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Estimation of biochemical parameters associated with various pathological conditions of kidney in goats (*Capra hircus*)

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Abstract

The present study was conducted to evaluate Total protein, Albumin, Globulin, A/G ratio, BUN and Serum Creatinine level in goats (*Capra hircus*) showing various renal lesions. Total 50 serum samples, 10 serum samples collected from healthy goats as control group and 40 serum samples collected from affected goats that were showing various renal lesions were collected in and around Bikaner district. Total protein and Albumin ($p^* < 0.01$) were found significantly decreased, Globulin and A/G ratio ($p < 0.07$) were found non-significant decreased, Blood urea nitrogen (BUN) and Creatinine was found to be highly significantly increased ($p^{**} < 0.001$) in case of affected animals showing various renal lesions in comparison with control group of animals.

Keywords: Total protein, albumin, globulin, A/G ratio, blood urea nitrogen (BUN), serum creatinine

Introduction

Kidney is an important organ of the body. Excretion is the main function of the kidney. Renal diseases don't seem to be uncommon in food animals and information resulting from abattoir data is a good source for evaluation and monitoring of renal diseases in livestock (Lari *et al.* 2007) [4].

Kidney Function Tests (KFT)/ Biochemical Tests for Renal Function: Kidney plays a very important role in the maintenance of water volume, electrolyte and acid-base balance within the body. Kidney serves a vital function of excretion of products of metabolism and other harmful substances.

Renal/ Kidney function tests are done to assess the functional capacity of kidney (Blood flow to the kidney, glomerular filtration and tubular function). The aim of renal function tests is to detect impairment of renal function as early as possible. The kidney function can be assessed by examination of blood and urine.

Blood/serum analysis

- Estimation of blood urea nitrogen
- Serum creatinine, protein

The selection of kidney function tests starts with routine urine examination, followed by serum creatinine and/or other blood urea estimation and at last the particular tests to measure the tubular and glomerular functions (Clearance tests). Biochemical profiles are important to be discussed because they supply valuable information about the breed, sex and animals health status (Madan *et al.* 2016) [5].

Creatinine: Creatinine is a waste product that forms when creatine, which is found in muscles, breaks down. Creatinine levels in the blood can provide information about how well kidneys are working. A study conducted by Mbassa and Poulsen (1991) [7], creatinine levels increased within the oldest goats and urea levels were higher in young goats than in adult goats.

Blood Urea Nitrogen (BUN): Urea is formed within the liver and passed out from the body in the urine. A BUN test is completed to work out how well kidneys are working.

If kidneys are not capable to remove urea from the blood normally, then BUN level rises. Heart failure, dehydration, or a diet high in protein can also make BUN level higher. It's known that dietary protein taken by ruminant is decomposed to amino acids and simpler nitrogenous compounds, especially ammonia, by the action of microorganisms swelling in rumen and that these nitrogenous compounds are resynthesized to microbial protein (Phillipson, A. T., 1964)^[8].

Materials and Methods

Collection of Blood Samples

Blood samples were collected from jugular vein of goat before slaughter at the slaughter house, in clean collection tube without anticoagulants. Serum was separated by making blood slant and incubate for 1 hr. at 37 °C. Blood clot was broken and tube was centrifuged at 2500 rpm for 30 minutes. Serum was pipette out into a small pyrex tube. The centrifuged serum was preserved in deep freezing at -20 °C for further biochemical studies. Serum samples were analysed for Biochemical parameters by IDEXX kit method. The data

