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Lactate Dehydrogenase and Aspartate Aminotransaminase, Activities as A Prognostic Indices to The Severity of Donkey's Colic

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ABSTRACT

Colic consider as one of the most and common cause leading to death in horses and donkeys. Colic is a general expression that refers to any gastrointestinal pain in horses and donkeys, our study aimed to evaluate the clinical -biochemical alterations of donkey's colic and proves the link between aspartate aminotransaminase, lactate dehydrogenase and severity grades in colicky donkeys. Thirty-five Egyptian donkey were included in this study, these donkeys were divided into fifteen apparently clinically healthy donkeys and twenty donkeys suffering from colic in Menofia and Behira Governate, these selected cases are clinically examined and biochemically expressed through estimation of serum glucose, total protein, blood urea nitrogen , Creatinine , Calcium , Potassium , Sodium, Alanine aminotransaminase , Aspartate aminotransaminase, Lactate dehydrogenase, Serum Malondialdehyde and Total antioxidant capacity. Clinical examination of the donkeys with signs of colic showed moderate significant increase in heart and respiratory rates with a great significant increase in capillary refill time. Analysed serum indicated mild significant increase in the levels of glucose and malondialdehyde as well as great significant increase in the Aspartate aminotransaminase and lactate dehydrogenase. On the other hand, there is significant decline of calcium and potassium. In Conclusions There is a difference in some clinical variables and some serum biochemistries, so we can recommend that the correlation between activities of aspartate aminotransaminase, lactate dehydrogenase in colicky donkeys can be used as an aid in the prognosis and gauging severity of tissue damage in donkey's colic.

Key words: *Aspartate transaminase; Lactate dehydrogenase, Colic, Donkeys*

INTRODUCTION

Colic in equine take in consideration as one of the most and common cause leading to death in horses and donkeys (Roepstorff *et al.*, 2009, Robertson & Sanchez, 2010). Colic is defined as a general expression that refers to any gastrointestinal pain in the horses and donkeys (Salem *et al.*, 2017).

There are many reasons for this syndrome may be risky factors like age, sex, breed and behaviour agents or some etiological factor like dilation of the stomach, impaction, obstructive, flatulent, parasite, and enteritis, finally both of these risk and etiological factors lead to raise the occurrence of colic in horses and donkeys (White & Edwards, 1999) (Radostits *et al.*, 2007). There is many classifications of the Colic, one classification depend on the anatomical feature of the digestive system and the location of colic while another classification depend on the origin of the colic and classified it

into true or false colic, true colic if the colic originated from any part related to digestive system and if the colic originated from any organ rather than digestive system like (kidney, spleen urinary bladder etc.) this mean false colic (White & Edwards, 1999) (Cohen *et al.*, 1999).

Symptoms of the abdominal pain may varied between low to high grade according to the severity of the abdominal pain, low grade or mild including the following signs like (no desire in eating, looking to site of abdominal pain especially flank region, curling the upper lip toward up, stamping on the ground and kicking the abdomen by hind limbs) and to high grade or severe that include the following symptoms like (aggressively rolling up onto their spines, frequently setting down and moving up, or dropping themselves down on the land) (Radostits et al., 2007, Hewetson *et al.*, 2006, Bryan *et al.*, 2009).

Clinical and physical variables like internal body temperature, pulse rate, respiratory rate, mucous membrane and capillary refilling time are very significant for differentiation of the severity and prognosis of the colic cases (Ihler *et al.*, 2004) (Sutton *et al.*, 2013, Bryan et al., 2009). But the problem that these variables have inverse relations with fatal endotoxaemia (Thoefner *et al.*, 2001) (Rani *et al.*, 2018). Many abnormalities observed in different biochemical parameters in many colic cases.(Alsaad & Nori, 2010) (Rani et al., 2018).(Ayaz *et al.*, 1999).

Most cases of colic ended by mortality is connected directly to homeostatic problem in intestine because of many reasons like circulatory collapse, wear of intestinal wall and action of bacterial lipopolysaccharide absorption (Meyers *et al.*, 1982, Graham *et al.*, 2011, Grosche *et al.*, 2011). Colic syndrome is associated by increase of oxidative damage by products which resulted from intestinal ischemia (Marañón *et al.*, 2009). So, our study aimed to investigate the clinical and biochemical diagnosis of colicky donkeys and prove the link between aspartate transaminase and lactate dehydrogenase and severity grades in colicky donkeys.

