

Diagnosis, Management and Control of Newcastle Disease Outbreak in Peafowls (*Pavo cristatus*)

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Abstract

Large scale mortality was reported in Peafowl (*Pavo cristatus*) population in Rohat tehsil and adjoining areas of Jodhpur district in Rajasthan. The birds were negative for Highly Pathogenic Avian Influenza (HPAI). A detailed study of ante-mortem and post-mortem findings confirmed a preliminary diagnosis of Newcastle Disease (Ranikhet disease). A treatment regimen was recommended for affected birds and immediate vaccination against the disease with live Lentogenic vaccine (Lasota strain) was started. After commencement of these measures, mortality stopped completely with a period of twenty days. Meanwhile after two weeks, the viscera sample were declared to be positive for Newcastle Disease (ND). Timely diagnosis, treatment and vaccination gave fifteen days of valuable time and saved lives of hundreds of peafowls.

Keywords: Lentogenic; peafowl; newcastle disease; ranikhet disease; vaccine

Introduction

There have been reports of natural outbreak of Newcastle Disease (ND) in 1968 (Goto *et al.*, 1968). ND virus was found in peafowls in China (Dou and Yang, 2007). Outbreak of ND virus was reported in Lahore, Pakistan in 2012 (Munir *et al.*, 2012) and Sindh province of Pakistan during 2012 and 2013 (Mustafa *et al.*, 2015). ND outbreak in peafowls was reported from July- September, 2012 in Haryana (Rewari), Uttar Pradesh (Noida) and Delhi, where 145 birds were found sick and 28 peafowls died (Kumar *et al.*, 2013; Khulape *et al.*, 2014 and Perumal *et al.*, 2016). During May-June 2018 there was another outbreak of virulent ND virus in peafowls in district of Gurgaon in Haryana. Approximately 30 peafowls died due to infection of ND virus. In the year 2020, many cases of ND virus were reported in peafowls in district of Ajmer which were diagnosed and treated by us. Mass vaccination of peafowls by Live Lentogenic Vaccine (Lasota strain) was undertaken and outbreak was controlled successful.

Newcastle Disease is also known as Ranikhet Disease in India. The ND is defined by Office International des Epizooties (OIE) of the World Organization for Animal Health as an infection of birds by a virus of Avian Paramyxovirus serotype 1. Virulent ND virus strains *i.e.* Velogenic and Mesogenic are endemic in poultry farms in most of the northern states of India. There is prevalence of multiple lineages of ND viruses in poultry farms and

wild birds. Strains of ND viruses are circulating and interspecies transmission is a definite possibility (Rahman *et al.*, 2018).

Movement of infected birds is the main mode of ND virus transmission. Infected birds shed virus in exhaled air, respiratory discharges and feces. Virus may also be present in all parts of carcass. Wild birds can be reservoirs of virus and can continue to excrete virus for up to 12 months. Incidentally there were no poultry farms running in and around Rohat area of Pali district.

Research Area

The study was carried out by collecting data from the list of villages (Tables 1, 2 and 3) from district Pali and adjoining areas of district Jodhpur.

Methodology

Starting from 23rd April, 2021 onwards sudden mortality in local free ranging peafowl population was reported from villages of Sanwalta, Vishnoion ki Dhani, Bhakariwala, Bhatinda, Kala Pipaliya ki Dhani, Napawas, Dhurasani villages of Rohat tehsil, district Pali. Rescued birds were being send to the Machia Biological Park and Wildlife Rescue Center, Jodhpur. There was opinion that the birds could have died due to poisoning. For confirmation of this observation, viscera samples were sent to Regional Forensic Science Laboratory, Jodhpur for toxicological examination on 29th April, 2021. However, symptomatic treatment of sick birds was initiated by wildlife Veterinarians of Machia Biological Park and Wildlife Rescue Center, Jodhpur.

