ABSTRACT

Hydatidosis, a disease of public health importance, is caused by the metacestodes of tape worm *Echinococcus granulosus*. An investigation on the prevalence of the disease was undertaken in buffaloes—calves, heifers and adults—slaughtered in Mirha Exports Pvt. Ltd. between March 2010 to Feb. 2011 revealed the overall prevalence as 50.96%. The group wise prevalence recorded was 3.52%, 5.58% and 54% in calves, heifers and adult buffaloes respectively. Females outnumbered the prevalence in heifers and adult buffaloes as 82.19% and 84%. The cyst showed higher occurrence in all the groups in winter (54.28%), spring (28.14%) followed by summer (21.92%) and autumn (20.92%). Distribution of the hydatid cyst in organs showed that the lungs accounted highest followed by liver and spleen. Fertile cysts recoded highest than sterile.

Keywords: buffaloes, *Bubalus bubalis*, hydatidosis, *Echinococcus granulosus*, cysts, seasons

INTRODUCTION

Hydatidosis is a zoonotic disease of public health importance. The tape worm *Echinococcus granulosus* is found in the small intestine of carnivores, particularly dogs and the metacestode (hydatid cyst) is found in a wide variety of ungulates and man (Varma et al., 1994). The pathogenicity of the cyst depends on the severity of the infection and the organ in which it is situated. In hydatidosis there is development of hydatid cyst in lungs, liver, brain, spleen and heart. In domestic animals clinical signs are not commonly seen despite heavy infections. Diagnosis of hydatidosis in domestic animals is rarely made at antemortem (Soulsby, 1982). However, immuno-diagnosis of hydatid diseases has been carried out by different workers in sheep, camel and cattle (Tassi et al., 1980; Dada et al., 1981; Bandyopadhyay and Basu, 1996).

Consumption of buffalo meat in India was around 2 million tons in 2012, as per a GAIN (Global Agricultural Information Network) report. Buffalo meat has doubled in three years between
2008 and 2011 and is set to scale further heights. (Business line, 2012). The estimation of the economic importance of hydatidosis varies greatly amongst countries and regions. There are reports of hydatidosis in buffaloes slaughtered in different regions of India (Khan and Purohit, 2006). The contamination rate in North India was reported as 48% for water buffalo (Singh et al., 1998a). Because of extensive distribution throughout the world, it gets such a significant attention that prevention of the disease is one of the dynamic programmes of the World Health Organisation (WHO Report, 1982). Indian subcontinent provides ideal conditions for the establishment, propagation and dissemination of hydatidosis both in man and livestock (Samra et al., 2000 and Gupta et al., 2011).

Owing to its zoonotic and economic importance in India, our study was aimed to determine the prevalence of hydatid cysts in buffaloes slaughtered in Mirha Exports Private Ltd. between March 2010 and Feb 2011.

MATERIALS AND METHODS

The study was conducted at Mirha Exports Private Ltd. a government-approved slaughter house (APEDA No. 125). The slaughter house has a capacity of 700 buffaloes per day. The plant is located at SAS-Nagar near Chandigarh, Mohali India. Mohali has a sub-tropical continental monsoon climate characterized by a seasonal rhythm, hot summers, slightly cold winters, unreliable rainfall and great variation in temperature (-1 to 44°C or 30 to 111°F). In winter, frost sometimes occurs during December and January. The average annual rainfall is recorded at 617 ml (24.3 inch). The company has seven qualified veterinarians who assist the government appointment Veterinarian in carrying out the operations. All the buffaloes come from the different parts of Punjab, viz, Batala, Rajpura, Ludhiana, Amritsar and Sultanpur. The method of slaughtering was halal.

A total of 209,615 buffaloes were slaughtered from March 2010 through Feb. 2011 (Table 1), which were categorized into three groups (A, B and C) based on the age detected at the ante-mortem examination.

