

الكساح الكلينيكي وتحت الكلينيكي فى الماعز وعلاقته ببعض مكونات الدم

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يعتبر الكساح بنوعيه الكلينيكي وتحت الكلينيكي واحدا من أهم أمراض الحيوانات صغيرة العمر بما فيها الماعز وتتخلص أعراض الكساح الكلينيكي فى حدوث تصلب أثناء المشى والحركة والرقاد وعدم القدرة على الوقوف مع تشوه فى الأطراف الأمامية وتورم فى المفاصل خاصة مفصل الركبة والضلوع بينما تتخلص أعراض الكساح تحت الكلينيكي فى وقف النمو عند الحيوانات المصابة مع فقدان الشهية والامتناع عن الأكل .

وقد أوضحت نتائج تحليل صورة الدم عن وجود نقص معنوى فى نسبة الهيموجلوبين حجم الخلايا المصمتة وعدد كرات الدم الحمراء فى كلا من حالات الكساح الكلينيكي وتحت الكلينيكي بينما ازدادت نسبة كرات الدم البيضاء زيادة معنوية فى حالة الكساح الكلينيكي فقط .

وبتحليل مكونات الدم الكيماوية وجد نقص ملحوظ فى مستوى كالا من الكالسيوم والفسفور الغير عضوى ، البروتينات الكلية والزنك بينما ارتفع نشاط أنزيمى الفوسفاتيز القلوى والترانس أمينيز فى مصل الحيوانات فى كلتا حالتى الإصابة . كما وجد نقص معنوى فى مستوى عنصر الماغنسيوم ، النحاس والحديد فى حالات الكساح الكلينيكي بينما لم يتأثر مستوى الصوديوم والبوتاسيوم فى حالات الكساح الكلينيكي وتحت الكلينيكي .

يعتبر هذا البحث محاولة لتشخيص الكساح بنوعيه الكلينيكي وتحت الكلينيكي فى الماعز بمصر ويتضح من النتائج العملية أنه يمكن الاعتماد على النسبة بين الكالسيوم الى الفسفور كمعيار لتشخيص حالات الكساح اذا تعدت هذه النسبة (٢) حتى لو لم تظهر الأعراض الظاهرية المميزة .

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CLINICAL AND SUBCLINICAL RICKETS IN GOATS IN RELATION TO SOME BLOOD PARAMETERS

(With 3 Tables & 3 Figs.)

By

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SUMMARY

Clinical signs of rickets were detected in young goats. These included stiffness in gait, tendency of affected animal to lie down, deformity in the bone of fore-limbs, enlargement of both knee joint and costochondral junction, while subclinical rickets showed only signs of anorexia and stunted growth rate.

Haematological changes included significant decrease in haemoglobin content, packed cell volume and total erythrocytic count in both clinical and subclinical forms of rickets. Leucocytosis was observed only in goats with clinical rickets.

Biochemically, hypoproteinaemia, hypocalcaemia, hypophosphataemia as well as decrease in serum zinc level were observed in both clinical and subclinical rickets, while serum alkaline phosphatase and transaminases activities were increased. Serum magnesium, copper and iron decreased significantly in clinically affected group. While sodium and potassium lies within normal in both affected groups.

In this trial increased Ca/P ratio (above 2) was taken as an indication for the detection of both clinical and the subclinical rickets.

INTRODUCTION

Rickets is one of the most important diseases of young animals, characterized by defective calcification of the growing bones. Although rickets was extensively studied in lambs and calves, but there is no available literature in goats inspite of their economical importance in Egypt.

Calcium and phosphorus are essential for adequate mineralization of bones and teeth, and deficiency of one of them or both, will lead to their abnormal development. The effect of inbalanced Ca/P ratio was studied by HOWARD (1981); GROENEWARD, *et al.* (1960) and HANSEN, *et al.* (1966). They recorded that, in goats fed on high phosphorus low calcium diet, osteodystrophia fibrosa prevailed in them.