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Table 1: Mortality pattern of Peafowls

District	Tehsil	Village
Pali	Rohat	Sanwalta
		Vishnoion ki dhani
		Bhakariwala
		Bhatinda
		Kala Pipaliya ki dhani
		Napawas
		Dhurasani
Jodhpur		Pabupura bhatan
		Modi Poshia
		Modi Sothala

Among other differential, diagnosis the Veterinarians of Department of Animal Husbandry, Pali suspected that the deaths could be occurring due to Highly Pathogenic Avian Influenza (HPAI) virus infection, commonly referred to as Bird Flu and hence to rule this out they submitted whole carcass samples to designated laboratory of ICAR National Institute of High Security Animal Diseases (NIHSAD), Bhopal. The samples were received by laboratory on 6th and 11th May, 2021 and were declared to be negative for HPAI virus. To rule out any anomalies with water that the birds were drinking, samples from multiple locations of different water bodies and ponds were submitted to Public Health Engineering Department Laboratory, Pali as per their report dated 24th May, 2021, the average pH of water was between 7.0 to 8.6; Total alkalinity (as CaCO₃) was in range of 160 mg/L to 520 mg/L, Total Dissolved Solids (TDS) were found to in range of 910 mg/L to 25450 mg/L. In meantime, under supervision of district administration, water bodies of this area were filled with fresh water through tankers.

Again on 22nd May 2021, post-mortem was conducted by a board of three Veterinarians, but opinion of board on cause of death was inconclusive. The very same day, with the post-mortem report, viscera samples of peafowls were sent to Center for Wildlife Conservation, Management and Disease Surveillance, Indian Veterinary Research Institute (IVRI), Izzatnagar, Bareilly for identification of cause of deaths (Table 3 and Fig. 1).

Further deaths of these birds created a public outcry from local population as well as animal rights activists.

Continuous electronic and print media coverage highlighting the issue further, complicated and worsened the matter thus placing intense pressure on the district administration and wildlife wing of Rajasthan Forest Department to get the issue resolved. After a month, the matter remained unresolved and author was asked to make a visit to the concerned area and to suggest the cause of death and treatment to be followed. There was hence a huge responsibility to ascertain the cause of mortality in peafowls, when the only laboratory report available was from National Institute of High Security Animal Diseases (NIHSAD), Bhopal, in which samples had been found to be negative for HPAI or Avian Influenza. Reports from the Regional Forensic Science Laboratory, Jodhpur and Wildlife Conservation, Management and Disease Surveillance, Indian Veterinary Research Institute (IVRI), Izzatnagar, Bareilly were still awaited.

Based on my clinical acumen, I personally bought 1000 doses of Live Lentogenic Vaccine (Lasota strain) of Ventri Biologicals and reached the main epicenter of the outbreak on 24th May, 2021. A visit to Wildlife Rescue Center, Rohat and physical examination of several rescued sick peafowls was followed by conducting a post-mortem of two carcasses of peafowls. The very same day Machia Biological Park and Wildlife Rescue Center, Jodhpur was also visited and another post-mortem of one peafowl was also conducted there (Fig. 1). Based on symptoms and post-mortem lesions, tentative diagnosis of Newcastle disease (Ranikhet) was made. An immediate mass vaccination drive of all susceptible peafowls was initiated starting from epicenter of endemic area with Live Lentogenic Vaccine (Lasota strain)

Newcastle disease (Ranikhet) affects the respiratory, digestive, or nervous systems and hence produces clinical signs related to them. Respiratory signs included gasping, coughing, sneezing and rales. These symptoms were very prominent in affected peacocks, especially respiratory distress with drooling of saliva. Nervous signs are tremors, torticollis, ataxia, paralysis of wings and legs, twisted necks and circling movements were clearly visible in affected peafowls. Peafowls sitting on the branches of trees which had come in contact of this virus developed paralysis of wings and legs, as a result their grip loosened and fell down from their perch on tree. As

