6 days at 27°C (Soulsby, 1982). In Bangladesh, temperature ranges from 25 -29°C in monsoon which favours the development and hatching of eggs and survival of the larvae to reach the infective stage. Moreover, unlike other trichostrongylids, the swimming capacity of A. anseris larvae and their skin penetrating capacity (Enigk and Dey-Hazra, 1970) may favour the infection through both the routes when water bodies become most available in the monsoon. A lower prevalence recorded in winter (14.28%) and the lowest in summer (7.38%) might be due to less development of eggs and infective larvae. Both eggs and larvae of A. anseris are highly susceptible to desiccation (Enigk and Dey-Hazra, 1970) and elevated temperature inhibited the development of eggs of A. anseris (Geller, 1962), even the infective larvae are killed by drying within 30 to 60 hours (Lapage, 1962). The parasites can survive in the 2-3 months old geese for 182 days and in geese of above 1 year old for 140 days (Stradowski, 1972) which may also be true for ducks and in that case ducks infected in the late monsoon will also carry the parasites almost throughout the winter but hardly in summer which is reflected by lowest rate of infection in summer. Moreover, average density of this parasite was relatively higher in summer season (6.09±02.13) followed by monsoon (4.67±03.05) and winter (3.05±01.94) season. Birova et al (1990) found the highest load of A. anseris in geese from March to October. Probably nutritional status and climatic conditions had an influence on the higher parasitic load in summer, because in the late winter and early summer there was scarcity of feeds of ducks and malnourished individuals harbour relatively higher parasitic burden (Ruff and Norton, 1997, Permin and Hensen, 1998 and Soulsby, 1982).

More infection rate and parasitic load in male ducks than those in the females recorded in this study are substantiated by the earlier report in indigenous ducks in Bangladesh (Islam et al., 1988). Male sex hormone of Hampshire chickens makes the individual more susceptible to parasitic infection (Ackert and Dewhirst 1950). Todd and Hollingsworth (1951) conducted an experimental infection with Ascaridia galli in chicken and observed fewer worm burdens in female compared to male. This hormonal influence may be the reason of making the male ducks more susceptible than the females.

Significantly (P<0.01) higher rate of infection in young ducks (30.61%) than the ducks of >6 months old (6.93%) is in contrast with the earlier finding of Islam et al. (1988) who recorded almost similar rate of infection in young (10%) and adult (12.86%). But Lapage (1962) reported higher rate of infection in young geese. These discrepancies in findings might be due to variation in the sample size, geographical area of sample collection or some other unknown factors. More parasitic burdens in young ducks (5.98±02.13) than in the adults (3.21±01.54) might be due to less development of immune system of young ducks (<6 months of age) to combat the infection. Stradowski (1972)
reported that in experimental cases, few *A. anseris* established themselves in ducks of above 6 months old and none of them reached to the maturity. However, the indigenous adult ducks of Bangladesh showed no such strong age resistance as showed by exotic breeds of ducks.

The severe pathological lesions were mostly observed in young ducks. Phug and Varga (1975) reported severe gizzard damage in ducklings after experimental infection with *A. anseris*. Similar findings were reported in young geese (Lapage, 1962; Soulsby 1982). In most cases pathological lesions were observed in gizzard mucosa characterized by small necrotic area with depressed center associated with the deposition of brown coloured fragile mass. The parasites were found embedded in the gross ulcerative lesions. Similar type of gross lesions in the gizzard mucosa of the affected birds was also observed by the earlier scientists (Enigk and Dey-Hazra, 1970; Lapage, 1962; Phug and Varga, 1975; Soulsby, 1982 and Ruff and Norton 1997). During this study, in few cases lesions were found in the proventriculus of the affected ducks. Less frequently proventricular lesions were also recorded by Ruff and Norton (1997), Soulsby (1982) and Lapage (1962) in geese. Histopathologically, the lesions were characterized by the loss of superficial lining epithelium with its underlying basement membrane, associated with the infiltration of polymuclear reactive cells, mainly eosinophils. Ruff and Norton (1997) described similar type of loosening and sloughing of gizzard mucosa in geese. In case of geese, the propria mucosa of the gizzard showed hemorrhages and localized infiltration of mononuclear cells and polymuclear leucocytes associated with cross sections of parasites (Soulsby, 1982 and Lapage 1962). But in this study, cross-section of parasite was not observed. Probably the sections were not cut in proper angle. However, the selected tissues were properly preserved and processed.

In conclusion, these findings suggest that amidostomiasis may be a major problem in indigenous ducks of both sexes and all ages especially in young ducks in Bangladesh, which is influenced by the seasonal changes of the year. Further studies are needed to assess the economic losses and to develop a sustainable control measures against amidostomiasis in ducks in Bangladesh.

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Amidostomiasis in ducks

REFERENCE


