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Prevalence and associated risk factors of inclusion body hepatitis and hydropericardium syndrome outbreaks in broiler chickens in Odisha, India

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Abstract
There was sudden increase in incidence of hepatitis hydropericardium syndrome in the state of Odisha where about 72 thousand commercial broiler chicks died devastating the industry. About 219 units with 7.26 lakh birds in 8 costal districts were affected. The overall loss was about 11% of exposed birds. The younger chicks mostly of 3rd week age group were more affected. There was surge of outbreak in the cooler months.

Keywords: Broiler chicken, hydropericardium syndrome, incidence, inclusion body hepatitis

Introduction
In recent years inclusion body hepatitis (IBH) and hydropericardium syndrome (HPS) has become one of more common impediments to the growth of broiler industry leading to heavy economic loss. As frequently both the conditions occur together many workers prefer to call this as hepatitis hydropericardium syndrome (HHS). The disease syndrome is mostly characterized grossly by pale, friable, enlarged, mottled, haemorrhagic and necrotic liver, slightly enlarged kidney, congested and oedematous lungs, hydropericardium (Goyal *et al*., 2009; Das *et al*., 2015) [3, 5] and in some cases with ascites, jaundiced body fat, haemorrhagic skeletal muscle and skin, hypertrophied testis, enlarged thymus and spleen. The disease is caused by aviadenovirus and transmitted both vertically and horizontally causing a rapid spread through all the pens in a short time. Recently, in the month of August 2011 there was an outbreak of this syndrome in various farms of Odisha causing heavy economic loss during the five months periods. The study was undertaken to find out incidence of IBH and HPS in Odisha for the first time.

Materials and Methods
During the period of study of 5 months from August 2011 to December 2011 there was outbreak of hepatitis hydropericardium syndrome in coastal districts of Odisha affecting 219 small and medium farms. During this study information pertaining to flock strength, month, age, area, mortality pattern etc. were collected from farms and analysed using Microsoft's Analysis Tool and the dead and ailing birds were randomly selected for histopathological study. In the present venture, the outbreak was investigated to gain knowledge of its effect and various influences that impacted the condition. Diagnosis was made on the basis of clinical signs, necropsy findings and histopathology by demonstrating intranuclear inclusion in hepatocytes.

Results and Discussion
In 2011, there was an outbreak of hepatitis hydropericardium syndrome in month of August to December where about 8 costal districts like Cuttack, Jagatsinghpur, Khurda, Bhadrak, Jajapur, Dhenkanal, Kendrapara and Puri were affected. 7.26 lakh birds were exposed to the risk; out of which72 thousand birds were lost. This involved about 219 small to medium scale farms. The overall loss was about 11% of exposed birds (Fig. 1). Kumar *et al.* 2003[6] reported outbreaks of classical inclusion body hepatitis in domestic fowl in private poultry farms in Uttar Pradesh and Uttaranchal with 3.2 to 10.4% mortality. In Mizoram, 33.3% farms evidenced hepatitis hydropericardium syndrome outbreaks (Suohu *et al*., 2021) [10]. In Assam, the seropositivity rate of IBH-HPS was reported to be 46.38% with indirect ELISA (Dutta *et al*., 2023) [4].

The peak exposure and mortality were seen in the month of September that is the second month of initial outbreaks. In this month 4.6 lakh birds were exposed while 45 thousand chicks were died. This was followed by October, November, August and the lowest in December. Towards end of the outbreak in the month of December only 856 birds were lost out of about 12 thousand at-risk birds which were about 7%. Although the mortality in the month of October and November was comparatively less at 19.3 thousand and 3700 respectively, the percentage of mortality was relatively high around 10.4%. This was followed by August, September and December varied from 7.0-9.8%. However, there was no significant difference between exposed and dead birds at confidence level of 95% (Fig. 2). During this period, the poultry units affected also showed a similar curve. In August, eleven units were affected while in December at the end of episode only 4 units were affected and in peak September 125 units suffered the menace (Fig.3). Sandhu *et al.* (1994) [9] reported highest number of cases in Ludhiana, in winter, in chicks aged 3-6 weeks. In Assam, highest seropositivity was recorded during post monsoon followed by monsoon, winter and pre monsoon (Dutta *et al.*, 2023) [4]. In other study, highest incidence of fowl adenovirus infection was also described in winter in India (Chitradevi *et al*., 2021) [2].

