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Clinicopathological evaluation of Anaemia in pigs

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Abstract
Present investigation, on clinicopathological evaluation of anaemia in pigs a total of 200 pigs were examined for anaemia. Among them 25 (10%) pigs had anaemia based on clinical examination and laboratory examination. Incidence was more common in pigs with less than 1year age and in females. Clinically weakness, diarrhoea, anorexia, cyanosis of ears, petechiae and ecchymotic hemorrhage on the ventral abdomen and legs and scaly lesions over the body. Haematobiochemically significant (p<0.05) increase in eosinophil count, ALT, AST, BUN, calcium and significant (p<0.05) decrease in haemoglobin, packed cell volume, TEC, TLC, albumin and phosphorous in anaemic pigs were observed.

Keywords: Clinicopathological evaluation, Anaemia, pigs

1. Introduction
Routine hematologic analysis in animals was performed using a fresh whole blood sample placed in EDTA anticoagulant. Other anticoagulants can create dilution errors and/or interfere with morphologic analyses. Samples may be refrigerated within 1 hour of collection if immediate analysis is not possible. Serum biochemical analyses are clinical laboratory tests which are useful aids in the diagnosis of certain diseases. The test results on the patient's serum before and after the onset of disease should be compared to determine whether the serum biochemistry is altered by disease. (Boyd, 1984) [2]

2. Materials and Methods
Present study was conducted on the 'Clinicopathological evaluation of anaemia in pigs for a period of 6 months from June 2021 to November 2021. Apparently healthy pigs and pigs affected with anaemia were considered for the present study. Regularly visited ICAR-AICRP on pigs, SVVU, Tirupati for collection of samples to assess anaemia. All pigs were subjected to detailed clinical examination and continuous clinical evaluation as described by Kelly (1984) [7]. After collection of history (anamnesis), general inspection and the clinical parameters – rectal temperature, respiratory rate and heart rate were recorded. The visible mucous membranes such as conjunctival and buccal mucosa were critically examined. Body coat/ skin was examined for ectoparasitic infestation (Scott *et al*., 1995) [9]. Faecal samples were examined for the presence of parasitic ova (Soulsby, 2012) [11]. For haematological studies blood was collected from ear vein or jugular vein of pigs. 2 ml of blood was transferred into a dry vial containing 10 percent EDTA for complete blood picture. All biochemical parameters were analysed using serum samples. Serum was used for estimation of AST (IU/L), ALT (IU/L), Total proteins (gm/dl), Blood Urea Nitrogen (mg/dl), serum creatinine (mg/dl), calcium (mg/dl), phosphorus (mg/dl) by using A15 biochemical analyzer (Kaneko *et al*., 2008) [6].

3. Results and Discussion
3.1 Causes of anaemia
Laboratory investigation revealed different etiological agents like mange infestation in 7 dogs (28%) and parasitic infestation in 12 dogs (48%). These results were in accordance with Saravanan *et al*., (2020) [8] who noticed parasitic infection in pigs and Sinha *et al.,* (2004) [10] who recorded mange infestation in pigs. Anaemia might be due to poor nutrition, parasitic infestation and idiopathic causes (Useh *et al*., 2003) [13]. Etiology of anaemia in pigs were presented in (Table. 1) and (Fig. 1).

Table 1: Different causes of anaemia in pigs

Causes of anaemia	Total	Percentage (%)
Mange infestation	7	28
Parasitic infestation	12	48
Unknown etiology	6	24