Table 2: Mortality pattern of Peafowls in Rohat, Pali district

S.No.	Date	No. of death	Injured peafowls
1.	24-4-2021	2	-
2.	25-4-2021	4	-
3.	26-4-2021	3	-
4.	28-4-2021	2	-
5.	1-5-2021	1	3
6.	2-5-2021	-	5
7.	3-5-2021	-	6
8.	4-5-2021	1	-
9.	5-5-2021	3	6
10.	6-5-2021	1	7
11.	7-5-2021	1	8
12.	8-5-2021	2	-
13.	9-5-2021	1	6
14.	10-5-2021	2	5
15.	11-5-2021	3	10
16.	12-5-2021	-	5
17.	13-5-2021	-	3
18.	14-5-2021	2	1
19.	15-5-2021	-	3
20.	16-5-2021	2	1
21.	17-5-2021	-	3
22.	18-5-2021	-	5
23.	19-5-2021	-	3
24.	20-5-2021	1	2
25.	21-5-2021	3	3
26.	22-5-2021	-	2
27.	23-5-2021	-	7
28.	24-5-2021	2	5
29.	25-5-2021	-	3
30.	26-5-2021	1	4
31.	27-5-2021	1	1
32.	28-5-2021	-	5
33.	29-5-2021	1	5
34.	30-5-2021	-	6
35.	31-5-2021	-	3
36.	1-6-2021	-	6
37.	2-6-2021	-	3
38.	3-6-2021	-	6
39.	4-6-2021	1	3

S.No.	Date	No. of death	Injured peafowls
40.	5-6-2021	2	-
41.	6-6-2021	-	4
42.	7-6-2021	-	-
43.	8-6-2021	1	2
44.	9-6-2021	1	-
45.	10-6-2021	-	3
46.	11-6-2021	1	1
47.	12-6-2021	1	3
48.	13-6-2021	-	2
49.	14-6-2021	-	3
50.	15-6-2021	1	3

they fell from trees they were attacked by wild dogs and were hence found dead or injured. Digestive signs include watery greenish diarrhoea. The infected peafowls also showed clear green coloured diarrhoea. Other signs like depression and inappetence were prominently seen.

Mortality is variable but can be as high as 100 percent in virulent ND Virus infections. Post-mortem lesions include pinpoint hemorrhages on tips of proventricular glands, hemorrhagic caecal tonsils, hemorrhagic ulcers on mucosal lining of intestines, congestion in trachea and lungs, air sacculitis and marked congestion of pectoral muscles. These lesions were not displayed prominently in presently affected population but were suggestive of such infection.

Differential Diagnosis

In field conditions, clinical signs and post-mortem lesions of ND give significant clues for a tentative diagnosis. However, a number of diseases may show similar clinical symptoms. Respiratory differentials are highly pathogenic avian influenza (HPAI), Infectious bronchitis, Infectious laryngotracheitis (ILT) and Fowl pox (diphtheritic form). Avian Influenza (HPAI) was already declared negative by NIHSAD, Bhopal. In this case of peafowls, nervous signs were prominent, which often leads to confusing them with signs of Avian encephalomyelitis (AE), Marek's disease, Fowl cholera, Botulism and poisoning (heavy metals).

Earlier poisoning was suspected and symptomatic treatment for poisoning was given to affected peafowls. Poisoning is an important cause of mortality in wild birds. Birds are sensitive to heavy metals like lead, zinc, cadmium, copper, mercury and iron in the environment. Accidental poisoning

