RESULT

Hematology:

Avian hematology is of great importance to scientists, veterinarians and also for poultry growers. It can be used as a tool to assess the health status of birds. An exhaustive work has been done on chicken hematology. It provides a model for avian hematology but there is a paucity of literature in quail and very little information is available on quail hematology. Also the results obtained in chickens may not be always extrapolated for other avian species. So the investigation of normal hematological values of quail under local conditions may be considered worthwhile.

- Normal Hematological values:

  Hematological values for Hb, PCV, RBC and WBC in different age groups (one week to twenty-four weeks of age) of healthy quails were determined (Table 1). The results found were -

Hb

1. The normal range of Hb in quails were observed as 8.2 ± 11.33.gm/dl.
2. The young quails belonging age 1 to 4 weeks of age, showed the mean value as 8.22 ± 0.33 gm /dl.
3. In the quails ranging between 5 to 10 weeks of age, the mean
value was found to be $11.15 \pm 0.24$ gm/dl

4. The quails of age group from 11 to 15 weeks, had the mean value as $11.16 \pm 0.24$.gm/dl.

5. The quails of 16-20 weeks age, showed the mean value as $11.33 \pm 0.29$ gm/dl.

6. The older quails of 21-24 weeks of age showed the mean value as $9.23 \pm 0.09$ gm/dl.

(Graph 1).

PCV

1. The normal range of PCV in quails were observed as $28.95 - 34.50\%$.

2. The young quails of age ranging between 1 to 4 weeks, showed the mean value as $28.95 \pm 0.38\%$.

3. The age ranging between 5 to 10 weeks of age, the mean value was found to be $31.7 \pm 1.46\%$.

4. The quails belonging to age group 11 to 15, had the mean value as $34.50 \pm 1.61\%$.

5. The quails of age group 16 to 20 weeks, showed the mean value as $34.20 \pm 0.05\%$.

6. The older quails of 21 to 24 weeks of age, showed the mean value as $30.0 \pm 0.4\%$.

(Graph 2).

RBC

1. The normal range of total erythrocyte count in quails was found to be $3.31 - 4.31$ Million / cu mm.
2. The young quails of age ranging between 1 to 4 weeks, showed the mean value 3.31 ± 0.2 million / cu mm.

3. The age ranging between 5 to 10 weeks, the mean value was found to be 4.20 ± 0.07 million / cu mm.

4. The quails of age from 11 to 15 weeks, had the mean value as 4.31 ± 0.08 million / cu mm.

5. The quails of age group 16 to 20 weeks, showed the mean value as 3.30 ± 0.078 million / cu mm.

6. The older quails of 21 to 24 weeks of age, showed the mean value as 3.33 ± 0.14 million / cu mm.

(Graph 3).

WBC

1. The normal range of total WBC count was found between 18.90 to 25.0 thousand /cu mm.

2. In the quails of age ranging between 1 to 4 weeks the mean value of total WBC count was found to be 18.90 ± 0.36 thousand /cu mm.

3. In the quails of age ranging between 5 to 10 weeks, the mean value of total WBC count was found to be 24.19 ± 0.60 thousand /cu. mm.

4. In the quails of age ranging between 11 to 15 weeks, the mean value of total WBC count was found to be 25.0 ± 1.2 thousand /cu mm.

5. In the quails of age ranging between 16 to 20 weeks, the mean value of total WBC count was found to be 22.97 ± 0.6 thousand /cumm.
6. The total WBC count in the older quails of age ranging from 21 to 24 weeks was found to be $18.95 \pm 0.14$ thousand/cu mm. (Graph 4).