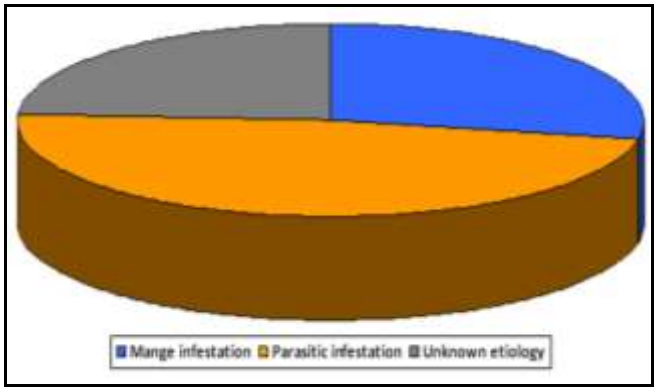

Fig 1: Different causes of anaemia in pigs

3.2 Clinical symptoms

Pigs affected with anaemia revealed pale mucus membrane in 21 pigs (84%), weakness in 15 pigs (60%), diarrhoea in 14 pigs (56%), anorexia in 7 pigs (28%). Similar results were reported by Saravanan *et al*., (2020) [8]. Cyanosis of ears in 4 pigs (16%), petechiae and ecchymotic hemorrhage on the ventral abdomen and legs in 6 pigs (24%) and scaly lesions over the body in 9 pigs (36%). Similar results were noticed by Stadler *et al*., (2021) [12]. Clinical symptoms in pigs were presented in (Table. 2) and (Fig. 2)

Table 2: Different clinical symptoms of anaemia in pigs

Clinical symptoms	Total	Percentage (%)
Pale mucus membrane	21	84
Weakness	15	60
Diarrhoea	14	56
Anorexia	7	28
Cyanosis of ears	4	16
Petechiae and ecchymotic hemorrhage	6	24
Scaly lesions over the body	9	36

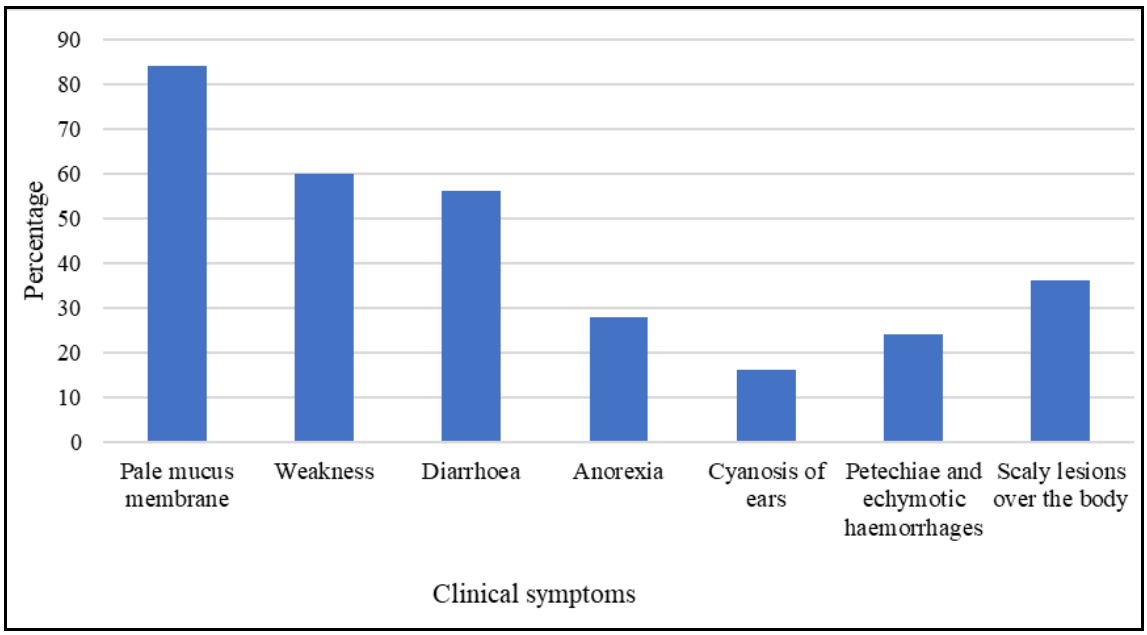

Fig 2: Different clinical symptoms of anaemia in pigs

3.3 Faecal sample examination

Examination of faecal samples in pigs revealed the presence of *Trichuris suis* ova had barrel shaped egg with thick shell and dark brown colored, transparent plugs present at either poles, yolk is unsegmented. *Trichuris* worms had long anterior part of the body and slender and thick posterior part. The hind end of the male worm was curled and there was one spicule which is usually armed with fine cuticular spines surrounded by a protrusible sheath. These types of observations were in agreement with those of (Soulsby, 2012) [11]. *Trichuris* worms were depicted in (Fig. 3) and (Fig. 4).

