



## Effects of Newcastle Disease Virus on Different Haematological Parameters in Broilers

MEHWISH MALIK<sup>1\*</sup>, MUHAMMAD SOHAIL<sup>1</sup>, MUHAMMAD SAJID<sup>1</sup>, HAMIDULLAH<sup>1</sup>, MUHAMMAD SHOAB<sup>1</sup>, NASEEM BANO<sup>1</sup>, SAID SAJJAD ALI SHAH<sup>2</sup>

<sup>1</sup>Veterinary Research & Disease Investigation Center, Abbottabad; <sup>2</sup>Center of Parasitology and Poultry, Veterinary Research Institute Peshawar, Pakistan.

**Abstract** | Newcastle disease (ND) is a severe life threatening viral infection of poultry birds in Pakistan. Current study was performed to evaluate effects of Newcastle disease virus on haematological changes in broiler chicken. Eighty (80) blood samples were collected from twenty (20) different farms of District Abbottabad clinically suspected for Newcastle disease infection & eighty (80) samples were collected from the healthy (ND free Broiler Flock) raised at Veterinary Research and Disease Investigation Centre, Abbottabad. The data revealed that there is a sharp decline in values for total erythrocyte count, haemoglobin concentration, HCT, MCH & MCV for ND affected birds viz; (1.63±0.07, 8.7±0.26 & 21.79<sup>b</sup>±1.05, 53.3<sup>a</sup>±7.3 & 1.33.68<sup>a</sup>±29 respectively) was significant (*p*-value<0.05) as compared to healthy broiler birds viz; (2.66<sup>a</sup>±0.08, 10.1<sup>a</sup>±0.31 & 28<sup>a</sup>±0.51, 37.9<sup>b</sup>±1.6 & 105.2<sup>b</sup>±2.1 respectively). Values for MCHC (36.1<sup>a</sup>±1.4 of healthy & 39.9<sup>a</sup>±29 for ND affected broiler birds) were not significant. Whereas for leukogram of group A, TLC, Heterophils/lymphocytes, monocytes & eosinophils for ND infected birds viz; (20<sup>a</sup>±1.2, 18<sup>b</sup>±0.04, 74<sup>a</sup>±0.14, 5<sup>b</sup>±0.16 & 2.8<sup>b</sup>±0.04 was significant as compared to healthy broilers viz; (17.2<sup>b</sup>±0.9, 26<sup>a</sup>±0.03, 63<sup>b</sup>±0.15, 7<sup>a</sup>±0.14 & 3<sup>a</sup>±0.03 respectively). Basophils of ND infected & healthy broilers viz; 0.2<sup>a</sup>±0.02 & 0.1<sup>b</sup>±0.02 respectively were not found significant as *p*>0.05. It was also observed that ND virus has significantly affected haematology parameters in broiler birds.

**Keywords** | Broiler, Newcastle disease, Total erythrocyte count, Total leukocyte count.

**Editor** | Kuldeep Dhama, Indian Veterinary Research Institute, Uttar Pradesh, India.

**Received** | January 30, 2018; **Accepted** | April 13, 2018; **Published** | April 24, 2018

\***Correspondence** | Mehwish Malik, Veterinary Research & Disease Investigation Center, Abbottabad, Pakistan; **Email:** dr.mehwish2015@gmail.com

**Citation** | Malik M, Sohail M, Sajid M, Hamidullah, Shoaib M, Bano N, Shah SSA (2018). Effects of newcastle disease virus on different haematological parameters in broilers. *Adv. Anim. Vet. Sci.* 6(4): 183-186.

**DOI** | <http://dx.doi.org/10.17582/journal.aavs/2018/6.4.183.186>

**ISSN (Online)** | 2307-8316; **ISSN (Print)** | 2309-3331

**Copyright** © 2018 Malik et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

## INTRODUCTION

In the last few decades, poultry industry of Pakistan has shown extra ordinary growth and instilling a lot to the economy of the country. However, this increasing growth of poultry is threatened by various factors most importantly deadly viral and bacterial diseases which effect negatively on its economic impact (Tripathy, 2004, Harrison et al., 2011). Newcastle disease is one of those infectious and contagious diseases which are badly affecting our broiler flocks. The very first outbreaks of Newcastle disease (ND) of poultry were noticed in 1926 in Java, Indonesia (Kraneveld, 1926). Afterwards this disease progressed into many countries of the world including Asian countries. In

Pakistan many outbreaks of ND were reported in different geographic areas in different time period of the year. Broilers of all ages are susceptible to this infection & severity of infection was seen in unvaccinated broilers, mixed infection, bad managemental conditions and unhealthy feeding system. Measurement of different parameters of blood provided valuable information about the health status of both human and animals (Talebi et al., 2005). Esonu et al. (2001) had assured that haematological constituents reveal the physiological sensitivity of the animal to its inside and external environment. There is insufficient of information related to the effect of ND on the total erythrocyte count and haemoglobin concentration in Pakistan. This study was designed to study the effect of ND on Haemogram of

broiler birds and to compare the haematological values of healthy broilers with the ND affected broiler birds.

detailed values for haematological parameters of ND infected and normal broiler birds are presented in Table 1.