MATERIALS AND METHODS

Animals

Thirty-five Egyptian donkey were included in this study, these donkeys were divided into fifteen apparently healthy control donkeys and twenty donkeys clinically manifesting colicky pain in Menofia and Behira Governate. The cases were collected in the period between April to July this is the time to change from feeding on alfalfa (berseem) to feeding whey straw and dry hey in addition to sever extreme fatigue and profuse sweeting due to hard working which expose the animal to manifest colicky pain.

Blood samples:

One blood sample about 8 mml was collected from all donkeys by jugular vein puncture; they were collected in tube without anticoagulant for serum isolation. Serum samples were harvested by centrifugation at 3000 rpm for 10 min, then preserved at −20°C until the biochemical analysis.

Clinical Examination

Complete clinical examination was done on both healthy and diseased donkeys which includes all the vital parameters like rectal temperature, heart rate, respiratory rate, colour of mucous membrane and capillary refilling time. A complete physical examination including palpation, percussion and auscultation of most important body parts, to check if there is any abnormality of the heart, lungs or intestines. The clinical examination has done acc. To (Kelly, 1984)

Biochemical analysis:

Glucose, total protein, blood urea nitrogen (BUN), creatinine (Cr), calcium (Ca), potassium (K), sodium (Na), alanine aminotransaminase (ALT), aspartate aminotransaminase (AST), lactate dehydrogenase was estimated spectrophotometrically by using commercial test kits supplied by Biomed diagnostics (Germany) after following the manufacture instructions.

Serum malondialdehyde (MDA) and total antioxidant capacity (TAC) were checked by spectrophotometric technique utilizing kits from Bio-diagnostics (Egypt) after following the manufacture instructions.

Statistical Analysis

The data were showed by the mean ± standard error of mean, compared by t-test. The Linear correlations between clinical variables and serum parameters were detected by Spearman's rank correlation test. Statistical analyses were done using SPSS version 23 (IBM, Armonk,

NY, USA) and graphs were created with Prism 5 (GraphPad, La Jolla, CA, USA).

RESULTS

Clinical manifestation of colicky pain in donkeys

Clinical manifestation in colicky donkeys are sweating, curling of lips, flank watcher, stretching, rolling, stamping, pawing the ground with front foots and kicking at the abdomen and muscle tremors (Fig 1).

Clinical examination of healthy and diseased donkeys

Clinical examination of diseased donkeys reveals significant ($P<0.01$) increase in heart and respiratory rate when compared with healthy one, as well as significant ($P<0.001$) increase in capillary refill time in colicky donkeys while non-significant changes in the body temperature in both groups were recorded. On the other hand the color of ocular mucous membrane was cyanosed in diseased donkeys rather than pinky in healthy one and these data showed in the table no.(1).

Biochemical status in healthy and diseased donkeys

As showed in table (2) there is a mild significant ($P<0.05$) increase in the levels of glucose and Malondialdehyde in diseased group, as well as a great significant ($P<0.001$) increase in the Aspartate aminotransaminase AST and lactate dehydrogenase LDH in affected donkeys. On the other hand, there is mild significant decline of calcium ($p< 0.05$), while potassium show moderate significant ($P<0.01$) decrease in diseased donkeys. At the end there is no significance change in values of total protein, urea, creatinine, alanine aminotransferase, sodium and total antioxidant capacity (TAC) in the colicky donkeys in comparison with healthy cases.

Correlation between AST and LDH and the severity of Colic in Donkeys

According to the severity of sings in colicky donkeys, the diseased group was divided into 3 grades, grade 1 that showing mild signs, grade 2 that showing moderate signs and grade 3 that showing sever signs of colic. There is a great positive correlation between AST and LDH and the severity of colic in donkeys, spearman r is 0.77 and $p < 0.001$ where there is mild, moderate and highly significant increase in AST and LDH in grade1, grade2 and grade 3 respectively in comparison with control donkeys Fig (3)