• Conclusion:

Young quails (age ranging from one week to four weeks) and the older quails (age ranging from twenty weeks and more) were having slightly lower hematological values for all parameters as compared to the adult quails (age ranging from five weeks to nineteen weeks).
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<th>Hb Gm/dl</th>
<th>PCV %</th>
<th>RBC Million/Cu mm</th>
<th>WBC Thousand/Cu mm</th>
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<td>Normal range</td>
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<td>3.31 - 4.31</td>
<td>18.9 - 25.0</td>
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<td>Normal Mean value</td>
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<td></td>
<td>1-4</td>
<td>8.22 ± 0.33</td>
<td>28.95 ± 0.38</td>
<td>3.31 ± 0.2</td>
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<td>5-10</td>
<td>11.15 ± 0.24</td>
<td>31.7 ± 0.46</td>
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<td>24.19 ± 0.6</td>
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<tr>
<td></td>
<td>11-15</td>
<td>11.16 ± 0.24</td>
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<td>25.0 ± 1.2</td>
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<td>16-20</td>
<td>11.33 ± 0.29</td>
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<td>4.30 ± 0.078</td>
<td>22.97 ± 0.6</td>
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<td></td>
<td>21-24</td>
<td>9.23 ± 0.09</td>
<td>30 ± 0.4</td>
<td>3.33 ± 0.14</td>
<td>18.95 ± 0.14</td>
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<tr>
<td>3</td>
<td>Effect of high temperature</td>
<td>12.31 ± 0.92</td>
<td>39 ± 0.19</td>
<td>4.67 ± 0.053</td>
<td>27 ± 0.23</td>
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<td>4</td>
<td>Coccidiosis</td>
<td>7.5 ± 0.7</td>
<td>27.3 ± 0.46</td>
<td>3.1 ± 0.092</td>
<td>27.7 ± 0.74</td>
</tr>
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Table No.1: Hematological values
Graph 1: Hemoglobin % in Different Age Groups of Quails

Graph 2: PCV values in Different Age Group of Quails
Total RBC count in different age groups

Graph 3: Total RBC Count in Different Age Groups of Quails

Total WBC count in different age groups

Graph 4: Total WBC Count in Different Age Groups of Quails
• **Effect of high temperature on hematological values:**

In the month of May 2005, when the maximum temperature of the afternoon was more than 45 degree Celsius, suddenly it was noticed that some quails died due to heart stroke. Out of 35 quails 14 died i.e. 40% mortality was observed. Blood from these quails were collected immediately and values were determined. (Table 1).

**Hb**

The mean Hb value in heat stroke affected quail was $12.31 \pm 0.92$ gm/dl.(Graph 5).

**PCV**

The heat stroke affected quails showed the mean value $39.0 \pm 0.19$ % for PCV.(Graph 6).

**RBC**

The mean total erythrocyte count in heat stroke affected quails was found to be $4.67 \pm 0.053$ million cu mm.(Graph 7).

**WBC**

The heat stroke affected quails showed higher values than the normal values reported. Its mean value was found to be $27.0 \pm 0.23$ thousand / cu mm.(Graph 8).
Other observations:

Quails affected with heat stroke showed clinical signs like weakness, respiratory stress unconsciousness and high rectal temperature (1040F). Their post-mortem revealed congested carcass. Muscles were dried with cooked appearance. Lungs were congested and adhered to thoracic walls. Hemorrhage was seen in muscles, lung, intestine and proventriculus Liver and spleen was enlarged.

- Conclusion:
  
The hematological values for all the parameters observed, were higher in quails suffered from heat stroke than normal. Mortality rate was 40%. They showed respiratory stress and congestion and hemorrhage in almost all organs.

- Effected of Coccidiosis on Hematological Values:

Hb

The quails infected with coccidiosis showed mean value for Hb as $7.50 \pm 0.7 \text{gm} / \text{dl}$. (Graph 5).

PCV

The mean value recorded for PCV in quails affected with coccidiosis was $27.30 \pm 0.46\%$. (Graph 6).
RBC

The mean value of total erythrocyte count in quails affected with coccidiosis was recorded 3.1± 0.092 million / cu mm. (Graph 7).

WBC

The quails infected with coccidiosis showed mean value 27.7 ± 0.74 million / cu mm for total WBC count. (Graph 8).