## MATERIAL AND METHODS

### STUDY AREA

The study was carried out at Veterinary Research and Disease Investigation Center Abbottabad. Twenty (20) broiler flocks clinically affected with ND reared in different areas of the District were selected for sampling. Torecord normal hematologic values,a broiler flock of eighty (80) birds was reared at research centre.

### SAMPLE COLLECTION

1.5 ml of blood from each broiler bird (infected & healthy) was collected in sterile, labelled anticoagulant (EDTA) added vacutainers. These tubes were place in ice box and shifted to haematology laboratory of Veterinary Research and Disease Investigation Centre, Abbottabad for hematology studies. Blood Samples were divided into two groups i.e., Group A for normal broilers and Group B for ND infected broilers.

### PROCESSING OF SAMPLES

Anticoagulant added whole blood was processed through automatic heamtology analyzer (URIT-2900) for estimation of hematological profile including; total erythrocyte count (TEC), haemoglobin concentration (Hb), hematocrit values (HCT), total leukocyte count (TLC) and differential leukocyte count (DLC). Erythrocytic indices including; mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) was also estimated (Shah et al., 2017). Total leukocyte count (TLC) and differential leukocyte count (DLC) were estimated manually through standard procedure (Fudge and Alan, 2000). MCHC was calculated as according to the method as described by Jain (1993). HCT was calculated automatically by using automatic heamtology analyzer (URIT-2900).

### STATISTICAL ANALYSIS

The data thus obtained was compiled in Microsoft excel sheet and analysed through statistical analytical software (Statistics version 8.1). General analyses of variance test was used for haematological differences and means were compared by LSD at  $p < 0.05$  level of significance (Shah et al., 2017).

## RESULTS AND DISCUSSION

A total of eighty (160) blood samples were analysed. Eighty samples collected from normal birds and Eighty from birds infected with ND. The samples were processed for Hb, TEC, MCH, MCHC, MCV, TLC and DLC values. The

**Table 1:** Haematological parameters of healthy and ND affected broiler birds

Parameter	Normal (Group A)	Infected (Group B)	P-value
TEC ( $\times 10^6/\mu\text{l}$ )	2.66 <sup>a</sup> $\pm 0.08$	1.63 <sup>b</sup> $\pm 0.07$	0.00*
Hb (g/dl)	10.1 <sup>a</sup> $\pm 0.31$	8.7 <sup>b</sup> $\pm 0.26$	0.02*
HCT (%)	28 <sup>a</sup> $\pm 0.51$	21.79 <sup>b</sup> $\pm 1.05$	0.00*
MCH (pg)	37.9 <sup>b</sup> $\pm 1.6$	53.3 <sup>a</sup> $\pm 7.3$	0.02*
MCV (fl)	105.2 <sup>b</sup> $\pm 2.1$	133.68 <sup>a</sup> $\pm 29$	0.04*
MCHC (g/dl)	36.1 <sup>b</sup> $\pm 1.4$	39.9 <sup>a</sup> $\pm 4.2$	0.06
TLC ( $\times 10^3/\mu\text{l}$ )	17.2 <sup>b</sup> $\pm 0.9$	20 <sup>a</sup> $\pm 1.2$	0.03*
Heterophil (%)	26 <sup>a</sup> $\pm 0.03$	18 <sup>b</sup> $\pm 0.04$	0.00*
Lymphocytes (%)	63 <sup>b</sup> $\pm 0.15$	74 <sup>a</sup> $\pm 0.14$	0.00*
Monocytes (%)	7 <sup>a</sup> $\pm 0.14$	5 <sup>b</sup> $\pm 0.16$	0.04*
Eosinophils (%)	3 <sup>a</sup> $\pm 0.03$	2.8 <sup>b</sup> $\pm 0.04$	0.01*
Basophils (%)	0.1 <sup>b</sup> $\pm 0.02$	0.2 <sup>a</sup> $\pm 0.02$	0.13

a, b means with different superscript with in row are significant at P-value <0.05; TEC: Total erythrocytes count; Hb: Hemoglobin; HCT: Hematocrit; MCV: Mean corpuscular volume; MCH: Mean corpuscular hemoglobin; MCHC: Mean corpuscular hemoglobin concentration; TLC: Total leukocytic count

As presented in the above table it is revealed that total erythrocyte count (TEC) of the normal health chicken were greater than that of ND affected Birds. This change was found significant ( $p\text{-value} < 0.05$ ). The results of this study are parallel to the study of Ripon et al. (2013) which also revealed the same results for normal birds while that of ND affected birds is comparable to studies of Chekwube et al. (2014). Moreover, it was also observed that TEC was lowered in ND affected flocks of broiler birds.