EL-SHERIF and FAWZIA (1981) and ATTIA (1984), ensued subclinical forms of the disease in lambs, caused by a dietary deficiency of calcium and phosphorus with high imbalance of

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these minerals, the case was only diagnosed by significant variation in most of the biochemical component of the blood. ATTIA (1984) added that subclinical rickets occurred when the Ca/P ratio elevated above 2 without obvious clinical signs, while clinical forms appeared only when the Ca/P ratio was above 2 but with apparent clinical symptoms.

In the present work, both clinical and subclinical rickets were detected in goats. Haematological and biochemical changes in both affected cases had been done and evaluated.

MATERIAL and METHODS

Fifteen growing goats (2-5) months old) were included in this study. Four of them were suffering from locomotor disturbances, deformities of the bones of the fore-limbs and stunted growth (Group I), six were stunted in growth and suffered from anorexia and respiratory manifestations (Group II), and five were apparently normal and parasitic free (these served as control).

Blood and serum samples were collected from affected as well as from apparently normal goats for haematological and biochemical studies. Blood picture (haemoglobin concentration, total erythrocytic and leucocytic counts and packed cell volume) were determined after SONNENWIRTH and JARETT (1980). Serum calcium inorganic phosphorus, magnesium, copper, iron, zinc and total proteins levels were estimated according to the methods of GINDLER and KING (1972); FISKE and SUBBAROW (1925); DENIS (1922); Gubler, *et al.* (1952); PICCARDI, *et al.* (1972); MERET and HENKIN (1971) and WEICHSELBAUM (1946), respectively. While sodium and potassium levels were determined by Flame-Photometer as described by OSER (1965). Serum enzyme activities were estimated using the methods after KIND and KING (1954) and REITMAN and FRANKEL (1957), for the alkaline phosphatase and transaminases (SGOT & SGPT), respectively.

RESULTS

From Table (1) it appeared that both clinical and subclinical cases, of rickets in goats, behaved lowered values of haemoglobin concentration, packed cell volume and red blood cells count if compared with clinically healthy ones. Clinical rickets however exhibited the most lowest values of studied parameters. On the other hand, significant increase in total leucocytic count was observed only in clinically affected cases, while subclinical cases of rickets vary slightly from normal. Similar phenomena was emphasized with regard to mineral changes in blood serum of tested animals. Calcium/phosphorus ratio behaved highest figures (2.56 ± 0.21) in clinical rickitic cases followed by subclinical ones (Table 2). Also from the same table, clinical form of rickets, was accompanied by significant decrease the levels of serum magnesium, zinc, copper and iron, while in subclinical rickets all previously mentioned parameters varied slightly from normal except serum zinc level which was decreased significantly.

Table (3) cleared out the values of total proteins, alkaline phosphatase, transaminases, sodium and potassium in sera of clinically normal goats as well as in goats affected with clinical and subclinical rickets. It is evident that total serum proteins have a marked and significant lower values in the affected cases, while serum enzymes were significantly elevated. On the other hand, the level of serum sodium and potassium in affected cases lies within the normal.

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Table (1)
Haematological changes in blood of normal goats and goats affected with clinical and subclinical rickets

Parameter	Normal goat (control)	Goats suffering from rickets	
		(Group I) Clinical form	(Group II) Subclinical form
Haemoglobin (gm/dl)	11.6 \pm 0.456	9.40 \pm 0.272**	10.84 \pm 0.300*
PCV (%)	44.2 \pm 0.996	37.80 \pm 0.597**	40.80 \pm 0.858*
Total RBCs count (10 ⁶ /Cu.mm)	7.69 \pm 0.353	5.48 \pm 0.191**	6.55 \pm 0.298*
Total leucocytic count (10 ³ /Cu.mm)	8.89 \pm 0.387	10.67 \pm 0.616*	9.06 \pm 0.317

* Significant variation at P/ 0.05

** Highly Sig. variation at P/ 0.01

Table (2)
Mean values of some minerals and trace elements in serum of normal goats and goats affected by clinical and subclinical rickets

