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The present study was carried out to investigate, the physiological adaptation to flight in the pigeon (powerful flight), the common buzzard (strongl flight) and the moorhen (flightless) birds. The parameters were chosen for the present study were some physical properties (body weight, wing surface area, wing loading index, relative weight of organs), blood indices (erythrocyte count, haemoglobin content, haematocirt MCV, MCH, and MCHC), the respiratory function of blood (blood-gases, acid-base status and oxygen equilibrium curve, some metabolites (serum glucose, liver and muscle glycogen, serum total protein, serum total lipids, serum triglyceride, serum cholesterol and serum uric acid), some serum enzymes (aspartate amino transferase and alanine amino transferase), and some hormones (Insulin, Triiodo thyronine, Teteraiodothyonine and cortisol).

**Part (I): Concerning the effect of flight on body weight, wing surface area, wing loading index and relative organs weigh in the three studied birds.**

The present study revealed the following

1- There was a relation between the pattern of flight and the body weight of the bird. Body weight of buzzard was significantly lower than those of the pigeon and moorhen.

2- Wing surface area of the buzzard was significantly higher than those of the pigeon and moorhen.

3- Wing loading index showed a significantly high value in the moorhen as compared to the common buzzard and pigeon.

4- The relative heart length to the heart width of pigeon showed non significant difference between the three birds.

5- The relative weights of the organs showed significant differences between the three birds.

**Part (II): Concerning hematological parameters and respiratory functions of blood of the three studied birds.**

1- Erythrocyte count, haemoglobin content and haematocrit value showed that the values of the pigeon were significantly higher than those of the buzzard and moorhen. Non significant difference was found between the values of the buzzard and moorhen. This help the bird to receive the oxygen needs.

2- Mean corpuscular volume and mean corpuscular hemoglobin of the buzzard were higher than those of the pigeon and moorhen and there were non signihicant difference between the values of the buzzard and moorhen.

3- Mean corpuscular hemoglobin concentration of the moorhen was significantly higher than those of the pigeon and buzzard. Non signihicant difference between the pigeon and moorhen values was found.

4- There were significant differences in oxygen partial pressure, carbon dioxide partial pressure and percentage Oxygen saturation

in arterial and venous blood and the percentage arterio-venous difference values of the three birds.

5- Acid-base status showed non significant differences in arterial blood pH while there were significant differences in venous blood pH value between the three birds.

6- There were significant differences in arterial and venous blood $HCO^{-}_{3}$.

7- Total $CO_2$ and base excess of arterial blood were significantly different but these differences not clear in venous blood .

8- Oxygen equilibrium curve of three bird species were non significantly different.

**Part (III): Effect of flight on some metabolite, enzymes and hormne activities in the three studied birds.**

1- Serum glucose level and total protein were significantly higher in common buzzard than those of the pigeon and moorhen.

2- Liver and muscle glycogen of the moorhen were significant higher in moorhen than those of the pigeon and buzzard. This may be related to the activity of flight.

3- Serum total lipid, triglyceride, and cholesterol were significantly higher in pigeon than that of the common buzzard and moorhen.

4- Serum uric acid of moorhen was significantly higher than those of buzzard and moorhen.

5- Serum AST, ALT activites of moorhen were significant higher than those of the buzzard and pigeon.

6- Insulin, $T_3$ and $T_4$ and cortisol of pigeon were significant higher than those of the buzzard and moorhen.

This study revealed that was there is a relation between the pattern of flight of pigeon (powerful flight), the common buzzard (strongly flight) and the moorhen (flightless) birds and physical properties, blood parameters, respiratory function of blood, serum metabolites and serum hormones.