Haemoglobin concentration (Hb) of normal broiler birds was noticed as 10.1<sup>a</sup> $\pm 0.31$ (g/dl) while that of ND affected birds was 8.7<sup>b</sup> $\pm 0.26$  (g/dl). This decrease in Hb concentration in ND affected birds was significant ( $p\text{-value} < 0.05$ ). Results obtained in this study are supporting the findings of Adeyemo and Sani (2013), which also obtained the same results.

HCT (%) of healthy broiler chicken was found greater than ND affected broilers and was found significant ( $p\text{-value} < 0.05$ ). The findings of current study for HCT are supporting the findings of Adeyemo and Sani (2013). HCT% of infected broilers was very much lowered. The severe anaemia (decrease in Hb & TEC) observed in ND affected chickens may likely be due to possible loss of blood from gastrointestinal tract ulcers, haemorrhages in proventriculus and also due to intravascular hemolysis (Chekwube et al., 2014; Calderon et al., 2005).

MCV (fl) values of normal broiler flock were found which is lower than ND affected flocks i.e.  $133.68 \pm 29$ . This increase in MCV values is significant ( $p$ -value < 0.05) which is supported by the studies of Chekwube et al. (2014). MCH (fl) values for normal birds was significantly lower than the ND infected broilers ( $p$ -value < 0.05).

MCHC (g/dl) of normal experiment flock was found significantly lower than that of ND affected flock. Hb (g/dl) and MCHC(g/dl) of normal experiment flock was found this is refer to Sebastian et al. (2012) and MCH(pg) of normal Group A was found  $55.39 \pm 1.6$  this shows similarities to Talebi et al. (2005). Normal values of broilers were also correlated to Zinki (1986). The results of MCHC in present study are also correlated to (Kral, 2000; MS Islam et al., 2004) which also revealed same results.

TLC and Lymphocytes values were found significantly higher than the normal healthy chickens, heterophils were decreased significantly in infected broilers. This is correlated to studies of Calderon et al. (2005). Monocytopenia is the decrease in monocytes then the normal and was observed in present study. This might be due to acute infection of ND in broilers. Monocytes play role in all the viral and bacterial infections (Harrison et al., 2011). Basophils values were no significance difference ( $p > 0.05$ ).

All the values of TLC, TEC, MCH, MCV, MCHC, Hb, HCT and DLC of group A values were compared with values as discussed by Brar et al. (2014). These all values were found in required range.

Present study showed that haematological values of broiler chicken was significantly ( $p < 0.05$ ) influenced by Newcastle disease virus, and results of this study are also correlated to Galindo et al. (2001).

## CONCLUSION

The present study revealed that TEC, Hb and HCT was lowered while TLC, Lymphocytes MCH, MCV, and MCHC was increased significantly in Newcastle disease affected broiler birds. So it is concluded that ND affects the Haemogram and leucogram significantly when compared to healthy broiler birds.

## ACKNOWLEDGEMENTS

I am very thankful to all authors for their nice contribution in this research trial from data collection to finalization of the manuscript.

## CONFLICT OF INTEREST

There is no conflict of interest.

## AUTHOR'S CONTRIBUTION

MM conceived the idea of the manuscript. Muhammad Sajid supervised the sample collection process. MM processed the samples. SSAS analyzed the data and Muhammad Sohail wrote the manuscript. All authors reviewed the draft of the manuscript.