Mineral	Normal goat (Control)	Goats affected with rickets	
		(Group I) Clinical form	(Group III) Subclinical form
Calcium (mg%)	11.3 \pm 0.27	7.05 \pm 0.18**	9.08 \pm 0.20*
Inorg. Phosph. (mg%)	5.95 \pm 0.53	2.76 \pm 0.15**	3.94 \pm 0.096*
Ca/P ratio	1.9 \pm 0.21	2.56 \pm 0.24*	2.31 \pm 0.22*
Magnesium (mg%)	2.48 \pm 0.28	1.72 \pm 0.13*	2.44 \pm 0.04
Zinc (Ug%)	68.12 \pm 0.74	48.69 \pm 0.93**	53.18 \pm 1.16*
Copper (Ug%)	101.00 \pm 2.26	88.40 \pm 0.94*	95.40 \pm 0.49
Iron (Ug%)	115.40 \pm 1.49	100.60 \pm 1.31*	112.80 \pm 1.33

* Significant variation at P/ 0.05

** Highly Sig. variation at P/ 0.01

Table (3)
Mean levels of some biochemical and enzymatic changes in serum of normal goats and those suffered from clinical and subclinical rickets

Estimated value	Normal goat	Rachitic goats	
		(Group I) clinical form	(Group II) Subclinical form
Total proteins (gm%)	6.1 \pm 0.27	3.04 \pm 0.09**	4.19 \pm 0.16*
Alkaline Phos. (I.U./L.)	11.76 \pm 0.44	19.85 \pm 0.40**	15.78 \pm 0.56*
SGOT (R.F.U./ml.)	37.99 \pm 1.15	53.96 \pm 1.00**	46.37 \pm 1.86*
SGPT (R.F.U./ml.)	11.00 \pm 0.50	20.89 \pm 0.14**	16.87 \pm 0.12*
Sodium (m.Eg/L.)	148.00 \pm 4.15	147.00 \pm 1.79	146.00 \pm 2.06
Potassium (m.Eq./L.)	4.07 \pm 0.17	3.98 \pm 0.33	3.85 \pm 0.19

* Significant variation at P/ 0.05

** Significant variation at P/ 0.01

DISCUSSION

The clinical signs observed in clinically affected goats were stiffness in gait, tendency to lie down with a typical deformity of the fore limbs and enlargement of the knee joint (Fig. 1, 2 & 3), as well as enlargement of the costochondral junction. The long bone showed abnormal curvature forward and outward at the knee, in addition to that, arching of the back. Dyspnoea was also noticed which may be attributed to the severe deformity of the chest bones resulting from defective mineralization of developing bones. While those suffering from subclinical form of rickets exhibited no apparent symptoms except anorexia and stunted growth. These results were in agreement with those found by EL-SHERIF and FAWZIA (1981) and ATTIA (1984) in similarly affected lambs.

Regarding haematological results as seen in table (1), there was a highly significant reduction ($P/0.1$) in total erythrocytic count, haemoglobin concentration and packed cell volume reading with significant elevation ($P/0.05$) in total leucocytic count in clinically affected goats. While similar changes, but less pronounced ($P/0.05$) in total erythrocytic count, haemoglobin content and packed cell volume were seen in those suffering from subclinical rickets. These changes in the haematological values could be attributed to the anaemic state following anorexia which may be attributed to the poor dental development resulting from calcium deficiency, in addition to the disinclination of the animals to move and graze. It may be also attributed to the improper metabolism of minerals that could be reflected on the state of some other minerals and trace elements (such as iron and copper) which were responsible for haemoglobin formation. This was proved latter on by the reduction in the levels of calcium, iron and copper in sera of affected goats. These results coincided with the values obtained by EL-SHERIF and FAWZIA (1981) and ATTIA (1984).