• Conclusion:

Values of Hb, PCV and total RBC count in quails affected with coccidiosis were found to be decreased than the normal. Total WBC count was found to be increased than normal. It was even higher than the values observed in quails affected with heat stroke.
Alteration in Hb percentage in affected quails

Graph 5: Alteration in Hb Percentage in Quails Affected With High Temperature and coccidiosis.

Alteration in PCV in affected quails

Graph 6: Alteration in PCV Values in Quails Affected with High Temperature and Coccidiosis.
Alteration in Total RBC count in affected quails

Graph 7: Alteration in Total RBC Count in Quails Affected with High Temperature and Coccidiosis.

Alteration in Total WBC count in affected quails

Graph 8: Alteration in Total WBC Count in Quails Affected with High Temperature and Coccidiosis.

Observation and Result
Examination of fecal sample:

Fecal samples (excreta as well as ingesta from intestine) of all the 501 quails were examined by sugar floatation and direct smear methods to detect the presence of pathogens and parasites. In total observation (501 quails), 128 fecal samples revealed presence of coccidiosis. Unsporulated oocysts of a protozoan parasite *Eimeria* were observed in these samples. (fig. 3) Coccidiosis is responsible for various levels of morbidity and mortality. The parasite develops inside cells lining the intestine.

- Clinical signs:
  - Affected Quails showed dullness and depression.
  - Bloody diarrhea were also observed in case of heavy infection.
  - Unsporulated oocyst were observed in fecal matter (Fig. 3)

- Pathological changes:

- Gross lesions:
  - Presence of numerous petechiae on the mucosal surface of the intestine was observed.
  - Thickening of caecal wall was observed. Hemorrhage was also seen.
  - Rectum showed mild hemorrhage and cogestion.
• Small intestine showed ballooning and hemorrhagic patches. (Fig. 4, 5, 6).

• **Microscopic changes:**
  
  • Degenerative and necrotic changes in the epithelial layer of the intestine were seen.
  • Infiltration of leukocytes was observed.
  • Schizonts were seen in epithelium.
  • Oocysts were present in the epithelial lining.
  • Loss of intestinal lining was also observed.
  
  (Fig. 7, 8)

• **Hematological changes:**

  As already mentioned in hematological results Hb PCV and total RBC count was decreased and total WBC count was increased slightly.

• **Other observations:**

  • Young quails belonging to the age group one to three weeks were more susceptible to coccidiosis.
  • Older quails were relatively resistance.
  • *Coccidiosis* was more frequent during monsoon season (July to September months).
  • Morbidity was 25.55% (128/501).
  • Mortality was found to be 15.61% (20/128 affected quails).
Histo-pathological alterations in organs:

• Incidence of pathological conditions:

Present study indicated that a quite significant number of quails suffered from various pathological conditions of hemopoitc system especially the lung which is the most frequently affected organ. Over all 501 naturally dead quails were observed for histopathological study. Out of 501 naturally dead quails 343 samples revealed different pathological conditions in various organs. 207 samples (41.31%) revealed different pathological conditions in lungs; 24 samples (4.79 %) showed different pathological alterations in trachea; 82 (16.36%) samples had cardiac lesions and 30 samples (5.98 %) were having affected spleen. The number of samples showing different pathological conditions is shown in related tables (Table 2, Graph 8 and 9).

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<thead>
<tr>
<th>SN</th>
<th>Organs affected</th>
<th>No.</th>
<th>Percentage (%)</th>
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<tbody>
<tr>
<td>1.</td>
<td>Lung</td>
<td>207</td>
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<td>2.</td>
<td>Trachea</td>
<td>24</td>
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<tr>
<td>3.</td>
<td>Heart</td>
<td>82</td>
<td>16.37</td>
</tr>
<tr>
<td>4.</td>
<td>Spleen</td>
<td>30</td>
<td>5.98</td>
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</tbody>
</table>

Table 2: Pathological Conditions in Concerned Organs
Number: Pathological conditions in organs

Graph 9: Number of Pathological Conditions in Concerned Organs

Percentage: Pathological conditions

Graph 10: Percentage of Pathological Conditions in Concerned Organs
Lungs

Normal structure:

Gross:

In birds lungs are small, pink colored only slightly distensible organ. They are present in the pleural cavity closely against the ribs and are without peritoneal covering. The lungs are aided by an extensive system of air sacs helping in ventilation.

