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Enzymatic analysis in liver of sheep in various hepatic diseases

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Abstract
For estimation of liver enzymes (ALT, AST, Alkaline Phosphatase, GGT) of sheep in various hepatic lesions, 58 serum samples (10 serum samples collected from healthy sheep as control group and 48 serum samples collected from affected sheep that were showing various hepatic lesions Bikaner and adjoining areas. In comparison with healthy control group of sheep, the value of Alanine aminotransferase (ALT). Aspartate aminotransferase (AST), Gamma-glutamyl transferase (GGT), Alkaline phosphatase was highly significantly (P<0.01) increase in various hepatic lesions.

Keywords: Liver enzymes, sheep, serum

Introduction
Sheep farming plays an important role in the national economy with the unique feature of providing low expenditure and maximum profit. Sheep have a specific talent to adapt adverse climatic conditions among all the domestic species. Sheep, with its multi-facet utility for wool, meat, milk, hide and manure forms an important component of the rural economy particularly in the arid, semi-arid and hilly areas of the country (National Action Plan on Sheep-2022) [9]. The liver has enormous task of maintaining the body's metabolic homeostasis. This task includes the processing of dietary amino acids, carbohydrates, lipids, vitamins, synthesis of serum proteins, detoxification and excretion into bile of endogenous waste products and xenobiotics also. Thus, it is not surprising that the liver is vulnerable to a wide variety of metabolic, toxic, microbial and circulatory insults (Kumar et al., 2007) [7]. ALT and AST are released in the blood and causes an increase in the amount of serum enzyme, when liver cell membrane damages (Pratt and Kalpan, 2000) [11]. ALT is an enzyme found in the liver that helps in converting proteins into energy for the liver cells. When the liver is damaged, ALT is released into the bloodstream and its level increases. AST is an enzyme that metabolizes amino acids. Like ALT, AST is normally present in blood at low levels. An increase in AST levels may indicate liver damage or diseases and muscle damage. Elevations in serum alkaline phosphatase levels originate predominantly from two sources, liver and bone. Chronic cholestatic, infiltrative liver disease and liver damages such as blocked bile duct or certain bone diseases may be due to excess alkaline phosphatase of liver origin (Pratt and Kalpan, 2000) [11]. Gamma-glutamyl transferase (GGT) is an enzyme in the blood, higher than normal levels may indicate liver or bile duct damage.

Materials and Methods
In the present study, blood samples were collected from sheep for estimation of ALT, AST, Alkaline Phosphatase, GGT at Bikaner district and adjoining areas. Blood samples were collected from jugular vein of sheep before slaughtering at slaughterhouse in vacutainer tube without anticoagulant. Being confirmed after slaughter of animal on the basis of hepatic lesions, the collected blood was taken or discarded. Serum was separated from blood by making the blood slant and incubated at 37 ºC for 1 hr. Blood clots were broken and tubes were centrifuged at 2500 rpm for 30 minutes. Serum was pipette out into small pyrex tube. 10 serum samples were collected from healthy sheep as control group and 48 serum samples were collected from affected sheep that were showing various hepatic lesions. The centrifuged serum was preserved in deep freezing at -20 ºC for further studies. Serum samples were analyzed for liver enzymes (ALT, AST, Alkaline Phosphatase, GGT) by IDEXX kit method. The data obtained from both apparently healthy and diseased sheep were analyzed by using

appropriate statistical method student's t-test. Using the SPSS software version-20.

Result and Discussion

Table 1 and Table 2 showed changes in ALT, AST, Alkaline Phosphatase, GGT.

Table 1: Control group and affected group.

S.N.	Name of Enzyme	Control (N=10)	Affected (N=48)	Significance
1.	ALT	19.09±0.89	27.27±0.58	**
2.	AST	86.46±2.50	130.74±2.78	**
3.	Alkaline Phosphatase	68.55±1.22	79.48±1.29	**
4.	GGT	43.06±1.97	55.34±1.44	**

** = highly significant (P<0.01)

Table 2: Control and affected according to various hepatic lesions

	ALT(IU/L)	AST (IU/L)	Alkaline Phosphatase (IU/L)	GGT (IU/L)
Control (N=10)	19.09^{a}±0.89	86.46^{a}±2.50	68.55^{a}±1.22	43.06^{a}±1.97
Abscess (N=11)	32.25^{f}±0.75	136.55^{d}±1.10	88.18^{c}±1.73	58.72^{b}±2.94
Necrosis (N=11)	29.46^{e}±0.08	136.55^{d}±1.10	82.64^{b}±1.67	59.94^{b}±2.96
Fatty liver (N=10)	26.17^{d}±0.26	155.24^{e}±2.94	81.52^{b}±2.11	58.87^{b}±2.67
Haemorrhage (N=8)	22.08^{b}±0.98	113.13^{c}±1.13	71.14^{a}±2.09	46.71^{a}±2.47
Congestion (N=8)	24.02^{c}±0.21	101.79^{b}±2.77	69.03^{a}±1.28	48.65^{a}±2.57

1. ALT (IU/L)

Table 1 showing highly significant (P<0.01) increase in ALT value of affected liver of sheep as compared to liver of control group of healthy sheep.