Fig 3: Photograph showing coiled end of male *Trichuris suis* worm. x40

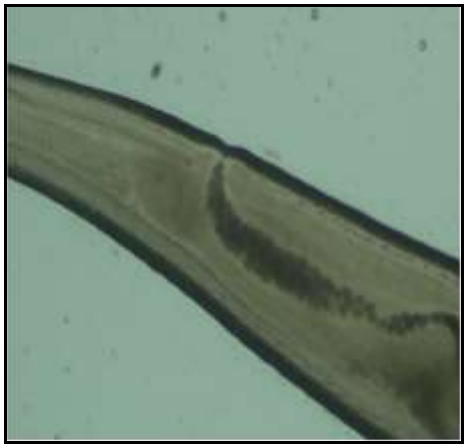

Fig 4: Photograph showing female *Trichuris suis* worm: Uterus containing eggs. x40

3.4 Skin scrapings

Examination of skin scrapings in pigs revealed Mange (*Sarcoptes scabiei*) infection. All the legs were short and the third and fourth pairs were not projected beyond the margin of the body. On the ventral surface, the epimeres were distinct, those of the first pair of legs were fused into a single rod and those of the third and fourth pair of legs are fused to form a lateral bar. The dorsal surface was covered with fine folds and grooves, mainly transverse in arrangement and had number of small triangular scales. Similar type of findings were noticed by (Soulsby, 2012) [11]. *Sarcoptes scabiei* mange depicted in (Fig. 5).

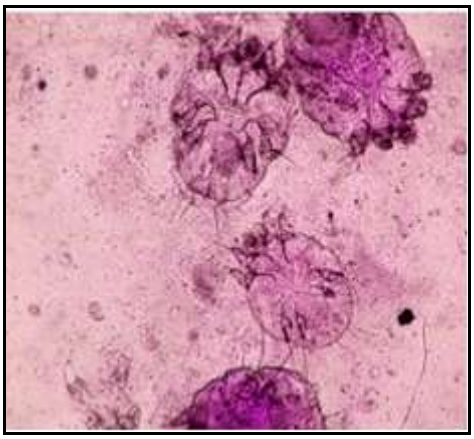

Fig 5: Photograph showing *Sarcoptes scabiei* mange in pigs. x100

3.5 Haematological profile in pigs

The Mean ± SE values of Hb, PCV, TEC in apparently healthy pigs were 11.04±0.24 g%, 37.83±1.62%, 5.74±0.16 millions/mm^3 and in anaemic pigs were 7.08±0.59 g%, 24.58±2.21%, 3.89±0.45 millions/mm^3 respectively. Hb, PCV, TEC were decreased significantly (p<0.05) in anaemic pigs when compared to apparently healthy pigs. These types of findings were in conformity with Das and Konar (2013) [4].

The Mean ± SE values of TLC, neutrophils, lymphocytes, eosinophils, basophils, monocytes in apparently healthy pigs were 12.92±1.61 thousands/mm^3, 44.33±1.03%, 52.00±1.04%, 2.83±0.30%, 0.50±0.35%, 0.33±0.33% and in anaemic pigs were 9.11±8.81 thousands/mm^3, 17.12±5.84%, 49.17±2.61%, 7.42±1.47%, 0.29±0.24%, 0.83±0.36% respectively. TLC was decreased significantly (p<0.05), eosinophils were increased significantly (p<0.05) in anaemic pigs when compared to apparently healthy pigs. Significant difference was not observed in neutrophils, lymphocytes, basophils and monocytes between anaemic pigs and apparently healthy pigs. A decrease in the erythrocyte count and impaired ability to transport oxygen affect many physiological processes, severe anaemia, for instance, affecting the physiology of blood circulation, fluid balance, blood-acid/base, osmolarity of the blood, and kidney function. The oxygen supply to different organs will also be disturbed, and hypoxia may occur. Severely anaemic over a prolonged period, with resulting impairment of growth and decreased leukocyte count (Egeli *et al*., 1998) [5].