(Fig. 9)

Microscopic:

Microscopically, structure of normal lung shows sections of primary, secondary and tertiary bronchi, respiratory bronchioles and the alveoli (Fig. 10). The bronchi are lined with pseudo-stratified columnar epithelial cells and lined by simple columnar epithelium. Alveolar sacs are lined with squamous epithelium. Alveoli are closely set thin walled out-pocketing. Between adjacent alveoli intra-alveolar septa containing blood capillaries are present. These blood capillaries are very fine.

(Fig. 10).

Pathological changes in lungs:

Following pathological conditions were observed in lungs.

(Table 3, Graph 11 and 12)

1. Suppurative pneumonia:

Out of 207 samples showing lung infection, 70 samples (33.8%) showed suppurative pneumonia.

Gross lesions:

• Lungs were congested.
Tiny abscess formations were seen
- Softening and liquefaction of tissue was observed
  (fig 11)

**Microscopic Changes:**
- Congestion of blood vessels was seen
- There were increased serous exudates in lung.
- The exudates consisted of liquefied tissue, leukocytes and a few RBC.
- Extensive Leukocytes infiltration was observed.
- Scattering of alveoli was evident.
- Blood vessels become amyloid in few cases.
  (fig 12).

2. Interstitial pneumonia :-

Out of 207 infected lung samples, 40 (19.13%) sample showed interstitial pneumonia.

**Gross Lesions:**
- Grossly lungs showed petechial hemorrhage.
- Lungs were congested and adhered with ribs.
- They sinked in water.

**Microscopic Changes:**
- Alveolar septa became thickened.
- In section, infiltration of few leukocytes and erythrocytes were observed.
- Alveolar epithelium was compressed and loss of epithelial
cells was observed.

- Vacuolated serous exudates were seen.

(Fig. 13)

3. Fibrinous Pneumonia:

Out of 207 affected lungs, 12 (5.79%) samples, revealed fibrinous pneumonia.

Gross Lesions:

- The organ (Lung) was firmer and tensor than normal.
- Lesions were gray or red in color, solid, heavy and sanked in water.
- Lungs were covered with fibrinous mucous.

Microscopic changes:

- Alveoli were surrounded with erythrocytes.
- Clumps of serofibrinous exudates were observed.
- Wall of alveoli were broken (emphysema).

(Fig 14)

4. Emphysema:

Out of 207 affected lungs, 20 (9.66%) were showing emphysema.

Gross lesions:

- Bloodless pale patches on the lung surface were present.
- Lesions were either local or generalized.
- Loss of natural elasticity of lungs was observed.
Microscopic changes:

- Pulmonary alveoli were over distended.
- Thinning of alveoli was seen.
- Epithelial desiliation and hyperplasia were seen.
- Alveoli were found ruptured.
- Hemorrhage was seen.

(Fig. 15).

5. Hemorrhagic Pneumonia:

Number of samples revealing hemorrhagic Pneumonia was found to be 50 (24.15%).

Gross Lesions:

- Lungs showed petechial hemorrhage.
- Lungs were firmer than normal.

(Fig 16).

Microscopic changes:

- Principle constituents of exudates were erythrocytes.
- Alveoli were seen packed with RBC.
- Blood vessels were ruptured and damaged.
- Alveoli showed serous exudates and eosinophilic coagulum.

(Fig.17, 18, 19)

6. Bronchopneumonia:

Out of 207 affected lungs samples, 15 (7.24%) samples showed bronchopneumonia.
Gross lesions:
- Necrotic lesions were patchy in distribution.
- These lesions were comprised of paler areas.
- Lesions were solid to touch and were prominent than the adjacent healthy tissue.