Group A consisted of calves (>1yr), accounting for 5,100. (males=4,131 and females=969).

Group B consisted of heifers (2-3 yrs), accounting for 7,840. (males=5,644 and females=2,196).

Group C consisted of adult buffaloes (3-7 years), accounting for 196,675 (males= 8,260 and females =188,415).

The organs visualized and palpated were lungs, liver, spleen and heart. The cysts collected were examined in laboratory to ascertain whether fertile or sterile, based on the presence of protoscolices (Soulsby, 1982). The organ wise fertility rate was recorded.

RESULTS AND DISCUSSION

The 209,615 buffaloes slaughtered from March 2010 through Feb. 2011 were as depicted below in Table 1 and were categorized into three groups (A, B and C) based on the age detected at the ante-mortem examination. The study revealed that the overall prevalence of hydatidosis was 50.96%. Earlier, Singh et al. (1998), Khan and Purohit (2006), Verma and Swamy (2009) and Terefe (2012) reported overall prevalences of 48%, 34.5%, 23.53% and 40.5% in slaughtered water buffaloes in different parts of India. Khan (1996) and Kumar et
(2008) reported a prevalence of 6.52% in buffalo in the north east of India. Pednekar et al. (2009) found a prevalence of 3.8% in buffaloes as against 5.10% in cattle of Maharashtra region of India. In our studies the high prevalence of hydatidosis could be due to the fact that various sites where buffaloes were brought may have had unhygienic conditions, especially overpopulation by stray dogs. Significant variations in the prevalence of hydatidosis has been observed in India by Ghourai and Sahai (1989) and Irshadullah et al. (1989).

The group wise study showed the prevalence as 3.52%, 5.58% and 54% in calves, heifers and adult buffaloes, respectively (Table 2). Terefe (2012) reported a prevalence of 9.3% in calves. Lahmer et al. (1999) observed a higher prevalence in males (44.8%) than in females (25.2%). A prevalence of cysts higher in adults than calves was also documented by Gupta et al. (2011). The obvious reason for higher prevalence in advanced age may be due to the various ailments of ageing and the chronic nature of the disease.

The prevalence among females was greater in heifers and adults as 82.19% and 84% as against the calves, where the males showed a higher incidence (63.88%). This is in total agreement with the findings of Khan and Prohit (2006) and Pour et al. (2012) who also reported higher incidents of hydatidosis in female buffaloes slaughtered. The higher prevalence in male calves could be due to the apathy of the owners who are reluctant to provide better management to the male calves, owing to their negligible utility.

Table 3 revealed that the cysts showed higher occurrence in all the groups in the winter (54.28%), the spring (28.14%) followed by the summer (21.92%) and the autumn (20.92%). This is contrary to the findings of (Khanmohammad, 2008) who reported maximum number of infections in the spring (30%) and the minimum number of infections in the winter (24.51%). However, our findings are parallel to those of Mohamadin and Abdelgadir (2011) who also documented higher prevalence in the winter. The increased incidence of the disease in the winter may be due to the survival of the cyst in the organs for various days in the cold as compared to hot summers. There was also higher inflow of buffaloes for slaughter in the winter as compared to other seasons. (Jithendran, 1996) also reported highest occurrence of hydatidosis in sheep and goat as 28.3% in sheep and 19.45% in goats infected in the winter.