## REFERENCES

- Adeyemo IA, Sani A (2013). Haematological Parameters and Serum Biochemical Indices Of Broiler Chickens Fed *Aspergillus Niger* Hydrolyzed Cassava Peel Meal Based Diet. IJRRAS. 15 (3).
- Brar RS, Sandhu HS, Singh A (2000). Avian clinical Pathology, Veterinary Clinical Diagnosis by Laboratory Methods, Kalyani Publishers, India, 1st edition:(146-150).
- Calderon NL, Galindo Muniz F, Ortiz M, Lomniezi B, Fehervari T, Paaseh LH (2005). Thrombocytopenia in Newcastle Disease: haematological Evaluation and histological study of bone Marrow, *Acta veterinaria hungarica*. 53(507-513), [http://dx.doi.org/10.1556/A\\_Vet.53.2005.4.11](http://dx.doi.org/10.1556/A_Vet.53.2005.4.11)
- Chekwube PE, John Osita AO, Innocent OO, Wilfred SE, Didacus CE, Emmanuel CO, Christan OK, Kalu II (2014). Comparative Evaluation of the Effects of Velogenic Newcastle Disease Virus Infection on the hematology of Ducks and Chicken. Open J. Vet. Med. 4(113-121). <https://doi.org/10.4236/ojvm.2014.46013>
- Esonu BO, FC Iheukwumere, OO Emenalom, MC Uchegbu, EB Etuk (2002). Performance, nutrient utilization and organ characteristics of broilers fed *Microdesmis puberula* leaf meal. Livestock Prod. Rural Develop. 14: 6.
- Fudge Alan M (2000). Laboratory Medicine Avian and Exotic Pets. Philadelphia, W.B. Saunders, 9-15.
- Galindo Muniz F, NL Caldero, MN Charles, IG Telez, TI Fortoul (2001). Haematological and histological findings in experimental Newcastle disease. *Acta Vet. Brno*. 70:185-189 <https://doi.org/10.2754/avb200170020185>.
- Harrison L, Brown C, Afonso C, Zhang J, Susta L (2011). Early Occurrence of Apoptosis in Lymphoid Tissues from Chickens Infected with Strains of Newcastle Disease Virus of Varying Virulence. *J. Comparat. Pathol*. 145, 327-335. <http://dx.doi.org/10.1016/j.jcpa.2011.03.005>.
- Jain NC (1993). Essentials of Veterinary Haematology. Lea and Febringers, Philadelphia, 365-372.
- Kral P Suchy (2000). Haematological studies in adolescent breeding cocks. *Acta. Vet. Brno*. 69: 189-194. <https://doi.org/10.2754/avb200069030189>
- Kraneveld FC (1926). A poultry disease in Dutch East Indies. *Nederlands- Indische Bladen voor Diergeneeskunde*. 38:448-450.
- MS Islam, NS Lucky, MR Islam, A Ahad, BR Das, MM Rahman, MSI Siddiui (2004). Haematological parameters of Fayoumi, Assil and local chickens reared in Sylhet region in Bangladesh. *Int. J. Poult. Sci*. 3 (2):144-147. <https://doi.org/10.3923/ijps.2004.144.147>
- Ripon Kumar Dutta, M Saiful Islam, Md Ashraful Kabir (2013). Haematological And Biochemical Profiles Of *Gallus* Indigenou, Exotic And Hybrid Chicken Breeds(*Gallus*

- Domesticus* L.) From Rajshahi, Bangladesh. Bangladesh J. Zool. 41(2): 135-144.
- Sebastian Trinca, Cristina Cernea, Alexandra Arion, Laurențiu Ognean (2012). The Relevance Of Mean Blood Samples In Hematological Investigations Of Broiler Chickens. Bulletin UASMV. Vet. Med. 69(1-2).
  - Shah SSA, U Sadique, Z U Hassan, S Ahmad, H Khan, M K Shah, M Israr, HU Rahman. (2017). Clinico-pathological profile and frequency of *Mycoplasma mycoides* subsp. capri infection in goats in northern zone of Khyber-Pakhtunkhwa, Pakistan. Vet. 66(2):72-77. <https://doi.org/10.14737/journal.aavs/2017/5.3.115.119>
  - Shah SSA, Khan MI, Rafiullah, Khan MA, Khan H, Ali A, Ali MI, Jan R (2017). Tick-borne diseases-possible threat to humans-dog interspecies bond. Adv. Anim. Vet. Sci. 5(3): 115-120.
  - Talebi S, Asri Rezaei R, Rozeh Chai, R Sahraei (2005). Comparative Studies on Haematological Values of Broiler Strains (Ross, Cobb, Arbor-acres and Arian). Int.J. Poult. Sci. 4 (8): 573-579. <https://doi.org/10.3923/ijps.2005.573.579>
  - Tripathy DN (2004). The impact of vaccine and the future of genetically modified poxvirus vaccines for poultry. Anim. Health Res. Rev. 5:263-266. <https://doi.org/10.1079/AHRR200480>
  - Zinki JG (1986). Avian hematology. In: Jain.N.C.(Ed), Schalm's Veterinary hematology 4<sup>th</sup> Edition. Lea & Febiger, Philadelphia, USA.