Microscopic Findings:
- Bronchioles were plugged with serous exudates
- Degenerated erythrocytes and leukocytes were seen
- Bronchial epithelium was destroyed.
- Thrombus was present in bronchi.
  (Fig. 20, 21, 22, 23).
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<tr>
<th>SN</th>
<th>Pathological conditions</th>
<th>Number</th>
<th>Percentage to affection (Out of 207) %</th>
<th>Overall percentage (out of 501) %</th>
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<tr>
<td>1</td>
<td>Suppurative Pneumonia</td>
<td>70</td>
<td>33.82</td>
<td>13.97</td>
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<td>2</td>
<td>Interstitial Pneumonia</td>
<td>40</td>
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<td>3</td>
<td>Fibrinous Pneumonia</td>
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<td>Emphysema</td>
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<td>09.66</td>
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<td>5</td>
<td>Hemorrhagic Pneumonia</td>
<td>50</td>
<td>24.15</td>
<td>09.98</td>
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<td>6</td>
<td>Broncho Pneumonia</td>
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<td>07.24</td>
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**Table 3: Pathological Conditions in Lung**
Number of Pathological conditions in lung

Graph 11: Number of Pathological Conditions in Lung

Percentage: Pathological conditions in lung

Graph 12: Types of Pneumonia
Trachea

Normal structure:

Gross:

It is a thin walled, white colored flexible tube. Trachea of birds consists of complete cartilaginous rings. The trachea divides into two main branches called as primary bronchi, which enters the lungs. (Fig.24). Each primary bronchus divides into two secondary bronchi and secondary bronchi divide into tertiary bronchi. The tertiary bronchi keep on dividing dichotomously forming terminal bronchioles which itself divide to form respiratory bronchioles and alveoli. (fig. 24)

Microscopic structure:

Trachea is lined with pseudo-stratified columnar epithelium. There is usually lymphatic tissue in the lamina propria of trachea and smooth muscles around the outside. Sub-mucosa has tracheal glands comprised of mucous and serous cells. Connective tissue is present between the rings of cartilage and in the outer walls.

Out of total 501 samples, 24 (4.79 %) samples showed different pathological changes in trachea (Table 4 Graph 13 and 14). Following pathological conditions were seen in trachea:

Pathological changes in trachea:

1). Tracheitis:

18 (75%) samples revealed tracheitis.
Gross Lesions:
- Tracheitis is invariably associated with bronchitis.
- Lining membrane was swollen, hyperaemic and dry.
- Increased mucoid secretion was observed.
  (Fig. 25)

Microscopic Changes:
- Mucus membrane was swollen and edematous.
- Blood vessels were congested.
- Proliferation and patchy desquamation of the columnar epithelium.
- Infiltrations of leukocytes were seen.
- Exudates was consisting of mucus desquamated epithelium, few RBC and a few leukocytes.
- Normal ciliated epithelium was sloughed off.
  (Fig. 26)

2. Hemorrhage:
Out of 24 affected trachea 6 samples (25%) showed hemorrhage.

Gross Lesions:
- Tracheal lumen was filled with bloody exudates.
- Congestion and petechial hemorrhage were seen.
  (Fig. 27).

Microscopic Changes:
- Exudates contained large number of RBCs
- Epithelial cells were desquamated
- Mucus secretions were seen.
- Cilia were lost.

(Fig. 28, 29).