Newcastle disease in peafowls

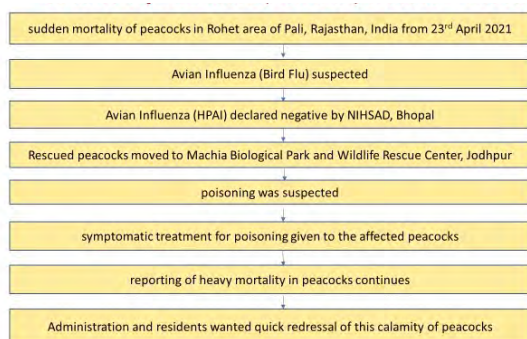


Fig. 1: Newcastle (Ranikhet) disease outbreak

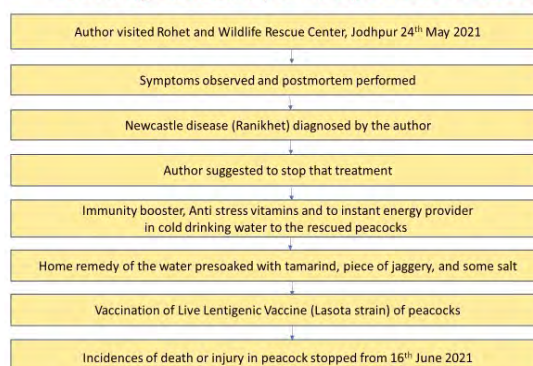


Fig. 2: Control of Newcastle (Ranikhet) disease

may occur *via* contaminated water and food like mono-crotophos treated grains (Pain *et al.*, 2004). In case of pesticide toxicity, birds show convulsions, paralysis, tremors, blindness and other neurological signs. Such cases of poisoning leading to mortality in birds are confined to particular areas. In this case, mortality in peafowls was spreading from one village to another, leading to suspicion of some viral disease. Clinical signs and post-mortem lesions were quite definitive for arriving at a tentative diagnosis of ND.

Vaccination

Vaccination is the only option to control ND outbreak in wild birds. A number of lentogenic ND virus strains such as B₁, F, Lasota, V₄, and I₂ are used as live vaccines but Lasota is most widely used to control this disease as it has superior immunogenicity in comparison to other strains as it induces strong mucosal immunity in respiratory tract. A single dose of live ND vaccine is able to provide 100 percent protection against ND virus. Mass vaccination of live Lasota vaccines in wild birds via drinking water is very suitable for the control of ND. The vaccine virus from vaccinated birds may spread to unvaccinated birds in the area, so overall herd immunity can also be achieved.

Keeping this in mind, a systematic vaccination program was initiated. Vaccination of Live Lentogenic Vaccine (Lasota strain), mixed in cold drinking water, was started the same day *i.e.* 24th May, 2021 as the author had brought with him 1000 doses of vaccine. Next day more vaccines were brought and vaccination was done on 25th-26th May, 2021 and 1st June, 2021. Exercise of vaccination programme was implemented with public support.

- a - Brand of Cargill Animal Health, Bengaluru
b - Brand of Virbac Animal Health, Mumbai

Vaccine was prepared and diluted in cold drinking water and prepared doses were distributed at an estimate of 25 birds per water bowl. Prepared vaccine was distributed to villagers, members of NGOs and employees of forest department which was poured into the designated water spots in bowls with 25 doses each, in the evening and early morning. Wildlife loving community of Bishnois and residents of villages provide grains and fresh water in pots as a daily routine and peafowls and other wild birds come to these fixed places for feed and water, habitually. So, the peafowls consumed this vaccine mixed with water. Same vaccine was also given to rescued peafowls admitted to Machia Biological Park and Wildlife Rescue Center, Jodhpur. Meanwhile the ND virus spread to the neighbouring Bhatinda village and nearby areas of Jodhpur district. In this village, 4000 doses of vaccination were immediately sent to this area and vaccinations were carried out as defined above, by the Forest Department of Jodhpur district.

As a booster dose, by carrying out a repeat mass vaccination drive was done in those particular villages on 13th June, 2021. From 16th June, 2021, no suspected case of ND or mortality or injury in peafowls was reported. Mission was thus successful (Tables 4, 5 and Fig. 2).