The Mean ± SE values of platelets, ESR, diameter of RBC and reticulocyte count in healthy control pigs were 2.46±3.24 millions/µl, 0.83±0.16 mm/hr, 5.98±0.04 µm, 0.00±0.00x10^3/ µl and in anaemic pigs were 2.07±1.29 millions/µl, 1.17±0.49 mm/hour, 5.29±0.23 µm and 46.45±8.93x10^3/ µl respectively. Significant difference was not observed in platelets, ESR, diameter of RBC and reticulocyte count between anaemic pigs and apparently healthy pigs. ESR was increased in anaemia and inflammation. Reticulocytosis were observed in many cases of anaemia with functional bone marrow (Cowgill *et al*., 2003) [3]. Thrombocytopenia might be due to platelet sequestration in the spleen or development of disseminated intravascular coagulation (Boozer and Macintire, 2003) [1]. Haematological profile in pigs with anaemia were presented in (Table. 3) and (Fig. 6)

Table 3: Haematological profile of the anaemic pigs

S.No	Parameter	Healthy pigs (Mean ± SE)	Anaemic Pigs (Mean ± SE)
1	Haemoglobin (g%)	11.04±0.24	7.08±0.59*
2	PCV (%)	37.83±1.62	24.58±2.21*
3	TEC (x 10^6/ mm³)	5.74±0.16	3.89±0.45*
4	TLC (x 10^3/ mm³)	12.92±1.61	9.11±8.81*
5	Neutrophils (%)	44.33±1.03	17.12±5.84
6	Lymphocytes (%)	52.00±1.04	49.17±2.61
7	Eosinophils (%)	2.83±0.30	7.42±1.47*
8	Basophils (%)	0.50±0.35	0.29±0.24
9	Monocytes (%)	0.33±0.33	0.83±0.36
10	Platelets (x 10^6/ µl)	2.46±3.24	2.07±1.29
11	ESR (mm/hour)	0.83±0.16	1.17±0.49
12	Diameter of RBC (µm)	5.98±0.04	5.29±0.23
13	Reticulocytes (x 10^6/ µl)	0.00±0.00	46.45±8.93

*Significant (p<0.05) analysed by two sample t- test

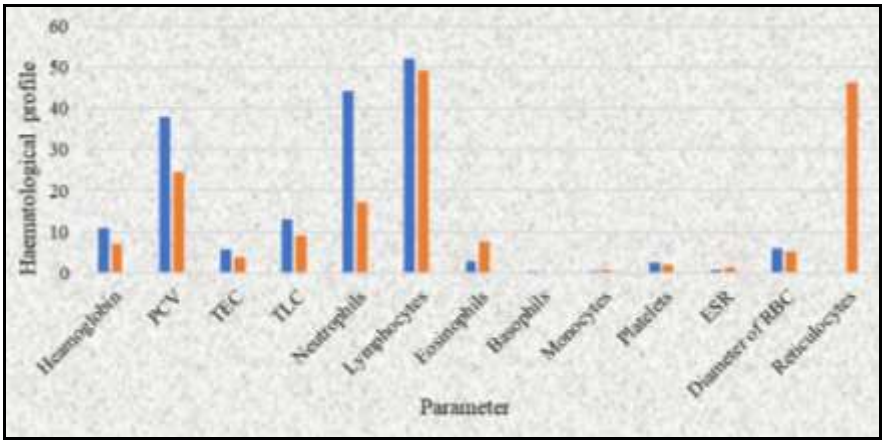

Fig 6: Graph showing haematological profile of the anaemic pigs

The Mean ± SE values of MCV, MCH, MCHC in apparently healthy pigs were 65.89±1.75 fl, 19.27±0.39 pg, 29.37±1.10% and in anaemic pigs were 63.91±3.25 fl, 20.10±1.38 pg, 32.14±4.55% respectively. Significant difference was not observed in MCV, MCH and MCHC between anaemic pigs and apparently healthy pigs. These findings were in contrast with Weiser and O'Grady (1983) [14] and Erythrocyte indices in pigs with anaemia were presented in (Table. 4) and (Fig. 7)