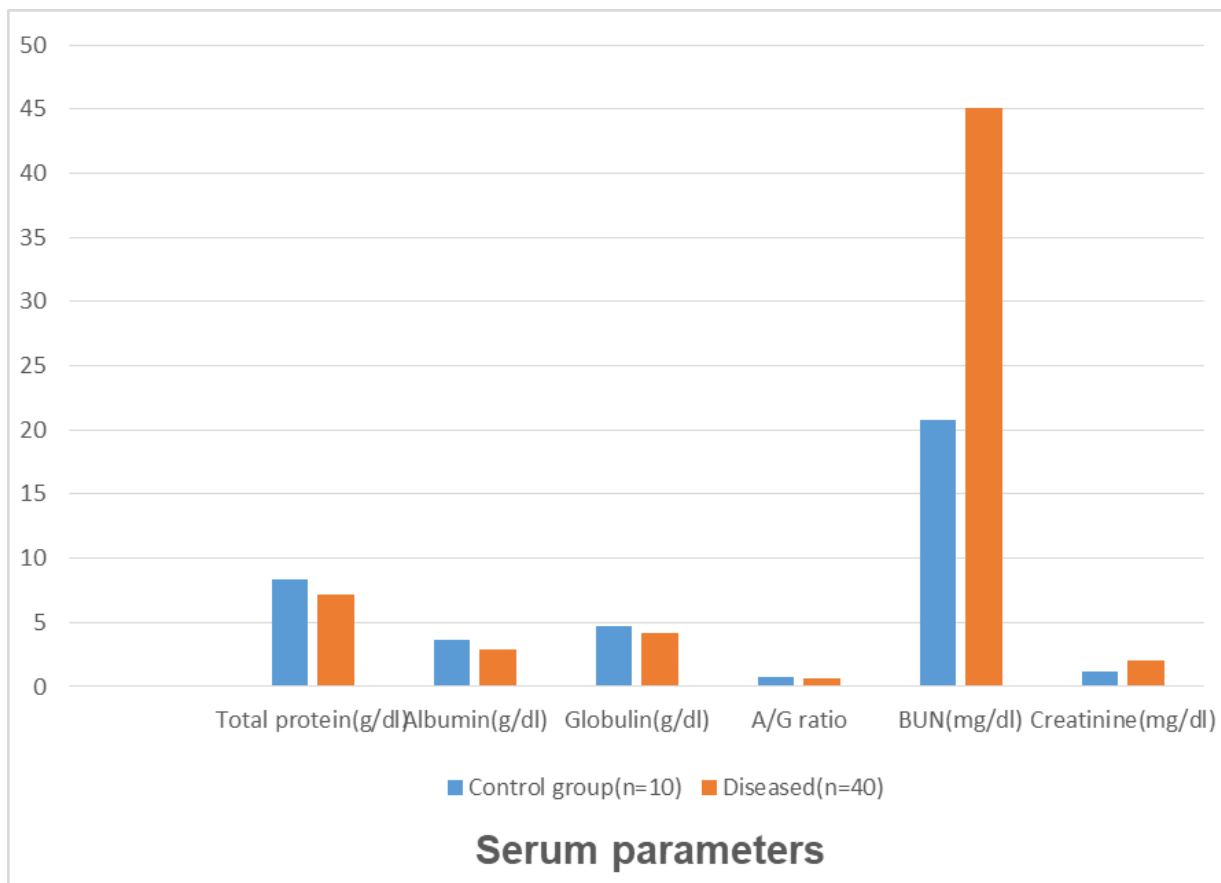
obtained from both apparently healthy and diseased goats were analysed by using appropriate statistical method student's t-test using the SPSS software version-26.

Results

Table 1: showing changes in blood parameters in healthy animals and affected animals.

S. No.	Blood parameters	Control group (n=10)	Diseased (n=40)
1.	Total protein (g/dl)	8.32±0.25	7.14±0.38*
2.	Albumin (g/dl)	3.64±0.17	2.9±0.24*
3.	Globulin (g/dl)	4.68±0.16	4.2±0.18
4.	A/G ratio	0.78±0.04	0.69±0.03
5.	BUN (mg/dl)	20.8±1.5	45.07±1.69**
6.	Creatinine(mg/dl)	1.22±0.12	2.0±0.13**

P value: significant: $P^* < 0.01$
 Non- significant: $P < 0.07$
 Highly significant: $P^{**} < 0.001$



Graph 1: Bar diagram showing changes in blood parameters in healthy animals and affected animals.

Total protein and albumin: Total protein and albumin in diseased animals (7.14±0.38) g/dl and (2.93±0.24) g/dl were noticed. Presence of proteins mostly albumin in urine it cause hypoproteinemia. Glomerular membrane doesn't allow the elimination of plasma protein and albumin in health animals but total protein and albumin are decreased due to defect in glomerular membrane, tubular injury and inflammatory reaction in kidney diseases such as nephrotic syndrome or glomerulonephritis, hydronephrosis, hyalinization, interstitial haemorrhage, tubular cell swelling, proteinaceous casts (in urinary spaces and renal tubules), renal cysts, tumours, renal abscesses etc.

Globulin and A/G Ratio: Globulin and A/G ratio in diseased animals (4.21±0.18) g/dl and (0.69±0.03) were observed. Globulin are group of proteins in blood play an important role in liver function, clotting and fighting infection. Low level of globulin due to kidney disease. A low A/G ratio due to loss of albumin in kidney affections like nephrotic syndrome.