Treatment

Before 24th May, 2021 symptomatic treatment for poisoning was given to affected peafowls including Inj. Ringers Lactated Solution, Inj. Dexamethasone, Inj. B₁, B₆ and B₁₂ and Inj. Atropine sulphate, etc. These treatment regimens were suggested to be stopped immediately. Immunity booster (Liquid E Care Se^a 10 ml per 100 birds), anti-stress vitamins (Liquid Vimeral^b 20 ml. per 100 birds) and to provide instant energy (Anabolite^b 20 ml. per

Table 2: Mortality pattern of Peafowls in Rohat, Pali district

S.No.	Date	Birds rescued	Birds dead	Birds survived
1.	2-5-2021	3	2	1
2.	3-5-2021	6	4	2
3.	5-5-2021	6	4	2
4.	6-5-2021	6	3	3
5.	8-5-2021	6	2	4
6.	9-5-2021	5	2	4
7.	10-5-2021	4	1	5
8.	11-5-2021	5	2	3
9.	12-5-2021	4	-	4
10.	13-5-2021	2	-	2
11.	14-5-2021	1	1	-
12.	15-5-2021	3	-	3
13.	17-5-2021	12	3	9
14.	18-5-2021	5	1	4
15.	20-5-2021	4	2	2
16.	21-5-2021	2	2	-
17.	22-5-2021	2	-	2
18.	23-5-2021	4	1	3
19.	24-5-2021	7	3	4
20.	25-5-2021	3	1	2
21.	26-5-2021	9	1	8
22.	28-5-2021	5	1	4
23.	29-5-2021	7	4	3
24.	30-5-2021	6	3	3
25.	31-5-2021	4	2	2
26.	1-6-2021	5	2	3
27.	3-6-2021	9	2	7
28.	4-6-2021	4	1	3
29.	6-6-2021	4	1	3
30.	8-6-2021	2	1	1
31.	10-6-2021	3	-	3
32.	11-6-2021	2	1	1
33.	12-6-2021	4	1	3
34.	13-6-2021	2	-	2

100 birds) was prescribed, which was to be given in cold drinking water or with the help of a dropper. In this center, the above suggested treatment was followed from 25th May, 2021 onwards and survival of rescued peafowls improved dramatically (Table 6 and Fig. 3).

Similar treatment was prescribed at the Wildlife Rescue Center, Rohat. As a first aid measure, the rescued peafowls were given the same treatment in the field and then sent to Machia Biological Park and Wildlife Rescue Center, Jodhpur. Immunity booster liquid was distributed to Villagers and they were advised to mix it in water pots (Fig. 4).

Home remedy of the water pre-soaked with tamarind, piece of jaggery and some salt, was also advised to the villagers. Polyphenols present in Tamarind have anti-inflammatory properties. It is rich in Vitamin B₁ (Thiamine), B₂ (Riboflavin), folic acid, Vitamin-C and good source of minerals such as selenium, zinc, potassium, magnesium, calcium, iron and copper. It helps in boosting immunity and strengthening of nervous system. Jaggery is good source of energy that lasts for longer time as it contains sucrose, glucose and fructose. It has antioxidants and minerals like selenium and zinc, which can boost immunity too. These three ingredients are easily available in household kitchen and act as electrolytes to prevent dehydration and could boost the immunity of peafowls. Incidences of death or injury in peafowls started to come down and from 16th June 2021 onwards, no case of dead or sick peaf-owl was reported.

Regional Forensic Science Laboratory, Jodhpur sent the report dated 2nd June, 2021 and concluded that viscera samples gave negative tests for metallic poison, cyanide, alkaloids, barbiturates, tranquilizers and pesticides.

Center for Wildlife Conservation, Management and Disease Surveillance, Indian Veterinary Research Institute (IVRI), Izatnagar, Bareilly stated in their report dispatched on 7th June, 2021, that sent samples were positive for ND virus on virological investigation. Toxicological examination report from same laboratory reported that sent samples were found negative for heavy metals and commonly used insecticides.

Results and Discussion

In Machia Biological Park and Wildlife Rescue Center, Jodhpur, survival of rescued peafowls improved, after giving suggested treatment. Home remedies also improved the survival of peafowls in the wild. A systematic vaccination program was effective to control this ND outbreak in peafowls.