<table>
<thead>
<tr>
<th>SN</th>
<th>Pathological conditions</th>
<th>Number</th>
<th>Percentage to affection (out of 24) %</th>
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<tr>
<td>1</td>
<td>Tracheitis</td>
<td>18</td>
<td>75</td>
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<td>2</td>
<td>Hemorrhage</td>
<td>06</td>
<td>25</td>
<td>01.20</td>
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Table 4: Pathological conditions in trachea
Number: Pathological conditions in trachea

Graph 13: Number of Pathological Conditions in Trachea

Graph 14: Percentage of Pathological Conditions in Trachea
Heart

**Normal structure:**

**Gross:**

Heart is a reddish brown colored, massive and four chambered organ. It is triangular in shape. It is oriented obliquely dorsoventrally and protected by pericardium a thin whitish membrane. The apex of heart is directed posterioventrally. Agroove, the coronary sukus, is present between the atria and ventricles.

(Fig. 30).

**Microscopic structure**

Normaly heart is composed of three layers, the endocardium, the myocardium and the epicardium. Endocardium lines the internal surface of the heart. The endocardium includes an inner layer of endothelial cells and a thin underlying layer of loose irregular connective tissue. Myocardium is the thickest layer of the heart wall. It is composed of striated cardiac muscle cells. Each fiber contain a centrally placed round or oval nucleus. Muscle fibers show branching and striations. The myocardium remains covered externally by epicardium. Epicardium consists of outer layer of mesothelial cells and a thin underlying layer of loose irregular connective tissue.

(Fig. 31).

A total 82 (16.36%) samples showed pathological changes in heart (Table 5, Graph 15 and 16).
Different pathological conditions in heart:

1. Endocarditis:
   Out of total 82 samples, 20 samples (24.39%) were positive for endocarditis.

Gross Lesion:
- Swelling of cusps of heart valve were seen.
- Congestion and necrotic fosse were observed.
- Petechial hemorrhages were seen.

Microscopic Changes
- In endocarditis, loss of striation and branching was seen in cardiac muscles.
- Necrosis was seen.
- Infiltration of leukocytes and erythrocytes was observed in between the cardiac muscle fibers.
  (Fig. 32)

2. Necrosis
   Out of total affected 82 samples of heart, 43 (52.43%) revealed necrosis.

Gross Lesions
- Affected areas became swollen firmer and assumed a dull white or yellow appearance.
• Necrotic fosse was seen.
  (Fig. 33).

**Microscopic Changes:**

• Loss of branching was seen in myocardium.
• Loss of striation was also observed.
• Nucleus showed necrotic appearance.
• Nuclei were mostly lost.
• Blood vessels were amyloid in appearance with few RBC.
  (Fig. 34).

3. **Edema:**

A total 3 (3.46%) samples showed pathological changes related to edema or enlarged heart.

**Gross Lesions:**

• Accumulation of fluid within the pericardial sac was observed.
• Swelling and enlargement in size and abnormal shape of the heart was observed.
• Color was less intensive than normal.
  (Fig 35).

**Microscopic Changes:**

• Interstitial spaces were enlarged.
• Edematus fluid was seen in cardiac muscles with few
leukocytes. (Fig 36).

4. Hemorrhagic endocarditis:
16 (19.51%) samples revealed hemorrhagic endocarditis.

Gross Lesions:
- Petechial hemorrhage was observed. (Fig. 37).

Microscopic changes:
- Hemorrhage was seen in myocardium.
- Cardiac muscles were degenerated
- Loss of striation was seen. (Fig 38, 39).

<table>
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<tr>
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<th>Pathological conditions</th>
<th>Number</th>
<th>Percentage to affection (out of 82) %</th>
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<td>Necrosis</td>
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<td>4.</td>
<td>Hemorrhagic Endocarditis</td>
<td>16</td>
<td>19.51</td>
<td>03.19</td>
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Table 5: Pathological conditions in heart
Observation and Result
Spleen

Normal structure:
Gross:
Spleen is part of lymphatic system. It is a small, oval, dark red colored organ present in close proximity to liver behind stomach. (Fig. 40)

Microscopic structure:
Histologically it remains covered by fibromascular capsule, which gives trabaculae into the substance of gland. Substance or pulp of spleen can be divided into red pulp (containing all types of cells found in circulating blood) and white pulp (which includes splenic nodules). Area of white pulp stains deep purple in color with H & E. (Fig 40).