Distribution of the hydatid cysts in organs showed that lungs accounted (2.17%) followed by liver (1.51%) and spleen (0.04%) in calves (Table 4a). However no cyst was observed in the heart. The organ wise fertility showed that 7.04% male cysts were fertile in lungs as compared to 2.94% in female cysts. In liver, 54.83% cysts were fertile in females whereas 30.95% in males. In heifers (Table 4b) the lungs showed 1.84% prevalence (29.92% fertile in females and 64.17% in males) as compared to liver, 1.31% (24.44% fertile in males and 32.75% in females), spleen 0.21% (40% in males and 41.66% females) and heart 0.01%. The adult buffaloes (Table 4c) revealed that lungs constitute 14.96% (0.44% fertile in females and 88.23% in males) of hydatid cysts, liver 9.55% (1.18% fertile in females and 70.66% in males), spleen 0.01% (69.66% fertile in females and 29.26% in males) and heart 0.01% (36.15% fertile in females and 44.44% in males). The findings are in correlation with Nadery et al. (2011), Pour et al. (2012), who also reported higher prevalence in lungs as compared to liver. (Singh et al., 1988b) reported presence of the cyst as 60% lungs, 32% liver, 4% spleen, 2% kidney, 0.9% heart and 0.1% brain. Higher infections of cysts in lungs as
Table 1. Number of buffaloes slaughtered at Mirha Exports Private Ltd., Punjab.

<table>
<thead>
<tr>
<th>Seasons</th>
<th>Months</th>
<th>Calves (1&gt;year)</th>
<th>Heifers (2-3 years)</th>
<th>Adult (3-7 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
</tr>
<tr>
<td>Spring</td>
<td>March</td>
<td>644</td>
<td>64</td>
<td>471</td>
</tr>
<tr>
<td></td>
<td>April</td>
<td>464</td>
<td>71</td>
<td>482</td>
</tr>
<tr>
<td></td>
<td>May</td>
<td>185</td>
<td>94</td>
<td>467</td>
</tr>
<tr>
<td>Summer</td>
<td>June</td>
<td>154</td>
<td>64</td>
<td>411</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td>222</td>
<td>43</td>
<td>436</td>
</tr>
<tr>
<td></td>
<td>August</td>
<td>131</td>
<td>37</td>
<td>489</td>
</tr>
<tr>
<td>Autumn</td>
<td>September</td>
<td>265</td>
<td>49</td>
<td>497</td>
</tr>
<tr>
<td></td>
<td>October</td>
<td>345</td>
<td>89</td>
<td>412</td>
</tr>
<tr>
<td></td>
<td>November</td>
<td>436</td>
<td>77</td>
<td>489</td>
</tr>
<tr>
<td>Winter</td>
<td>December</td>
<td>581</td>
<td>78</td>
<td>538</td>
</tr>
<tr>
<td></td>
<td>January</td>
<td>358</td>
<td>91</td>
<td>454</td>
</tr>
<tr>
<td></td>
<td>February</td>
<td>346</td>
<td>212</td>
<td>498</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4,131</td>
<td>969</td>
<td>5,644</td>
</tr>
</tbody>
</table>

Table 2. Age-wise prevalence of hydatidosis in respective groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Total</th>
<th>Positive</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calves (1&gt;year)</td>
<td>5,100</td>
<td>180 (3.52%)</td>
<td>115 (63.88%)</td>
<td>65 (36.11%)</td>
</tr>
<tr>
<td>Heifer (2-3year)</td>
<td>7,840</td>
<td>438 (5.58%)</td>
<td>78 (17.80%)</td>
<td>360 (82.19%)</td>
</tr>
<tr>
<td>Adult buffaloes (3-7years)</td>
<td>196,675</td>
<td>106,208 (54%)</td>
<td>16,993 (15.99%)</td>
<td>89,215 (84%)</td>
</tr>
</tbody>
</table>
Table 3. Seasonal prevalence of Hydatidosis in respective seasons.