Table 4: ND Vaccination of Peafowls in Pali and Jodhpur district

S. No.	Vaccination date	No of Vaccination	Villages
1	24-5-2021	1000	Sanwalta Khurd, Bhaton ki dhani of Pali district
2	25-5-2021	1000	Bhakariwala, Vishnoi dhani, Dewasiyaon ki dhani of Pali district
3	26-5-2021	1000	Sanwalta Khurd, Bhaton ki dhani, Kalali, Sanwalta Kala, Vishnoi dhani of Pali district
4	26-5-2021	1000	Rescue Center and Village Bhatinda and nearby area of Jodhpur district
5	29-5-2021 to 6-6-2021	3000	Bhatinda and nearby villages Pabupura Bhatan, Modi Poshia and Modi Sothala of Jodhpur district
6	1-6-2021	3000	Dalpat Garh, Sanwalta Kala, Vishnoi dhani, Bhaton ki dhani, Sanwalta Khurd of Pali district
7	13-6-2021	5000	Sanwalta Kala, Vishnoi dhani, Pipaliya Kala, Sanwalta Khurd, Dalpat Garh, Mukanpura of Pali district
Total Vaccination		15000	

Table-5: Effect of Vaccination on mortality of peafowls

Village	Pre-Vaccination	During Vaccination	Post Vaccination
At Rohet	61	15	0
At Machia	33	22	1
Total	94	37	1

Incidences of death or injury in peafowls started to come down and from 16th June, 2021 onwards, no case of a dead or sick peafowl has been reported (Fig. 5).

Conclusion

On the basis of symptoms and post-mortem lesions, an outbreak of Newcastle Disease (Ranikhet) was diagnosed. Suggested treatment, like providing immunity booster, anti-stress vitamins and energy providing solution in cold drinking water to rescued peafowls, worked very well and survival of peafowls improved. Home remedy of water suggested to villagers also increased survival of peafowls. Mass vaccination of peafowls in affected area with Live Lentogenic Vaccine (Lasota strain) was very effective to control ND outbreak in

Table-6: Effect of Treatment on mortality of peafowls

	Pre-Vaccination	During Vaccination	Post-Vaccination
Rescued birds	87	69	0
Mortality of birds	33	22	0
Survival of the birds	57	48	0

peafowls. Rescue, treatment and vaccination of peafowls would not have been implemented successfully without proactive support of the public and NGOs at large. In field conditions, symptoms post-mortem lesions and differential diagnosis are very important for diagnosis of ND Virus in wild birds. Suitable control measures like vaccination are necessary to avoid such outbreaks of ND Virus in wild birds.

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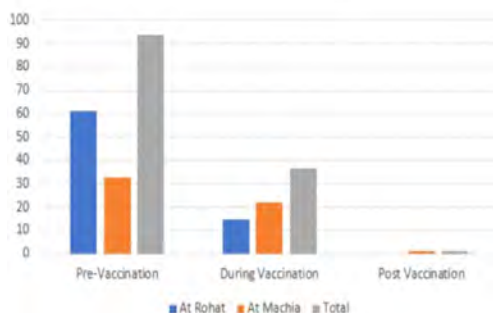


Fig. 3: Effect of vaccination on peafowls mortality

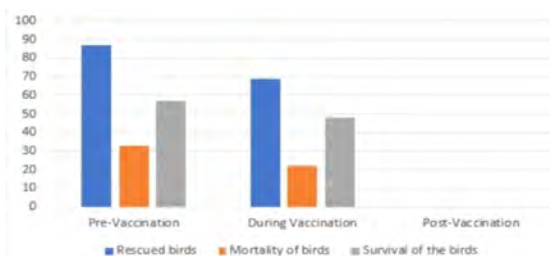


Fig. 5: Effect of treatment on mortality of peafowls

Dr. Vithlesh Vyas, Senior Veterinary Officers, Regional Disease Diagnostic Center, Dr. Indra Prakash Bagauria, Senior Veterinary Officer, District Disease Diagnostic Center, Pali, Dr. Baldev Chaudhary, Veterinary Officer, Veterinary Hospital Sanwalta, District Pali, Dr. Gyan Prakash, Veterinary Officer, Machia Biological Park and Wildlife Rescue Center, Jodhpur, Mr. Jawan Singh Forest Ranger, Pali, Mr. Bhairaram Iram, District President, Bishnoi Tiger Force, Mr. Lalit Paliwal, National Vice President, Kamdhenu Sena and other wildlife loving and dedicated villagers of Rohat Tehsil for their assistance.