Table 4: Erythrocyte indices of the anaemic pigs

S. No.	Parameter	Healthy pigs (Mean ± SE)	Anaemic Pigs (Mean ± SE)
1	MCV (fl)	65.89±1.75	63.91±3.25
2	MCH (pg)	19.27±0.39	20.10±1.38
3	MCHC (%)	29.37±1.10	32.14±4.55

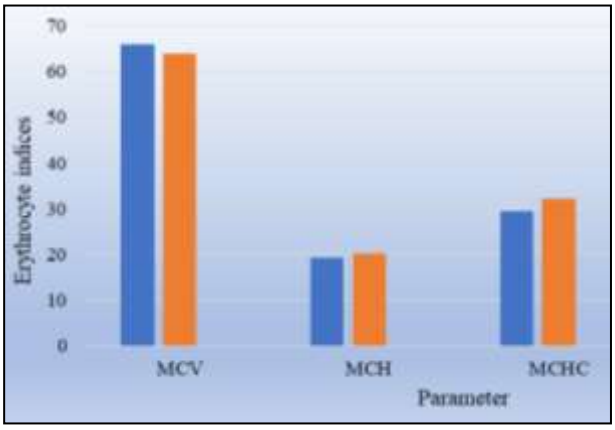

Fig 7: Graph showing erythrocyte indices of the anaemic pigs

3.6 Biochemical profile in pigs

The Mean ± SE values of ALT, AST, TP, albumin, BUN, creatinine, calcium, phosphorous in apparently healthy pigs were17.79±0.53 IU/L, 22.68±0.64 IU/L, 7.55±0.76 g/dl, 4.71±0.23 g/dl, 13.57±0.54 mg/dl, 1.72±0.09 mg/dl, 11.94±0.31 mg/dl, 8.94±0.30 mg/dl and in anaemic pigs were 82.06±9.42 IU/L, 145.26±25.75 IU/L, 6.48±0.30 g/dl, 3.00±0.24 g/dl, 17.42±1.49 mg/dl, 1.43±0.08 mg/dl, 14.23±3.96 mg/dl, 5.64±0.24 mg/dl respectively. ALT, AST, BUN, calcium were increased significantly (p<0.05), albumin, phosphorous were decreased significantly (p<0.05) in anaemic pigs when compared to apparently healthy pigs. Significant difference was not observed in TP and creatinine between anaemic pigs and apparently healthy pigs. In contrast lower AST and ALT levels might have been caused by a corresponding low tissue level of those enzymes during an iron deficiency (Egeli *et al.*, 1998) [5]. Biochemical profile in pigs with anaemia were presented in (Table. 5) and (Fig. 8).

Table 5: Biochemical profile of the anaemic pigs

S. No.	Parameter	Healthy pigs (Mean ± SE)	Anaemic Pigs (Mean ± SE)
1	ALT (IU/L)	17.79±0.53	82.06±9.42*
2	AST (IU/L)	22.68±0.64	145.26±25.75*
3	Total protein (g/dl)	7.55±0.76	6.48±0.30
4	Albumin (g/dl)	4.71±0.23	3.00±0.24*
5	BUN (mg/dl)	13.57±0.54	17.42±1.49*
6	Creatinine (mg/dl)	1.72±0.09	1.43±0.08
7	Calcium (mg/dl)	11.94±0.31	14.23±3.96*
8	Phosphorus (mg/dl)	8.94±0.30	5.64±0.24*