<table>
<thead>
<tr>
<th>Seasons</th>
<th>Groups</th>
<th>Calves (1&gt;year)</th>
<th>Heifer (2-3 years)</th>
<th>Adult buffaloes (3-7 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Positive</td>
<td>Total</td>
<td>Positive</td>
</tr>
<tr>
<td>Spring</td>
<td>1522</td>
<td>456</td>
<td>1945</td>
<td>583</td>
</tr>
<tr>
<td>% prevalence (group)</td>
<td>29.96%</td>
<td>29.97%</td>
<td>28.0%</td>
<td></td>
</tr>
<tr>
<td>% prevalence (season)</td>
<td>28.14%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td>651</td>
<td>136</td>
<td>1631</td>
<td>342</td>
</tr>
<tr>
<td>% prevalence (group)</td>
<td>20.89%</td>
<td>20.96%</td>
<td>22.0%</td>
<td></td>
</tr>
<tr>
<td>% prevalence (season)</td>
<td>21.92%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autumn</td>
<td>1261</td>
<td>252</td>
<td>1958</td>
<td>391</td>
</tr>
<tr>
<td>% prevalence (group)</td>
<td>19.98%</td>
<td>19.96%</td>
<td>20.99%</td>
<td></td>
</tr>
<tr>
<td>% prevalence (season)</td>
<td>20.92%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>1666</td>
<td>643</td>
<td>2306</td>
<td>922</td>
</tr>
<tr>
<td>% prevalence (group)</td>
<td>38.59%</td>
<td>39.98%</td>
<td>55%</td>
<td></td>
</tr>
<tr>
<td>% prevalence (season)</td>
<td>54.28%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4a. In situ involvement of visceral organs and number of cysts recovered with their fertility rate in calves.

<table>
<thead>
<tr>
<th>Organs</th>
<th>Calves (1&gt;year)</th>
<th>Total</th>
<th>Positive</th>
<th>Fertile</th>
<th>Sterile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lungs (males)</td>
<td>4,131</td>
<td>71</td>
<td>5</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Lungs (females)</td>
<td>696</td>
<td>34</td>
<td>1</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Liver (males)</td>
<td>4,131</td>
<td>42</td>
<td>13</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Liver (females)</td>
<td>696</td>
<td>31</td>
<td>17</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Spleen (males)</td>
<td>4,131</td>
<td>02</td>
<td>0</td>
<td>02</td>
<td></td>
</tr>
<tr>
<td>Spleen (females)</td>
<td>696</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Heart (males)</td>
<td>4,131</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Heart (females)</td>
<td>696</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Percentage prevalence in Lungs (males and females with fertility rate)</td>
<td>1.71% (males) 7.04% fertile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage prevalence in Liver (males and females with fertility rate)</td>
<td>4.88% (females) 2.94% fertile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage prevalence in Spleen (males and females with fertility rate)</td>
<td>1.01% (males) 30.95% fertile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage prevalence in Heart (males and females with fertility rate)</td>
<td>4.45% (females) 54.83% fertile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage prevalence in Spleen (males and females with fertility rate)</td>
<td>0.04% (males) 0% fertile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage prevalence in Heart (males and females with fertility rate)</td>
<td>0% (females) 0% fertile</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4b. In situ involvement of visceral organs and number of cysts recovered with their fertility rate in heifers.

<table>
<thead>
<tr>
<th>Organs</th>
<th>Total</th>
<th>Positive</th>
<th>Fertile</th>
<th>Sterile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lungs (males)</td>
<td>5,644</td>
<td>67</td>
<td>43</td>
<td>24</td>
</tr>
<tr>
<td>Lungs (females)</td>
<td>2,196</td>
<td>78</td>
<td>21</td>
<td>57</td>
</tr>
<tr>
<td>Liver (males)</td>
<td>5,644</td>
<td>45</td>
<td>11</td>
<td>34</td>
</tr>
<tr>
<td>Liver (females)</td>
<td>2,196</td>
<td>58</td>
<td>19</td>
<td>39</td>
</tr>
<tr>
<td>Spleen (males)</td>
<td>5,644</td>
<td>05</td>
<td>2</td>
<td>03</td>
</tr>
<tr>
<td>Spleen (females)</td>
<td>2,196</td>
<td>12</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Heart (males)</td>
<td>5,644</td>
<td>01</td>
<td>0</td>
<td>01</td>
</tr>
<tr>
<td>Heart (females)</td>
<td>2,196</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Percentage prevalence in Lungs (males and females with fertility rate)
- 1.18% (males) 64.17% fertile
- 3.55% (females) 26.92% fertile