Incidence of inclusion body hepatitis and hydropericardium syndrome was witnessed from 1-6 weeks age group. One week old chicks had minimum number of exposure and death numbering 5000 and 300 respectively involving a lone farm. This might have been due to vertical transmission from the supply hatchery. The other units that were affected had loss in 2nd week and above aged chicks. It is thought to be due to horizontal transmission caused by breach in biosecurity. The highest exposure and mortality were seen in 3rd week chicks numbering 3.3 lakh and 3.3 thousand respectively involving 93 poultry units. This was followed by 2nd week chicks with an exposure of 1.7 lakh and death of 1.8 thousand in 53 units which was followed by 4th week and 5th week chicks. At 6th weeks about 8000 birds were exposed with a mortality of 676 involving only 4 units. The average exposure and mortality were 1.2 lakh$^{\pm 51138.2}$ and 12 thousand$^{\pm 5069.6}$ affecting 36.5 units (Fig. 4 and Fig. 5). Asrani *et al.* (1997) [1] reported natural hydropericardium-hepatopathy syndrome in 25 broiler flocks (500-4000 birds per flock) which was characterized by 5-8% sudden deaths in 2- to 6-week-old birds. Kumar and Kharole (1998) [7] reported 10-30% among 3-6 weeks of aged broilers chicks in 32 affected poultry farms in Haryana from April 1996 to March 1997. Chitradevi *et al*., 2021 [2] reported maximum incidence (55%) and mortality (20%) among 30- and 40-days age groups. In Assam, highest seropositivity was recorded among 4 weeks age group birds (Dutta et al., 2023) [4].

It may be worth mentioning here that about 51thousand birds died were below 3 weeks and 20.8 thousand of above 3 weeks of age. This is about 71% and 29% respectively (Fig. 6). This suggests that the impact of outbreak was heavy in younger groups of chicks in comparison to growing sell-age group. Baring the solitary unit with loss of 300 chicks, the other important age were 2nd and 3rd week. The history revealed that the one-week-old chicks that were affected had been supplied by specific hatchery and investigation into that route of infection however could not be studied.

In this outbreak, it was seen that 41.4 thousand (10%) dead chicks out of 4.1 lakh exposed chicks showed predominant lesions of and diagnosed as IBH while, on the other hand, 9.2 thousand (9.6%) chicks showed prominent lesions of HPS out of 97 thousand chicks exposed. Rest 2.1 lakh chicks, out of which 21 thousand (9.8%) died, showed lesions of both IBH and HPS (Fig.7). The birds showing exclusive characteristics of IBH belonged to 128 units while HPS was seen in 27 units. Rest 64 units showed mixed infection of IBH and HPS (Fig. 8). This suggests that the horizontal transmission IBH was quite rapid in comparison to HPS. However, these two conditions may not be considered as separate or distinct from each other. Many workers would like to call this as Hepatitis hydropericardium syndrome. Still some others prefer to include fatty liver haemorrhagic syndrome in its bracket.

Mishra and Grewal (1994) [8] reported 1-40% mortality in various farms in broilers between 21-35 age groups in Punjab state due to inclusion body hepatitis with maximum outbreaks in the month of November and minimum in the month of August. In Mizoram, 18-25.2% mortality was reported among 4-6 weeks old broiler birds (Suohu *et al*., 2021) [10]. The present findings of the mortality pattern were broadly in accordance with that of other workers (Mishra and Grewal 1994 and Vairamuthu *et al*. 2004) [8, 11].