Number of affected spleen found during the study was 30 (5.98%). Different pathological conditions (Table 6, Graph 17 and 18) revealed were as follows:

Pathological Changes in Spleen:

1. Hemorrhage:
   Number of samples affected by hemorrhage was 6 (40%).

Gross Lesions:

• Petechial hemorrhage was seen.
• Architecture of spleen was changed.
(Fig 41).
Microscopic Changes:

- Escape of blood from blood capillaries was observed.
- Infiltration of RBCs and leukocytes in scattered pattern was seen.
  (Fig.42).

2. Necrosis:

A total 12 (20%) spleen samples were found to be necrotic.

Gross Lesions:

- Spleen was congested.
- Necrotic foci were seen.
- It was dark in color than normal red.
- Spleen was mottled in appearance.
  (Fig. 43)

Microscopic Changes:

- Necrotic areas were visible.
- Cells became structure less and degenerated or atrophied.
- Cytoplasm of necrotic cells stain less intensely than the normal with eosin.
- Sometimes cell outlines were absent.
- Cells have more glassy and homogeneous appearance than normal cells.
  (Fig. 44).

3. Amyloidosis:

Only two (6.66%) spleen samples showed amyloidosis.
Gross Lesions:

• Spleen was enlarged.
• It was smooth greasy and firm to touch.
• Spleen had a grayish color and cut surface was greasy or waxy in appearance.

Microscopic Changes:

• Amyloid deposition was seen.
• In H & E stain, amyloid appeared as an amorphous, eosinophilic, hyaline extracellular substance.
• Amyloid formed a cuff around the central artery of the spleen follicles. Large sheet like deposits of amyloid was also observed.
• Degeneration of lymphocytes and RBC were seen.

(Fig. 45).

5. Depletion of Lymphocytes:

Depletion of Lymphocytes was evident in 10 (33.33%) samples.

Gross Lesions:

• Spleen was mottled.
• Necrotic foci were visible.
• Spleen was smaller than the normal size.

Microscopic Changes:

• Degenerated and destroyed lymphocytes were seen.
- Number of Lymphocytes was decreased.
  (Fig 46).

<table>
<thead>
<tr>
<th>SN</th>
<th>Pathological conditions</th>
<th>Number</th>
<th>Percentage to affection (out of 30)</th>
<th>Over all Percentage (out of 501)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Hemorrhage</td>
<td>06</td>
<td>20</td>
<td>01.20</td>
</tr>
<tr>
<td>2.</td>
<td>Necrosis</td>
<td>12</td>
<td>40</td>
<td>02.39</td>
</tr>
<tr>
<td>3.</td>
<td>Amyloidosis</td>
<td>02</td>
<td>06.66</td>
<td>0.4</td>
</tr>
<tr>
<td>4.</td>
<td>Depletion of lymphocytes</td>
<td>10</td>
<td>33.33</td>
<td>01.99</td>
</tr>
</tbody>
</table>

Table 6: Pathological conditions in spleen
Number: Pathological conditions in spleen

Graph 17: Number of Pathological Conditions in Spleen

Percentage: Pathological conditions in spleen

Graph 18: Percentage of Pathological Conditions in Spleen

Observation and Result 79
FIG. 1. Blood film of quail showing (A) oval, nucleated RBCs and (B) leukocytes. (H & E X 1000)

FIG. 2. Showing congested carcass and congestion in all visceral organs.