The ALT was significantly increased (P<0.01) in various hepatic lesions viz. abscess, necrosis, fatty changes, haemorrhages and congestion in sheep as compared to healthy control group (Table 2).

In this research, ALT values highly significant increase in sheep with various hepatic lesions and also increase in total affected cases as compared to healthy control sheep. Similar observation was also recorded by Degheidy *et al*. (1990) [3] in their study on the effect of fascioliasis on liver function before and after treatment in sheep, Patra (2002) [10] in their study on pathology of hepatic disorder in garole sheep, Bamorovat *et al*. (2014) [2] in their study on comparative evaluation of hematological, biochemical and pathological changes among infected sheep with *Cysticercus tenuicollis* and non-infected control group, Khan *et al*. (2019) [6] in their study to examine the incidence of liver fluke infestation and pathological examination of sheep in Mirpur Azad, Aslam *et al*. (2020) [1] in their study hematobiochemical alterations and gross pathology of liver fluke infestation in goat.

2. AST (IU/L)

Table 1 showing highly significant (P<0.01) increase in AST value affected liver of sheep as compared to liver of control group of healthy sheep.

The AST was significantly increased (P<0.01) in various hepatic lesions viz. abscess, necrosis, fatty changes, haemorrhages and congestion in sheep as compared to healthy control group. However, lesions such as abscess and necrosis were comparatively non-significant to each other (Table 2).

In this research, AST values highly significant increase in sheep with various hepatic lesions and also increase in total affected cases as compared to healthy control sheep. Similar observation was also recorded by Degheidy *et al*. (1990) [3] in their study on the effect of fascioliasis on liver function before and after treatment in sheep, Patra (2002) [10] in their study on pathology of hepatic disorder in garole sheep, Bamorovat *et al*. (2014) [2] in their study on comparative evaluation of hematological, biochemical and pathological changes among infected sheep with *Cysticercus tenuicollis* and non-infected control group, Khan *et al*. (2019) [6] in their study to examine the incidence of liver fluke infestation and pathological examination of sheep in Mirpur Azad, Aslam *et al*. (2020) [1] in their study hematobiochemical alterations and gross pathology of liver fluke infestation in goat. Whereas no significant difference was recorded by Hodzic (2013) [5] and significantly decrease in AST value was recorded by Matanovic (2007) [8].

3. Alkaline Phosphatase (ALP, IU/L)

Table 1 showing highly significant (P<0.01) increase in ALP value of affected liver of sheep as compared to liver of control group of healthy sheep.

The ALP was significantly increased (P<0.01) in various hepatic lesions viz. abscess, necrosis and fatty changes in sheep as compared to healthy control group. However, lesions such as haemorrhages and congestion were comparatively non-significant to each other and control group (Table 2).

In this research, ALP values highly significant increase in sheep with various hepatic lesions and also increase in total affected cases as compared to healthy control sheep. Similar observation was also recorded by Swarup *et al.* (1986) [14] in their study on some biochemical indices in naturally occurring fascioliasis in goats, Degheidy *et al*. 1990) [3] in their study on the effect of fascioliasis on liver function before and after treatment in sheep, Patra (2002) [10] in their study on pathology of hepatic disorder in garole sheep, Shankarbhai (2007) [13] in their study on pathobiochemical studies on spontaneously occurring hepatic lesions in sheep, Khan *et al.* (2019) [6] in their study to examine the incidence of liver fluke infestation and pathological examination of sheep in Mirpur Azad, Aslam *et al.* (2020) [1] in their study hematobiochemical alterations and gross pathology of liver fluke infestation in goat. Whereas decrease ALP value was recorded by Purohit *et al*. (2003) [12] in their study on 10 amphistome infected Garole sheep.

4. Gamma-glutamyl Transferase (GGT, IU/L)

Table 1 showing highly significant (P<0.01) increase in GGT value affected liver of sheep as compared to liver of control group of healthy sheep.

The GGT was significantly increased (P<0.01) in various hepatic lesion viz. abscess, necrosis and fatty changes in

sheep as compared to healthy control group. However, lesions such as haemorrhages and congestion were comparatively non-significant to each other and control group (Table 2).

In this research, GGT values highly significant increase in sheep with various hepatic lesions and also increase in total affected cases as compared to healthy control sheep. Similar observation was also recorded by Gonenci *et al.* (2003) [4] in their study on subclinical fatty liver syndrome in Damascus goats, Shankarbhai (2007) [13] in their study on pathobiochemical studies on spontaneously occurring hepatic lesions in sheep, Hodzic (2013) [5] in their study on influence of *Fasciola hepatica* on serum biochemical parameters and vascular and biliary system of sheep liver, Khan *et al.* (2019) [6] in their study to examine the incidence of liver fluke infestation and pathological examination of sheep in Mirpur Azad, Aslam *et al*. (2020) [1] in their study hematobiochemical alterations and gross pathology of liver fluke infestation in goat.

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