Percentage prevalence in Liver (males and females with fertility rate)
- 0.79% (males) 24.44% fertile
- 2.64% (females) 32.75% fertile

Percentage prevalence in Spleen (males and females with fertility rate)
- 0.08% (males) 40% fertile
- 0.54% (females) 41.66% fertile

Percentage prevalence in Heart (males and females with fertility rate)
- 0.01% (males) 0% fertile
Table 4c. In situ involvement of visceral organs and number of cysts recovered with their fertility rate in adult buffaloes.

<table>
<thead>
<tr>
<th>Organs</th>
<th>Total</th>
<th>Positive</th>
<th>Fertile</th>
<th>Sterile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lungs (males)</td>
<td>8,260</td>
<td>612</td>
<td>540</td>
<td>72</td>
</tr>
<tr>
<td>Lungs (females)</td>
<td>1,188,415</td>
<td>178,454</td>
<td>789</td>
<td>177,665</td>
</tr>
<tr>
<td>Liver (males)</td>
<td>8,260</td>
<td>409</td>
<td>289</td>
<td>120</td>
</tr>
<tr>
<td>Liver (females)</td>
<td>1,188,415</td>
<td>113,919</td>
<td>1,345</td>
<td>112,574</td>
</tr>
<tr>
<td>Spleen (males)</td>
<td>8,260</td>
<td>41</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>Spleen (females)</td>
<td>1,188,415</td>
<td>89</td>
<td>62</td>
<td>27</td>
</tr>
<tr>
<td>Heart (males)</td>
<td>8,260</td>
<td>09</td>
<td>04</td>
<td>05</td>
</tr>
<tr>
<td>Heart (females)</td>
<td>1,188,415</td>
<td>130</td>
<td>47</td>
<td>83</td>
</tr>
</tbody>
</table>

Percentage prevalence in Lungs (males and females with fertility rate)
- 7.40% (males) 88.23% fertile
- 15% (females) 0.44% fertile

Percentage prevalence in Liver (males and females with fertility rate)
- 4.95% (males) 70.66% fertile
- 9.58% (females) 1.18% fertile

Percentage prevalence in Spleen (males and females with fertility rate)
- 0.49% (males) 29.26% fertile
- 0.007% (females) 69.66% fertile

Percentage prevalence in Heart (males and females with fertility rate)
- 0.10% (males) 44.44% fertile
- 0.01% (females) 36.15% fertile
43.09%, liver 24.39%, spleen 2.76%, heart 1.65% was reported by Varma and Ahluwalia (1990).

Our study is in contrast with Rinaldi et al. (2008) who reported only sterile and calcified cysts in the lungs and liver of slaughtered buffalo. Higher prevalence of sterile cysts in buffaloes was also documented by Varma and Malviya (1988). However Arbabi and Hooshyar (2006) found the fertile cysts in lungs of the slaughtered animals. The high prevalence of fertile cysts as encountered in the study poses a great public health hazard to butchers and meat handlers.

**CONCLUSION**

Higher infections in buffaloes slaughtered in the Mirha Exports are due to the overpopulation of stray dogs in the areas where the plant gets its supply. The lack of unhygienic unhygiene and appropriate disposal of affected organs at the plant adds to the worry. So, there is a need of drastic programme of deworming in stray dogs and buffaloes in the mandi areas. Proper disposal of the affected organs, the awareness of the butchers and their sero-surveillance is the need of the hour.

**ACKNOWLEDGEMENTS**

The authors are highly thankful to the Managing Director of the Mirha Exports Pvt. Ltd. for facilitating the study. Thanks are due to the unlettered butchers whose helped us lot during the investigation.

**REFERENCES**