FIG. 3. Showing unsporulated oocyst. (H & E X 400)
FIG. 4. Showing petechial hemorrhage in intestine

FIG. 5. Showing (A) hemorrhage (B) ballooning of small intestine

FIG. 6. Showing massive hemorrhage in mucosa of small intestine
FIG 7. Section of intestine showing (A) loss of glandular structure (B) infiltration of erythrocytes and (C) mono nuclear cells in lamina propria. (H & E X 400)

FIG 8. Section of intestine showing (A) schizonts of granulated oocysts in epithelial cells (B) degenerated epithelial cells. (H & E X400)

FIG 9. Showing normal lung
FIG. 10. Section of lung showing (A) normal alveoli (B) bronchioles and (C) epithelial cells. (H & E X 1000)

FIG. 11. Showing congested lung with tiny abscess

FIG. 12. Section of lung showing (A) congestion (B) serous exudates (C) infiltration of leukocytes (D) emphysema. (H & E X 400)
FIG. 13. Section of lung showing (A) thickened septa (B) erythrocytes (C) leukocytes and (D) emphysema. (H & E X 400)

FIG. 14. Section of lung showing (A) infiltration of leukocytes and (B) emphysema. (H & E X 400)

FIG. 15. Section of lung showing (A) rupture of alveoli along with (B) hemorrhage. (H & E X 400)
FIG. 16. Showing petechial hemorrhage in lung

FIG. 17. Section of lung showing hemorrhage in alveoli (H & E X 400)

FIG. 18. Section of lung showing (A) hemorrhage in alveoli and (B) hemorrhage in interstitial spaces (H & E X 400)
FIG. 19. Section of lung showing (A) erythrocytes (B) leukocytes (C) serous exudates and (D) eosinophilic coagulum. (H & E X 400)

FIG. 20. Section of lung showing (A) complete degeneration of bronchial epithelium (B) serous exudates and (C) degenerated leukocytes (H & E X 400)

FIG. 21. Section of lung showing (A) hemorrhage and (B) loss of epithelial cells in bronchiole. (H & E X 400)
FIG. 22. Section of lung showing (A) loss of epithelium in bronchioles and (B) bronchiole filled with erythrocytes and few leukocytes. (H & E X 400)

FIG. 23. Section of lung showing thrombus in bronchiole. (H & E X 400)

FIG. 24. Showing normal trachea
FIG. 25. Showing trachea filled with exudates.

FIG. 26. Section of trachea showing (A) loss of cilia (B) edematous epithelium and (C) infiltration of leukocytes. (H & E X 400)

FIG. 27. Showing hemorrhage in trachea
FIG. 28. Section of trachea showing (A) hemorrhage (B) mucus exudates and (C) desquamation of epithelial cells. (H & E X 400)

FIG. 29. Section of trachea showing (A) hemorrhage and (B) edematous fluid. (H & E X 400)

FIG. 30. Showing normal heart
FIG. 31. Section of heart showing normal cardiac muscles (H & E X 400)

FIG. 32. Section of heart showing (A) loss of striations and (B) infiltration of erythrocytes. (H & E X 400)

FIG. 33. Showing necrotic foci in heart
**FIG. 34.** Section of heart showing (A) loss of striation and degeneration of nuclei (B) amyloid in blood vessel with RBCs. (H & E X 400)

**FIG. 35.** Showing abnormal shape of heart due to edema.

**FIG. 36.** Section of heart showing (A) enlarged interstitial space and (B) edematous fluid between cardiac muscles with few leukocytes. (H & E X 400)
FIG. 37. Showing petechial hemorrhage in heart

FIG. 38. Section of heart showing (A) hemorrhage (B) loss of striation (H & E X 400)

FIG. 39. Section of heart showing (A) loss of branching (B) infiltration of leukocytes (C) necrosis and (D) hemorrhage. (H & E X 400)
FIG. 40. Showing normal spleen

FIG. 41. Showing petechial hemorrhage in spleen

FIG. 42. Section of spleen showing (A) erythrocytes and (B) lymphocytes in scattered pattern. (H & E X 400)
FIG. 43. Showing necrosis in spleen

FIG. 44. Section of spleen showing necrosis of (A) red and (B) white pulp. (H & E X 400)

FIG. 45. Section of spleen showing (A) amyloidosis and (B) degeneration of lymphocytes and erythrocytes. (H & E X 400)
FIG. 46. Section of spleen showing depletion of lymphocytes (H & E X 400)