References

Goto, H., Shimizu, D. and Shirahata, T. (1968). Occurrence of Newcastle disease in Indian peacocks (*Pavo cristatus*). *Res. Bull. Obihiro Univ.* 5: 720-28.

Khulape, S.A., Gaikwad, S.S., Chellappa, M.M., Mishra, B.P. and Dey, S. (2014). Complete Sequence Genome of a Newcastle Disease Virus Isolated from Wild Peacock (*Pavo cristatus*) in India. *Genome Announc.* 5: e00495-14.

Kumar, A., Maan, S., Mahajan, N.K., Rana, V.P., Jindal, N., Batra, K., Ghosh, A., Mishra, S.K., Kapoor, S. and Maan, N.S. (2013). Detection and molecular characterization of Newcastle disease virus in peafowl (*Pavo cristatus*) in Haryana State. *Indian J Virol.* 24: 380-85.

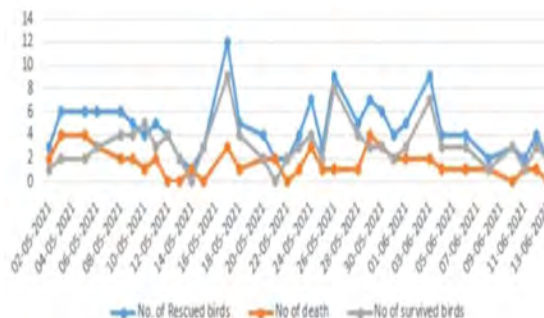


Fig. 4: Survival and mortality/ pattern of peafowls in Machia Wildlife Rescue Center, Jodhpur

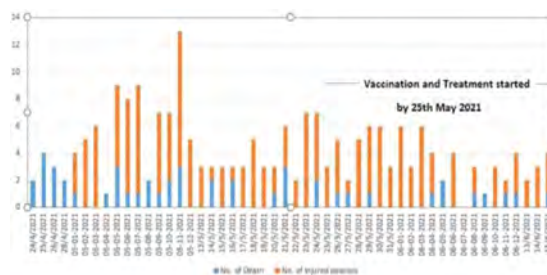


Fig. 6: Pattern of injury and mortality of peacocks

Munir, T., Aslam, A., Zahid, B., Ahmed, I., Imran, M. and Ijaz, M. (2015). Potential of commonly resident wild birds towards newcastle disease virus transmission. *Pak. Vet. J.* 35: 106-07.

Mustafa, I., Ahmed, H., Lodhi, M.A., Khan, A.R.S.S., Haider, W., Bostan, N., Asif, S., Khan, M.R., Qayyum, M. and Ali, S. (2015). Newcastle disease as an emerging disease in peacocks of Tharparker, Pakistan. *J. Infect. Dev. Countries* 9: 914-16.

Pain, D.J., Gargi, R., Cunningham, A.A., Jones, A. and Prakash, V. (2004). Mortality of globally threatened Sarus cranes *Grus antigoni* from monocrotophos poisoning in India. *Sci Total Environ* 326: 55-61.

Perumal Arumugam Desingu, Shambhu, Dayal Singh., Dhama, Kuldeep, Obli Rajendran Vinodhkumar, Barathidasan, Rajamani, Malik, Yashpal Singh Singh, Rajendra and Singh, Raj Kumar (2016). Molecular characterization, isolation, pathology and pathotyping of peafowl (*Pavo cristatus*) origin Newcastle disease virus isolates recovered from disease outbreaks in three states of India. *Avian Pathol.* 45: 674-82.

Rahman, A.U., Habib, M. and Shabbir, M.Z. (2018). Adaptation of Newcastle Disease Virus (NDV) in Feral Birds and their Potential Role in Interspecies Transmission. *Open Virol J.* 31: 52-68.

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