Concerning biochemical analysis (Tables 2 & 3), there was a significant decrease in the values of serum calcium and inorganic phosphorus in both clinical and subclinical rickets. This decrease was more pronounced ($P/0.01$) in clinical form than subclinical one. It seemed possible that deficiency of phosphorus in the diet may leads to withdrawal of both calcium and phosphorus from bone and increased calcium excretion rate, with consequent rarification of these bones (NORDIN, 1960). These results were similar to those obtained by UDALL (1972) and EL-SHERIF and FAWZIA (1981) in lambs suffering from clinical and subclinical rickets. Moreover there was a significant increase in Ca/P ratio in both clinical and subclinical cases of rickets in goats, which reflected a disturbed metabolism of these elements and/or disturbed Ca/P ratio. Magnesium level decreased significantly ($P/0.05$) in clinically affected animals but showed no significant alteration from normal in the subclinical cases. Basically this observation was confirmed by data obtained by GRAY (1968), who stated that the reduction of serum calcium level in sheep was concurrent with marked fall in magnesium level.

From Table (2) it appeared that, clinical form of rickets was accompanied by significant decrease in the levels of serum zinc, copper and iron, while only significant decrease in the level of serum zinc was occurred in the subclinical form. Nearly similar results in serum iron and copper were reported by EL-SHERIF and FAWZIA (1981) and ATTIA (1984) in lambs affected with clinical or subclinical rickets.

Table (3) revealed that, highly significant ($P/0.01$) and significant ($P/0.05$) decrease in serum total protein level was noticed in goats affected with clinical and subclinical rickets respectively. This indicating unthriftiness of the animals which may be due to the state of anorexia. It may be also due to the role played by inorganic phosphorus in protein metabolism. Same

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findings were recorded by UDALL (1972); EL-SHERIF and FAWZIA (1981) and ATTIA (1984).

Variations in serum enzymes activities was shown in Table (3). A highly significant ($P/0.01$) increase in serum alkaline phosphatase and serum transaminases (SGOT and SGPT) was recorded in clinical rickets, while in subclinical form the increase in previously mentioned enzymes was only significant ($P/0.05$). The elevation in serum alkaline phosphatase in affected goats may be due to the disturbance in mineralization of the oestoid and cartilagenous matrix of developing bone as reported by SALEM, *et al.* (1979) and EL-SHERIF and FAWZIA (1981). The changes in serum transaminase indicated haemolysis of red cell in the muscles. The increased levels explained the degenerative changes in cells affected. Therefore enzyme measurements played an important tool in the diagnosis of rickets in goats.

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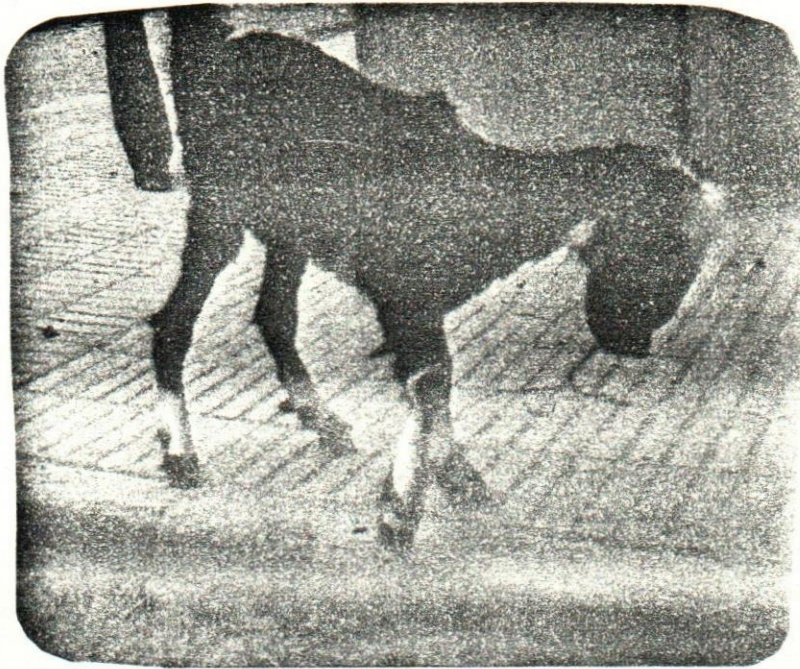


Fig. (1): Rachitic goat showing deformity of the forelimbs and enlarged joints.



Fig. (2): Rachitic goat exhibited enlarged knee joints and outside deviation of the fore-limbs.



Fig. (3): Rachitic goat lie down with inability to stand.