Blood Urea Nitrogen: BUN (45.07±1.69) mg/dl were recorded in diseased animals. Increase level of BUN due to renal failure, there of accumulation of urea in blood because the rate of excretion is decreased as compare to production of BUN. Urea was formed in the liver by the breaking down of

amino acids. These changes were associated with kidney affection such as dehydration, degeneration changes, circulatory disturbances (congestion, haemorrhages and hydronephrosis), chronic kidney disease, decrease in glomerular filtration resulting in retention of urea and bacterial, viral and parasitic infections.

Serum Creatinine: Creatinine level in diseased animals (2.0 ± 0.13) mg/dl were observed. Increased level of creatinine in blood due to poor clearance of creatinine by the kidneys. Abnormally increased level of creatinine it cause failure of the kidneys. Retention of creatinine in the body showed that the decrease in tubular secretion, kidney were severely affected, failing to excrete these catabolic products and might also be associated with muscle wasting.

Discussion

Total protein and albumin: In the present study, total protein and albumin was significantly decreased in diseased animals due to renal infection, the mean value of total protein as (7.14 ± 0.38) g/dl and albumin as (2.9 ± 0.24) g/dl were recorded. Similar value is noticed by Shaymaa *et al.* (2011)^[10] total protein as (5.92 ± 0.55) g/dl and albumin as (3.07 ± 0.13) g/dl, also noticed by Somu *et al.* (2017)^[11] and Manisha *et al.* (2019)^[6]. Ismael *et al.* (2014) was recorded Total protein g/dl (6.02 ± 0.14) and Albumin g/dl (3.11 ± 0.13). Abeer and Shyamaa (2011)^[10] observed no significant change in serum total protein.

Glomerular membrane doesn't allow the elimination of plasma proteins, except in renal disorder like pyelonephritis, glomerulonephritis, polycystic disease, renal abscess. In this condition glomerular filtration rate is affected that causes low protein level in blood.

Globulin and A/G ratio: In the present study, globulin and A/G ratio is non- significantly decreased. Globulin level as (4.2 ± 0.18) g/dl and A/G ratio as (0.69 ± 0.03) were found. Similar value is recorded by Shaymaa *et al.* (2011)^[10] globulin as (2.85 ± 0.43) g/dl and A/G ratio as (1.08 ± 0.1) also observed by Abeer and shaymaa *et al.* (2011)^[10]. Ismael *et al.* (2014) observed Globulin g/dl (2.83 ± 0.15).

In some renal disorders like acute renal failure, glomerulonephritis, chronic renal failure, pyelonephritis that causes low level of globulin in blood.

BUN (Blood Urea Nitrogen): In the present study, highly significant level of BUN was found as (45.07 ± 1.69) mg/dl. Similar value was observed by Valtonen *et al.* (1982), Sandhu *et al.* (1998), Abeer and Shyamaa (2011)^[10], Riedi *et al.* (2014), Bamnele *et al.* (2015)^[2], Rosa *et al.* (2015)^[9]. Shaymaa *et al.* (2011)^[10] BUN (49.56 ± 8.08) mg/dl were recorded. Increase level of BUN is due to renal insufficiency, which cause accumulation of urea in blood because the rate of elimination of BUN is decreased these changes may be attributed to the renal affection by the presence of vacuolar and degenerative changes in renal tubular epithelial cells and tubular nephrosis.

Serum creatinine: In the present study, highly significant value of creatinine as (2.0 ± 0.13) mg/dl was found. Similar incidence was reported by Valtonen *et al.* (1982), Sandhu *et al.* (1998), Abeer and Shyamaa (2011)^[10], Shaymaa *et al.* (2011)^[10], Riedi *et al.* (2014), Bamnele *et al.* (2015)^[2], Kar *et al.* (2015)^[3], Mishra *et al.* (2015), Rosa *et al.* (2015)^[9],

Manisha (2019)^[6]. Serum creatinine were significantly increased due to degeneration, vacuolation, and tubulitis might also be attributed with muscle wasting disease.

Conclusion

In the present study, Total protein (7.14 ± 0.38) g/dl and Albumin (2.93 ± 0.24) g/dl were found significantly decreased, Globulin (4.21 ± 0.18) g/dl and A/G ratio (0.69 ± 0.03) were found non-significant decreased, BUN (45.07 ± 1.69) mg/dl and Serum creatinine (2.0 ± 0.13) mg/dl were found highly significant Increased in diseased animals.

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