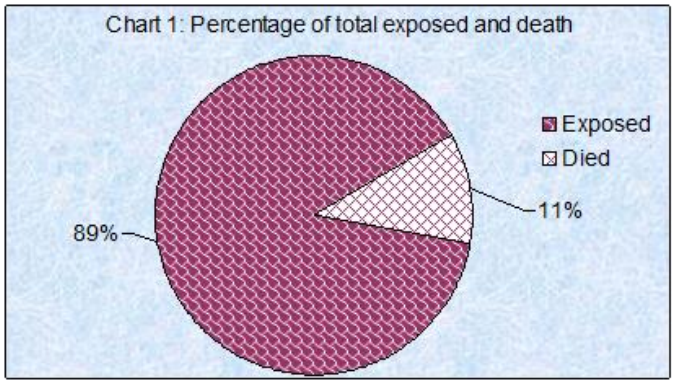

Fig 1: Percentage of total exposed and death due to IBH-HPS

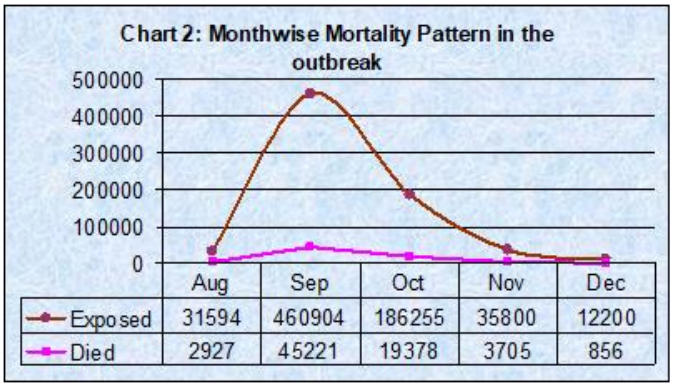

Fig 2: Month wise mortality pattern in the outbreak

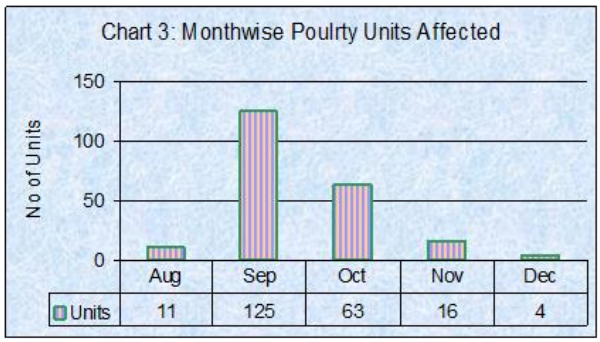

Fig 3: Month wise poultry units affected in the outbreak

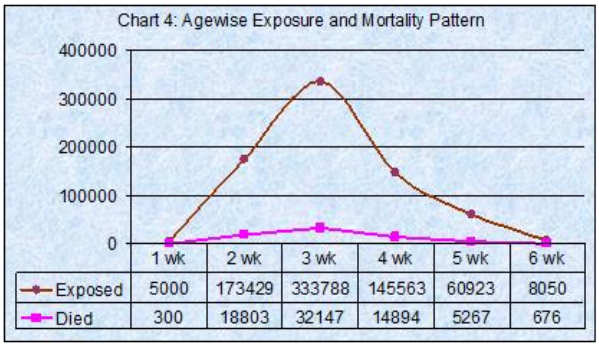

Fig 4: Age wise exposure and mortality pattern

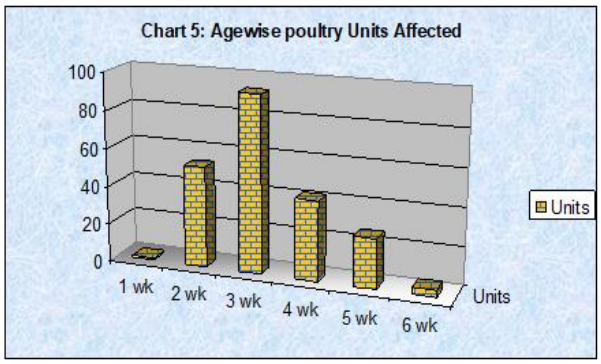

Fig 5: Age wise poultry units affected in the outbreak

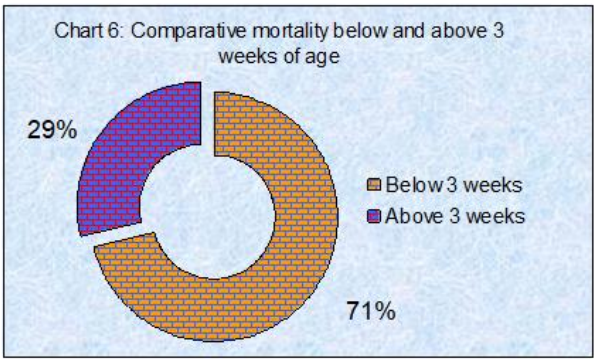

Fig 6: Comparative mortality in different age groups

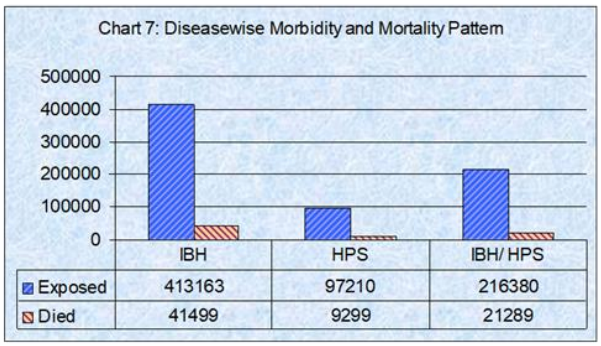

Fig 7: Disease wise morbidity and mortality pattern

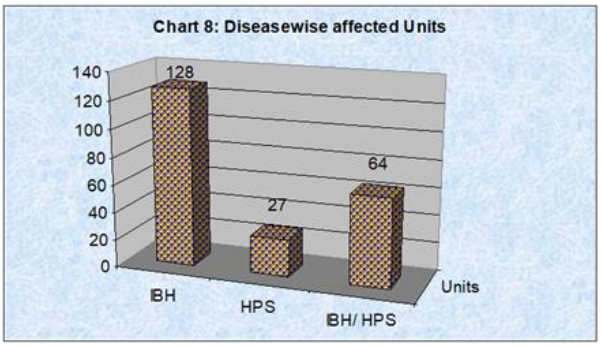

Fig 8: Disease wise affected units

Conclusion

The overall loss was about 11% of birds at risk. The younger chicks mostly of 3rd week age group were more prone to inclusion body hepatitis and hydropericardium syndrome. The impact of outbreak was heavy in younger groups of chicks in comparison to growing sell-age group. The later months of the year i.e. in cooler months there was surge of outbreak. It may be concluded that the hazard of HHS outbreak caused an immense loss to the farmers of the state. The entrepreneurs had borne a fiscal burden of around 15 to 20 lakhs within a period of 6 month.

It may be suggested that by scientifically improving the management and health care and adopting strict biosecurity particularly while purchasing and introducing a new stock. Sufficient information on the disease status of the source breeder and hatchery should be collected from fellow entrepreneurs before placing order for new stock.

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