*Significant (p<0.05) analysed by two sample t- test

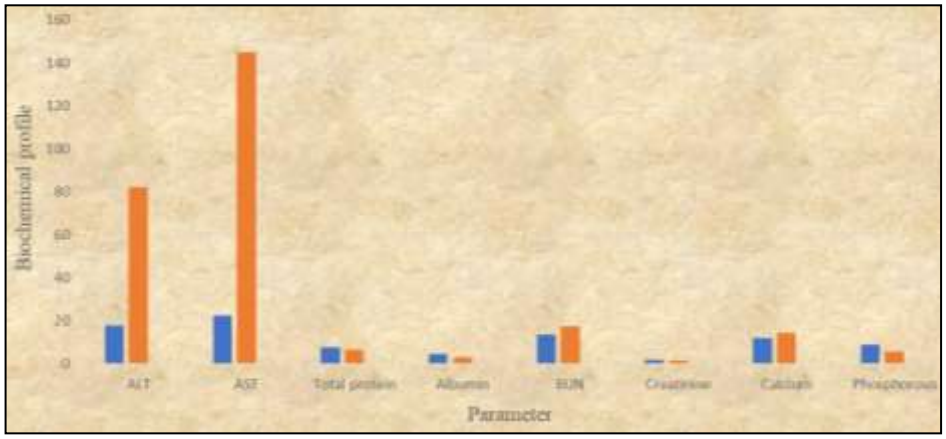

Fig 8: Graph showing biochemical profile of the anaemic pigs

4. Conclusion

From the above studies, it was concluded that prevalence of anaemia was found to be more common in young pigs, and in female pigs. Haematologically, reticulocytosis was observed indicating regenerative and responsive anaemia and active bone marrow. In pigs, anaemia was found to be mainly due to parasitic infestation. Decrease in Hb, PCV and TEC value in parasitic infestation and mite infestation in pigs were supposed to have occurred due to the suppressive effects of the toxic substance secreted or excreted by the G.I. helminths and sucking of blood and tissue fluid by the mite and the decreased feed intake due to constant irritation caused by mites leading to deficiency of essential nutrients needed for normal haemopoiesis. Biochemically increased level of BUN and decreased levels of TP and Albumin resulted from anorexia of varying severity and diaarhoea.

5. References

1. Boozer AL, Macintire DK. Canine babesiosis. Vet Clin North Am Small Anim Pract. 2003;33:885-904.
2. Boyd JW. The interpretation of serum biochemistry test results in domestic animals. Vet Clin Pathol. 1984;13(2):7-14.
3. Cowgill ES, Neel JA, Grindem CB. Clinical application of reticulocyte count in dogs and cats. Vet Clin Small Anim Pract. 2003;33(6):1223-1244.
4. Das M, Konar S. Clinical and haematological study of canine Ehrlichiosis with other hemoprotozoan parasites in Kolkata West Bengal. I A Pac J Trop Biomed. 2013;3(11):913-915.
5. Egeli AK, Framstad T, Morberg H. Clinical biochemistry, haematology and body weight in piglets. Acta Vet Scand. 1998;39:381-393.
6. Kaneko JJ, Harvey JW, Bruss ML. Eds. Clinical biochemistry of domestic animals. Academic press; c2008.
7. Kelly WR. Veterinary clinical diagnosis. 3rd Edition; c1984.
8. Saravanan M, Ramkumar PK, Rani N, Kannan K, Selvaraj P, Venkatesan M, *et al*. Mucohaemorrhagic enteritis caused by mixed parasitic infection in a large white yorkshire pig. Anim Health Prod. 2020;8(3):130-133.
9. Scott DW, Miller WH, Griffin CE. Muller and Kirk's Small Animal Dermatology. 5th Edition. Saunders Philadelphia; c1995. p. 882-883.
10. Sinha S, Kumar A, Prasad KD. Haematobiochemical variations during mange mite infestation in pigs and its therapeutic management. J Parasit Dis. 2004;28:127-129.
11. Soulsby EJL. Helminths arthropods and protozoa of domesticated animals. 7th Edition. Bailliere Tindall, London; c2012.
12. Stadler J, Ade J, Hermanns W, Ritzmann M, Wentzel S, Hoelzle K, Hoelzle LE. Clinical, haematological and pathomorphological findings in Mycoplasma suis infected pigs. BMC Vet Res. 2021;17(1):1-10.
13. Useh NM, Oladele SB, Adamu S, Ibrahim ND, Nok AJ, Esievo KA. Etiology and prevalence of canine anemia in Zaria: a review of 2139 cases observed at the Veterinary Teaching Hospital of the Ahmadu Bello University Zaria Nigeria (1990-2003). Vet Q. 2003;25(4):150-154.
14. Weiser G, O Grady M. Erythrocyte volume distribution analysis and haematological changes in dogs with iron deficiency anaemia. Vet Pathol. 1983;20(2):230-241.