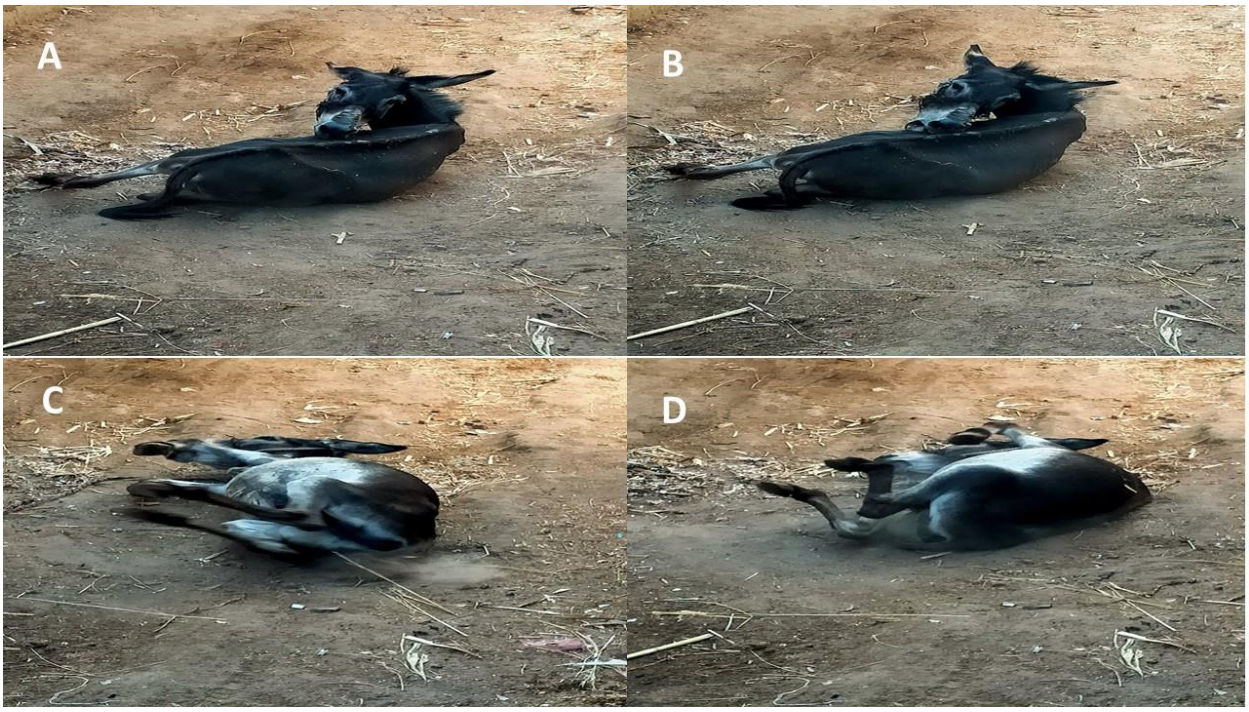

Fig (1A, B, C,D), showed one donkey with different colic signs A, looking to left fleck region, B trying to bite the flank region, C and D kicking and rolling on the ground due to the severity of the pain.

Table (1): Some physical parameters in healthy and colicky donkeys.

Parameter	Control group	Colicky group	P value
Rectal Temperature	37.8±0.056	38.5±0.02	NS
Heart Rate/min	34±0.056	65±0.05**	0.01
Respiratory rate/min	16±0.05	30±0.03**	0.01
Mucous membrane	Pink Colour	Cyanosed colour	
Capillary refilling time/sec	1.1±0.07	2.8±0.3***	0.001

Physical parameters (Means ± SE) in donkeys with colic and control one *p< 0.05, **p < 0.01 and ***p < 0.001

Table (2): Some Serum Biochemistries in healthy and colicky donkeys

Parameter	Control group	Colicky group
Glucose (mg/dl)	82.64± 0.49	152.64± 0.43*
Total protein (mg/dl)	7.84± 0.343	7.12± 0.311
BUN(mg/dl)	46.21± 0.094	49.06± 0.06
Creatinine (mg/dl)	1.01± 0.03	1.27± 0.07
ALT(u/l)	36.48± 0.10	44.56± 0.021
AST(u/l)	41.4± 0.08	118.38± 0.089***
LDH (u/l)	655,3± 1.08	1503.2± 1.021***
Calcium (mg/dl)	7.81± 0.248	4.6± 0.543*
Potassium (mg/dl)	2.45± 0.1	1.01± 0.08**
Sodium(mg/dl)	4.9± 0.6	4.74± 0.5
Malondialdehyde MDA(µmol/L)	50.12± 0.07	92.54± 0.04*
Total antioxidant capacity TAC (mmol/L)	0.178± 0.008	0.153± 0.006

Serum Biochemistries (Means ± SE) in donkeys with colic and control one *p< 0.05, **p < 0.01 and ***p < 0.001

Table (3): AST and LDH (Means ± SE) in healthy and colicky donkeys with different grades of colic.

Parameters	Control	Grade (1) Mild colic	Grade (2) Moderate colic	Grade (3) Severe colic
AST(u/l)	41.4± 0.08	83.23± 0.07*	106.45± 0.06**	145.7± 0.03***
LDH (u/l)	655,3± 1.08	980.7± 0.89 *	1496.2± 1.01**	2100.5± 1.21***

AST and LDH (Means ± SE) in donkeys with different grades colic and control one *p< 0.05, **p < 0.01 and ***p < 0.001

DISCUSSION

Equine colic is a thought provoking issue for wide range of consultants and for holders for determination the prognosis of colic which mirror the chance of mortality in colicky patients (FURR *et al.*, 1995). There are many parameters that revealed the condition grade of colicky donkeys including clinical signs, clinical and physical examination and some biochemical parameters (Johnstone & Crane, 1986).

The observed clinical findings in diseased donkeys are sweating, curling of lips, flank watcher, stretching, rolling, stamping, pawing the ground with front foots, kicking at the abdomen and muscle tremor., and these symptoms agreed by (Ayaz et al., 1999, Alsaad & Nori, 2010, Scantlebury et al., 2014, Ismail & Suliman, 2014) and these signs attributed to the physiological alterations and seriousness of pain (Blood & Radostits, 1989).

Physical finding revealed that there is no significance changes in internal body temperature in colicky group and this data agreed by (Rani et al., 2018, El-Zahar *et al.*, 2018) but disagreed by (Hillyer *et al.*, 2008) that mentioned that there is decline in internal body temperature attributed to the occurrence of shock and also disagreed by (Blood & Radostits, 1989) that said there is elevation of internal body temperature and explained that due to the occurrence of excessive skeletal muscle activity that lead to increase internal temperature, moreover there is moderate significant increase in heart and respiratory rates in affected cases, these coincide with (Rani et al., 2018, El-Zahar et al., 2018) which attribute to the occurrence of

excitement, muscular contraction, pain or gastric dilation that lead to pressure on the diaphragm and then to lung (Radostits et al., 2007). After close examination of the ocular mucous membrane, it was changed from normal pink colour to cyanosed colour which attributed to septicaemia and endotoxaemia or vasoconstriction of blood vessels (Ihler et al., 2004). Finally there is a great significant increase in capillary refilling time in colicky cases and this agreed by (Rani et al., 2018) and disagreed by (El-Zahar et al., 2018) and this attributed by the occurrence of severe dehydration (Bryan et al., 2009) and vasoconstriction of blood vessels.

In some serum biochemistries as shown in table 2, there is a mild significant increase in the levels of glucose in colicky donkeys and this accepted with (Ismail & Suliman, 2014) and this explained that during pain there is elevation of adrenaline and glucocorticoid which lead to elevation of glucose in the blood (Kerr, 2008). Malondialdehyde is mildly elevated in affected donkeys, this coincide with (Ibrahim, 2014) and attributed to the occurrence of oxidative stress which explained by (Kooreman et al., 1998) who mentioned that MDA was elevated in the jejunum of the horses during reperfusion which is contacted directly with oxidative damage. Increase in the activities of aspartate aminotransferase and lactate dehydrogenase LDH in the diseased group, these data agreed by (Rani et al., 2018) which attributed to the occurrence of severe muscular contraction and activity which lead to muscular exhaustion and exertion with subsequent elevation of AST and LDH as an indicators of sever tissue damage, while their level significantly increased in prolonged sever cases of colic.

On the other hand there is mild significant decline of calcium in the diseased donkeys, result was in agreement with (Rani et al., 2018, Ismail & Suliman, 2014) and explained by (Corley, 2007) who mentioned that hypocalcaemia is caused by loss of calcium in sweat due to excitation induced by abdominal pain. There is moderate decrease in Potassium in colicky cases, this agreed by (Ismail & Suliman, 2014) and disagreed by (Rani et al., 2018) and this attributed to loss of electrolytes in profuse sweeting. Some serum biochemistries like total protein, urea, creatinine, alanine aminotransferase, sodium and total antioxidant capacity (TAC) in the colic cases, these coincide with (Rani et al., 2018, Ismail & Suliman, 2014).

After deep and close analysis of our data, we found that there is a great positive correlation between AST and LDH and the severity of colic in donkeys, spearman r is 0.77 and $p < 0.001$ where there is mild, moderate & highly significant increase in AST and LDH in grade1, grade 2 & grade 3 respectively in comparison with healthy donkeys, this result indicates that the elevation of LDH correlated with sever tissue damage also approved by (Rani et al., 2018).

CONCLUSION

We concluded that there is a difference in special clinical variables and some biochemical parameters between healthy and colicky donkeys and after deep analysis we found that there is a great significant difference in the activities of aspartate aminotransferase and lactate dehydrogenase and correlation are positively correlated with the degree of severity of tissue damage in colicky donkeys so elevation in the activities of AST and LDH can be recommended as an aide in the prognosis, gauging severity of tissue damage in colicky cases

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